



**Advanced Course at  
Laboratory of Natural Materials Technology,  
Åbo Akademi University**

# **Modern Analytical Tools for Pulp, Paper, and Biorefinery**

**December 08-12, 2025**

**Turku / Åbo**

**Modern Analytical Tools  
for Pulp, Paper, and Biorefinery  
DS00CJ20**



This course will present recent analytical techniques for pulp, paper and biorefinery processes. It is a combined course for PhD students and researchers from industry and research institutes.

- For students, who want to earn 5 credits (ECTS) for the course, there will be lectures, group work and essays. We strongly recommend that students should have at least a basic knowledge of wood/biomass chemistry and analytical methods before registering.
- For industry representatives, you may attend all the lectures. Group work and course essay are not required.

### **Course leaders:**

Prof. Chunlin Xu and Docent Anna Sundberg, Laboratory of Natural Materials Technology

### **Contact information:**

Professor Chunlin Xu

Åbo Akademi/Laboratory of Natural Materials Technology

Henrikinkatu 2, FIN-20500 Turku

Chunlin.Xu@abo.fi

### **Course venue:**

K124B, Agora, Åbo Akademi University

Vesilinnantie 3, 20500 Turku, Finland

### **Course fee:**

-PhD students from Åbo Akademi University and University of Turku: Free for participation; register in Peppi

-PhD students from other Universities: Free for participation with a course participation certificate; alternatively, 150€ to Åbo Akademi university for credits transfer. Information:

<https://www.abo.fi/en/supplementary-studies-for-non-degree-students-extra-students/#fees>

-Representatives from industry and research institutes: 950€

### **Registration:**

-Online form(CRM). Note! The number of participants is limited.

### **Accommodation:**

Moderate-price hotels at walking distance are found from [www.booking.com](http://www.booking.com).

### **Links:**

- Homepage of the university: <http://www.abo.fi/>
- Information about Turku/Åbo can be found at <http://www.turku.fi/> and <http://www.visitturku.fi/>

Questions? Do not hesitate to contact Prof. **Chunlin Xu**! See you in December!

## Preliminary Course Contents

### Theme 1. Basics of Analysis

- 1.1. Sampling, pre-treatment and extraction of different samples (wood, pulp, paper, waters, deposits), Chunlin Xu, ÅA
- 1.2. Introduction to NMR spectroscopy, Robert Lassfolk, ÅA
- 1.3. Introduction to size exclusion chromatography and molar mass determinations, Antje Potthast, BOKU
- 1.4. Introduction to gas chromatographic techniques, André Mazega Fontes, ÅA

### Theme 2. Lignin analysis

- 2.1. Lignin analysis and some microanalytical techniques including GC&GC-MS for lignin, Andrey Pranovich, ÅA
- 2.2. NMR analysis for lignin, Ewellyn Capanema, RISE

### Theme 3. Carbohydrate and fibre analysis

- 3.1. Analysis of cellulose, hemicelluloses and pectins: cleaving and chromatography, Anna Sundberg, ÅA
- 3.2. NMR for Polymer/Nanocellulose analysis, Alistair King, VTT
- 3.3. Solid-state NMR and Diffusion NMR, Lars Evenas, Chalmers University of Technology
- 3.4. Aging, bleaching and chromophores of cellulose fibers, Thomas Rosenau, BOKU
- 3.5. Mass spectrometry for carbohydrate analysis, Chunlin Xu, ÅA
- 3.6. Fiber properties - standard and advanced analysis of fibers, pulp and paper, Jan Gustafsson, ÅA

## Theme 4. Extractives

- 4.1. Lipophilic and hydrophilic extractives – a mess without appropriate analyses; Challenges with extraction/polymerized extractives, Anna Sundberg, ÅA
- 4.2. SPME – A versatile technique for methanol, volatile terpenes, odorous compounds, cognac aroma etc, Andrey Pranovich, ÅA (Note: included in 2.1)
- 4.3. Non-destructive techniques - NIR and Raman combined with machine learning, Julia Chrzastowska, ÅA

## Theme 5. Forest industry cases

- 5.1. Chemical analysis of paper surfaces, Janet Preston, Artemyn Minerals Ltd
- 5.2. Barrier properties and quality control, Vinay Kumar, VTT

	<b>Monday 08.12</b>
9:45	Registration and coffee
10:00-10:45	Welcome and introduction, Chunlin Xu (NMT, ÅA) Presentation of attendees
10:45-11:45	Sampling, pre-treatment and extraction of different samples (wood, pulp, paper, waters, deposits), Chunlin Xu (NMT, ÅA)
11:45	Lunch break
13:00-14:00	NMR spectroscopy - Introduction, Robert Lassfolk (Organic chemistry, ÅA)
14:00-15:00	Introduction to gas chromatographic techniques, André Mazega Fontes, ÅA
15:00-15:30	Coffee
15:30-16:00	Initialization of essays
	<b>Tuesday 09.12</b>
8:30-10:00	Analysis of cellulose, hemicelluloses and pectins: cleaving and chromatography, Anna Sundberg, ÅA
10:00-10:30	Coffee break
10:30-12:00	NMR for Polymer/Nanocellulose analysis, Alistair King, VTT
12:00	Lunch break
13:15-14:45	Solid-state NMR and Diffusion NMR, Lars Evenas, Chalmers
14:45-15:15	Coffee break
15:15-16:00	Solid-state NMR and Diffusion NMR, Lars Evenas, Chalmers
About 16:30	Lab tour at Aurum (Henrikinkatu 2) in Aurum
	<b>Wednesday 10.12</b>
8:45-10:15	Introduction to size exclusion chromatography and molar mass determinations, Antje Potthast, BOKU
10:15-10:45	Coffee break
10:45-12:15	Aging, bleaching and chromophores of cellulose fibers, Thomas Rosenau, BOKU
12:15	Lunch break
13:15-14:45	Lignin analysis and some microanalytical techniques; Pyrolysis and thermal chemolysis combined with GC and GC-MS, Andrey Pranovich, ÅA
14:45-15:15	Coffee break
15:15-16:45	NMR analysis for lignin, Ewellyn Capanema, RISE
	<b>Thursday 11.12</b>
8:30-10:00	Lipophilic and hydrophilic extractives – a mess without appropriate analyses; Challenges with extraction/polymerized extractives, Anna Sundberg, ÅA
10:00-10:30	Coffee break
10:30-11:30	Introduction to surface analysis and non-destructive techniques - NIR and Raman combined with machine learning, Julia Chrzastowska, ÅA
11:30	Lunch break
12:30-13:15	Chemical analysis of paper surfaces, Janet Preston, Artemyn Minerals Ltd
13:15-14:00	Mass spectrometry for carbohydrate analysis, Chunlin Xu, ÅA
14:00-14:30	Coffee break
14:30-	Group work on essays
	<b>Friday 12.12</b>
8:30-10:00	Fiber properties - standard and advanced analysis of fibers, pulp and paper, Jan Gustafsson (NMT, ÅA)
10:00-10:30	Coffee break
10:30-12:00	Barrier properties and quality control, Vinay Kumar, VTT
<b>12:00</b>	<b>End of the course</b>