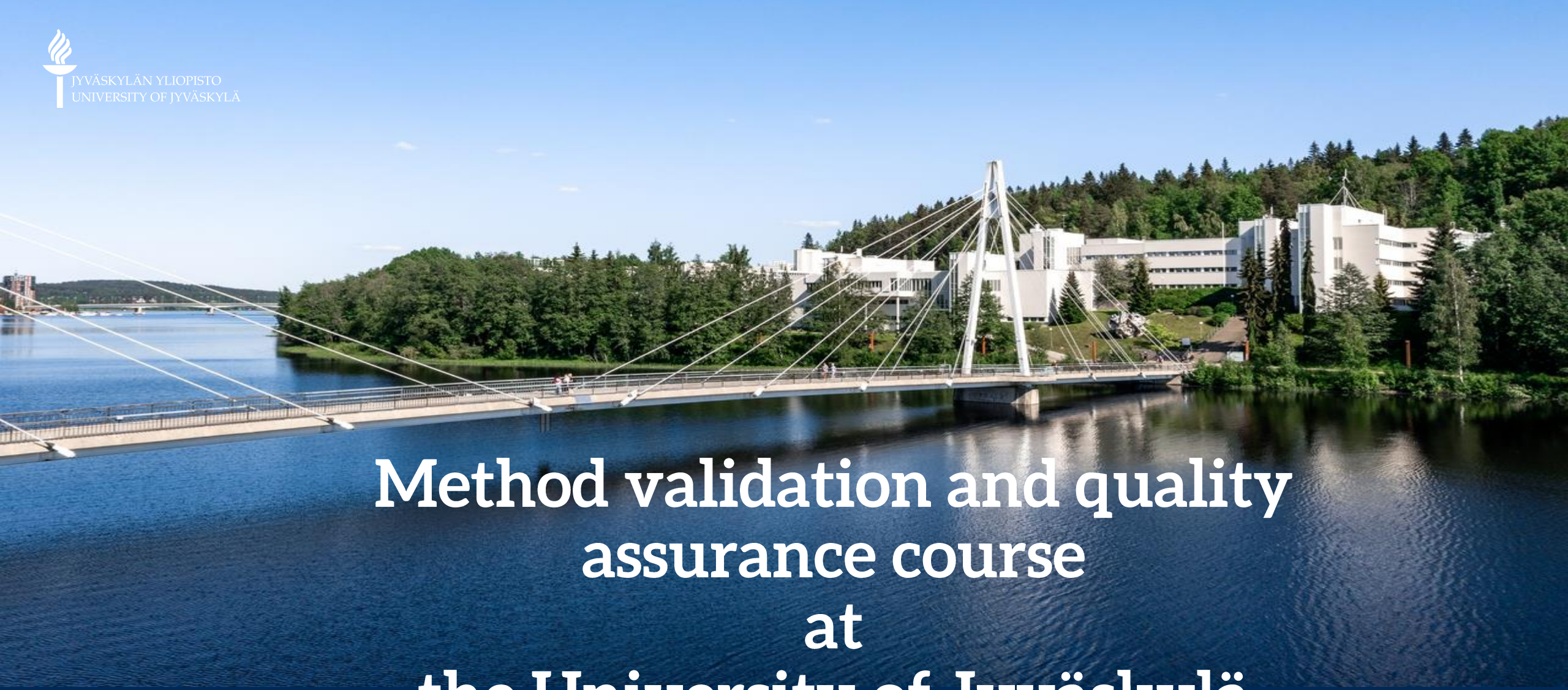
JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ



Method validation and quality assurance course at the University of Jyväskylä

Ari Väisänen

eit RawMaterials
Connecting matters

Funded by the European Union

JYU SINCE 1863.

