Tunnistus

University of Tartu (registry code 74001073,
number of the notice of economic activities 169617) certifies that

Addisu Afrassa Tegegne

date of birth 1 November 1997

has completed the continuing education programme

Estimation of Measurement Uncertainty in Chemical Analysis

P2AV.TK.652
26 hours (1 ECTS credit point)
by the Office of Academic Affairs
from 19 March 2024 to 2 May 2024

Annika Tina

Head of the Office of Academic Affairs

Esta Pilt

Programme Director for Continuing Education

Tartu, 2 May 2024

A supplement is appended to the certificate

The supplement is valid together
with the certificate no. 05493-24
1/1

Addisu Afrassa Tegegne

date of birth 1 November 1997

has completed the continuing education programme **Estimation of Measurement Uncertainty in Chemical Analysis** (P2AV.TK.652) from 19.03.2024 to 02.05.2024, 26 hours (1 ECTS).

Topic	Hours	Lecturer
The concept and origin of measurement uncertainty. The basic concepts and tools (distribution functions, standard uncertainty, A and B type uncertainty estimates). Principles of measurement uncertainty estimation (random and systematic effects and definitions for precision, trueness, accuracy). Overview of the measurement uncertainty estimation approaches. The ISO GUM modeling approach. The single lab validation approach. Comparison of different approaches.	26	Ivo Leito, Irja Helm

The student who has successfully passed the course knows

- the main concepts related to measurement results and measurement uncertainty, including their application to chemical analysis;
- the main mathematical concepts and tools in uncertainty estimation;
- the main measurement uncertainty sources in chemical analysis;
- the main approaches for measurement uncertainty estimation.

The student who has successfully passed the course is able to

- decide what data are needed for uncertainty estimation, understand the meaning of the available data and decide whether the available data are sufficient;
- select the uncertainty estimation approach suitable for the available data;
- quantify the uncertainty contributions of the relevant uncertainty sources using the available data;
- carry out estimation of uncertainty using the main approaches of uncertainty estimation

Method for assessment of learning outcomes: differentiated   Assessment result: A - Excellent

1 ECTS credit point corresponds to 26 hours

Annika Tina
Head of the Office of Academic
Affairs

Esta Pilt
Programme Director for Continuing
Education