UNIVERSITY OF TARTU

AMS

EACH

Applied Measurement Science
Excellence in Analytical Chemistry

TARTU ÜLIKOOL · UNIVERSITAS TARTUENSIS · 1632

UPPSALA UNIVERSITET

Lyon 1

Åbo Akademi University

[ams.ut.ee](ams.ut.ee)

www.analyticalchemistry.eu

First things

- Can we record the session?
- Tour de Table
  - Name, country, major, situation with travel to Estonia
- There was an online orientation course on Aug 25-26
  - Orientation course presentations and different other useful information are available via https://ut.ee/en/orientation-course

Applied Measurement Science

- **Interdisciplinary** 3+2 master's degree programme
- Tuned to the job market needs
- **Cross-sectorial**
  - Physical measurements
  - Chemical measurements (chemical analyses)
  - Metrology
  - Quality systems
  - Economic and legal aspects of measurements
  - Practical placement

The education that you will get is of very broad applicability

AMS Programme structure

AMS

Obligatory Module (45 ECTS)

Courses: Measuring and Instrumentation, Measurement Data Processing, Lab of Physical Measurements, Practical Chemical Analysis Methods, Lab of Chemical Analysis Methods, Fundamentals of Metrology, Metrology in Chemistry, Seminar in Measurement Science, Quality Systems

Elective Module (30 ECTS, courses can be chosen from the list)

Courses: Measurements in Biochemistry, Measurements and the Law, Economic Aspects of Measurements, Signal Processing, Chemometrics, Environment and Measurement, Structural Analysis, Introduction to Electroanalysis, Introduction to Forensic Analysis, Principles and Applications of Fluorescence Spectroscopy, etc.

Optional Subjects

(**6 ECTS**, any courses can be chosen university-wide)

Internship

(**9 ECTS**, internship placement in industry or analysis or calibration laboratories)

Master's thesis

(30 ECTS, reasearch project with a topic related to measurement science**)**

AMS Programme structure

Applied Measurement Science (120 ECTS) print XLS		
1. Obligatory subjects (45 ECTS) "and"		Show module's objectives
LOKT.06.036	Master's Seminar in Measurement Science (12 ECTS)	
LOFY.01.039	Measurement Data Processing (3 ECTS)	
LOFY.01.036	Measuring and Instrumentation (3 ECTS)	
LOKT.06.030	Metrology in Chemistry (6 ECTS)	
LOFY.01.037	Modern Metrology (3 ECTS)	
LOKT.06.032	Practical Chemical Analysis (6 ECTS)	
LOKT.06.033	Practical Works in Chemical Analysis and Metrology (6 ECTS)	
LOFY.01.040	Practical Works on Physical Measurement and Calibration (3 ECTS)	
LTKT.06.015	Quality Systems (3 ECTS)	
2. Elective subjects (30 ECTS) "or"		Show module's objectives
LTKT.02.007	Applied Electrochemistry (3 ECTS)	
LOKT.06.047	Atomic Spectroscopy (3 ECTS)	
LTMR.00.001	Bio-enterprise (6 ECTS)	
LTKT.06.009	Chemical Analysis Lab for Beginners (3 ECTS)	
LOKT.08.005	Chemometrics (6 ECTS)	
LOTI.05.052	Data Acquisition and Signal Processing (6 ECTS)	
LOTI.05.037	Digital Image Processing (6 ECTS)	
LTKT.06.011	Economic Aspects of Measurements (3 ECTS)	
LOKT.04.072	Environment and Measurement (3 ECTS)	
LTKT.06.014	Estimation of Measurement Uncertainty in Chemical Analysis (1 ECTS)	
FLLC.09.001	Estonian for Beginners I, on the Basis of English, Level 0 > A1.1 (6 ECTS)	
SVSV.00.002	How to Build a Startup Company (3 ECTS)	
LOKT.06.061	Introduction to Electroanalysis (3 ECTS)	
LTKT.06.016	Introduction to Forensic Analysis (1 ECTS)	
SVMJ.04.020	Introduction to MATLAB (3 ECTS)	
SVMJ.02.005	Knowledge-Based Start-Up Entrepreneurship (3 ECTS)	
LOKT.06.064	LC-MS Methods Validation (2 ECTS)	
LOKT.06.016	Liquid Chromatography and Mass Spectrometry (6 ECTS)	
LOFY.05.051	Master's Course in Biological Physics (3 ECTS)	
MTMS.01.099	Mathematical Statistics (6 ECTS)	
LTKT.06.013	Measurement Science in Chemistry Summer School (6 ECTS)	
LOKT.06.034	Measurements and the Law (3 ECTS)	
LOKT.10.017	Measurements in Biochemistry (3 ECTS)	
MTMS.01.088	Multivariate Analysis (6 ECTS)	
LTKT.06.017	Nanomaterials and Nanotechnology and Their Applications in Analytical Chemistry (3 ECTS)	
LTKT.06.012	Principles and Applications of Fluorescence Spectroscopy (3 ECTS)	
LTKT.06.022	Proteomics (1 ECTS)	
LOTI.02.015	Reproducible Data Analysis in R (3 ECTS)	
LOFY.02.028	Sensors and Sensor Materials (3 ECTS)	
LOKT.09.022	Structural Analysis I (3 ECTS)	
LOKT.09.023	Structural Analysis II (3 ECTS)	
SVMJ.02.012	Technology Entrepreneurship Basic Course (6 ECTS)	
2.1. Mobility module (15-30 ECTS) "or" Elective		Show module's objectives
Principles of module selection: The overall volume of elective courses has to be 30 ECTS. Elective courses can be taken in the framework of the mobility module abroad. If the number of ECTS credits taken in the framework of the mobility module is less than 30 then the missing ECTS credits have to be compensated by taking courses at UT. The amount of credits to be earned abroad is at least 15 ECTS per semester.		
3. Optional courses (6 ECTS) "or"		Show module's objectives
4. Practical speciality training (9 ECTS) "and"		Show module's objectives
LOKT.00.017	Practical Speciality Training (9 ECTS)	
5. Master´s thesis (30 ECTS) "and"		Show module's objectives
LOKT.00.002	Master's Thesis (30 ECTS)	