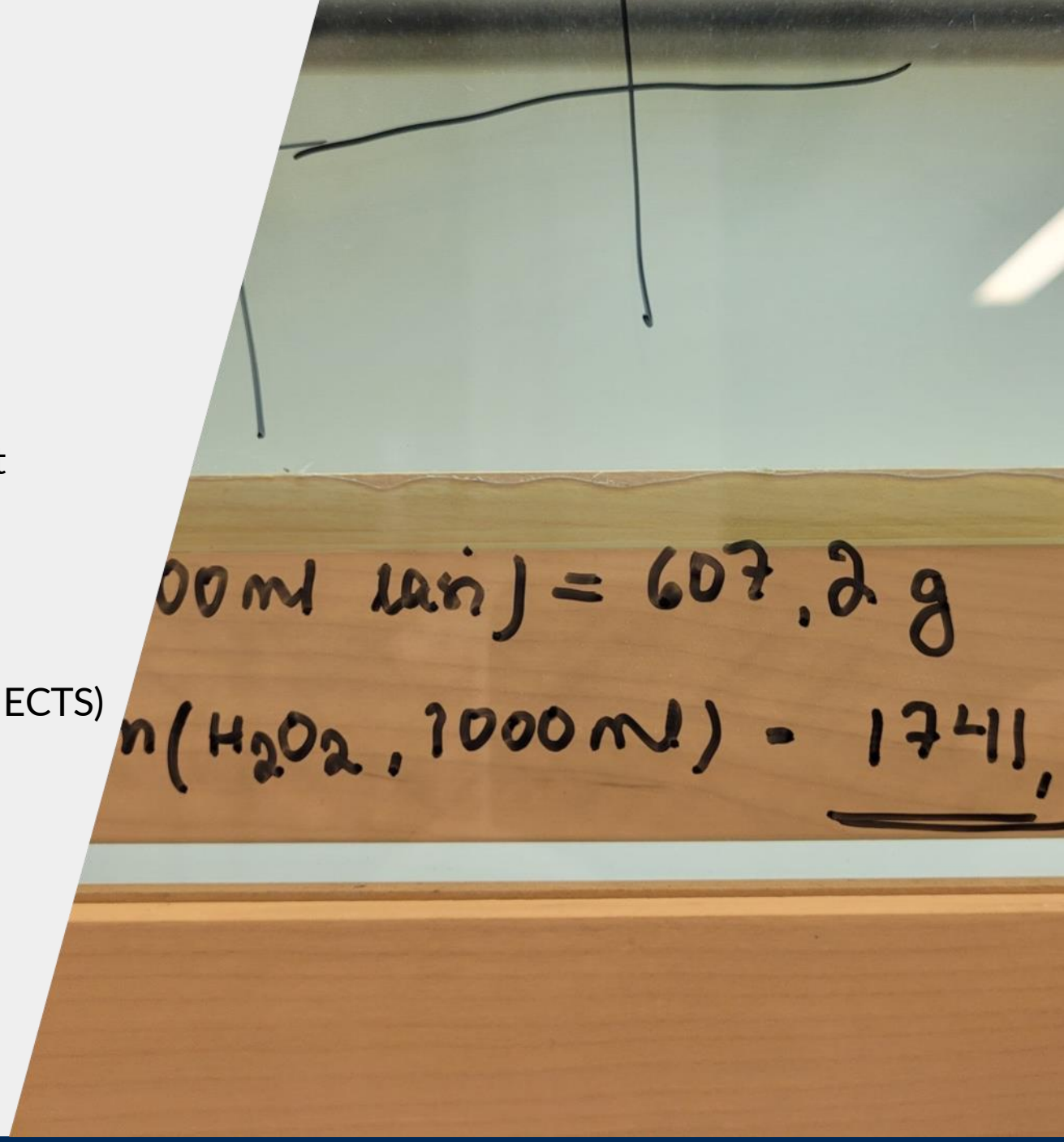
Contents

- KEMS3040 Measurement Uncertainty and Validation of Analytical Methods 4 ECTS
- Course is based on the book Miller, J.N. & Miller, J.C., Statistics and Chemometrics for Analytical Chemistry, Prentice Hall.

- Error types and their sources
- Statistics of repeated measurements
- Significance tests
- The quality of analytical measurements
- Calibration methods in instrumental analysis

- Intended for 4- or 5-year students

- First lectures and then exercises (using Microsoft Excel)
- The same calculations are practiced in advanced laboratory works (10-18 ECTS)
- The course can include the written exercise (2-4 ECTS)
- Course is scheduled just before Masters thesis



Statistics of repeated measurements

- Mean and standard deviation
- Confidence limits of the mean
- Presentation of results (the accuracy with which the result is informed)

$14.784\ mg\ L^{-1}$

$14.784 \pm 0.167\ mg\ L^{-1}$

$14.8 \pm 0.2\ mg\ L^{-1}$

Significance tests

- Probably the most important part of the course
  - Comparison of the experimental mean with the certified value
  - Comparison of two experimental mean
  - Paired t-test

$$t = \frac{|\bar{x} - \mu|}{s / \sqrt{n}}$$

$$|t| = \frac{\bar{x}_1 - \bar{x}_2}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$|t| = \frac{\bar{d}\sqrt{n}}{s_d}$$

1. Zn concentrations in carbide blade raw material was analyzed using FAAS (standard method) and ICP-OES (new method).

ICP	0.242	0.240	0.239	0.244	0.241	0.238 mg/g
FAAS	0.252	0.247	0.242	0.248	0.248	0.246 mg/g

Is the difference between the methods significant?

Zn is a metal that weakens carbide blades, the concentration of which should not exceed the 0.025 %. Is the copper concentration at the acceptable level?

The quality of analytical measurements

- Sampling
- Quality control methods

- standard reference materials

- internal quality control standards

- recovery tests

- Shewhart charts
- Proficiency tests
- Uncertainty

    - MUKIT teached by Teemu Näykki

- Other lecturer from the industry

Calibration

- Principles of trace element analysis
- Preparation of calibration standard solutions
- Linear regression and correlation coefficient
- LOD and LOQ

Thank you for your attention!