Excellence in Analytical Chemistry

- Stemmed from AMS via ***Erasmus Mundus***
- **Full-fledged contemporary analytical chemistry master's degree programme** (120 ECTS)
- Tuned to the job market needs
  - Future-oriented
  - Metrology topics, Socio-economic aspects, Transferable skills
  - Practical placement
  - **2nd year at a different university**

Excellence in Analytical Chemistry

- **Four European universities excelling in different fields:**

TARTU ÜLIKOOL · UNIVERSITAS TARTUENSIS · 1632

Fundamentals of analytical chemistry, metrology in chemistry, quality assurance, socio-economic aspects

UPPSALA UNIVERSITET

Organic and bioorganic analysis, advanced separation methods, mass spectrometry

Åbo Akademi University

Advanced analytical devices, sensors, miniaturization, electrochemistry

Lyon 1

Industrial analysis, process control and monitoring

EACH Programme layout

University of Tartu
Fundamentals of analytical chemistry, metrology in chemistry, quality assurance, socio-economic aspects

Year 1: Fundamentals + Internship placement 60 ECTS

Uppsala University
Organic and bioorganic analysis, advanced separation methods, mass spectrometry

University of Lyon
Industrial analysis, process control and monitoring

Åbo Akademi
Advanced analytical devices, sensors, miniaturization, electrochemistry

Year 2: Specialisation + Master's thesis 60 ECTS

EACH Programme structure (1)

1	**NAME OF CURRICULUM**	Excellence in Analytical Chemistry
2	**ACRONYM**	EACH
3	**EDUCATIONAL INSTITUTION(S)**	University of Tartu, Estonia (UT) Uppsala University, Sweden (UU) University Claude Bernard Lyon 1, France (UCBL) Åbo Akademi University, Finland (AAU)
4	**CURRICULUM TYPE**	Joint Master Programme
5	**LEVEL OF STUDY**	Master's studies
6	**CURRICULUM GROUP**	Physical sciences
7	**LANGUAGE(S) OF INSTRUCTION**	English
8	**OTHER LANGUAGES REQUIRED FOR ATTAINMENT OF THE LEARNING OUTCOMES**	Swedish, French or Estonian
9	**FORM OF STUDIES**	Regular studies
10	**NOMINAL PERIOD OF STUDY**	2 years
11	**AMOUNT OF CREDITS (ECTS)**	120
12	**QUALIFICATIONS GRANTED**	- Master of Science (Excellence in Analytical Chemistry) (UT) and one of the following (according to the assigned study track): - Master of Science (UU) - Master of Physical and Analytical Chemistry (Industrial Analysis) (UCBL) - Master of Science (Technology), (Master's programme in Excellence in Analytical Chemistry (EACH)) (AAU)
13	**DOCUMENTS ISSUED UPON GRADUATION**	Diploma with Diploma Supplement
14	**HIGHER EDUCATION INSTITUTION(S) ISSUING GRADUATION DOCUMENTS**	Tartu University Uppsala University University Claude Bernard Lyon Åbo Akademi University
15	**APPROVAL**	This agreement describes all aspects of the programme and by signing it all participating organisations agree with it.
16	**SPECIALISATION(S)**	Analytical chemistry
17	**VERSION OF CURRICULUM**	2020/2021
18	**PROGRAMME MANAGER**	Ivo Leito
19	**TERMS OF ADMISSION**	BA degree or equivalent qualification; - Prerequisites: at least 60 ECTS in chemistry or in industrial chemistry and 20 ECTS in mathematics or physics. More detailed admission requirements: https://each.ut.ee/EACH/admission-requirements/.
20	**GOALS OF CURRICULUM**	The goal of the curriculum is to provide students with in-depth knowledge and practical skills in analytical chemistry to be qualified for research and development.

EACH Programme structure (2)

21	**BRIEF DESCRIPTION OF CURRICULUM STRUCTURE**	**I study year at the University of Tartu** 1. General analytical chemistry module (21 ECTS); 2. Metrology and quality management module (9 ECTS); 3. Socio-economic module (6 ECTS) and language module (6 ECTS); 4. Internship (6 ECTS); 5. Elective courses (9 ECTS); 6. Optional courses (3 ECTS); **II study year - spent in one of the partner universities:** ***7. Specialisation module (30 ECTS):*** **7.1. Uppsala University** 7.1.1. Organic and bioorganic analysis and multimodal separation techniques module (30 ECTS). **7.2. University Claude Bernard Lyon 1** 7.2.1. Industrial analytical chemistry module (30 ECTS). **7.3. Åbo Akademi University** 7.3.1. Electroanalysis module (30 ECTS); 8. Master thesis (30 ECTS).
22	**REQUIREMENTS FOR COMPLETION OF CURRICULUM**	Completion of the coursework as foreseen in the curriculum.
23	**LEANING OUTCOMES OF CURRICULUM** (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Upon completion of the curriculum, the student: 1) Has systematic understanding of the physical, chemical and metrological foundations of analytical chemistry; factors affecting analytical results; methods for calculating and presenting of results and evaluating their quality for the widespread chemical analysis methods. 2) Has systematic understanding of laboratory quality systems (ISO 17025 and GLP), economic and legal aspects of chemical analysis and basic understanding of managing an analytical laboratory, including maintaining a quality management system. 3) Has the basic skills to work with the widespread analysis and sample preparation techniques and to tune them according to specific analysis tasks; to optimize analysis procedures; to make data evaluation and sampling. 4) Is able to define the problem, choose the methods, test them and determine their characteristics, assess their suitability for the task and apply corrective actions in one of the subfields of analytical chemistry: - Separation science and organic analysis, including multimodal separation techniques and complex samples of biological importance; - Industrial analytical chemistry and process control; - Electroanalysis and electrochemical sensors, including their design, miniaturization and uses for different analytical tasks. 5) Has the knowledge and skills to evaluate the adequacy of chemical analysis results obtained either by him/herself or by others. 6) Is able to apply his/her knowledge and skills for solving novel analytical chemistry problems, including in multidisciplinary context, having limited information and time. 7) Is able to work in a team (including as team leader), manage streams of information, time and resources, present results both for experts and non-experts. 8) Is able to speak Swedish; French or Estonian at least at A1 level.

EACH Programme structure (3)

24	**MODULES**	
	General analytical chemistry module (21 ECTS)	
	GOALS OF MODULE:	To provide the basic knowledge and skills in analytical chemistry.
	LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Upon completion of the module, the student: 1) Has systematic understanding of analytical chemistry, its main concepts, methods of analysis and their characteristics 2) Knows the physical and chemical background of the common chemical analysis techniques and is able to apply them in practice; 3) Knows and is able to apply mathematical methods for treatment of measurement data and is able to present measurement results correctly; 4) Knows the specialisation related terminology and will be capable of explaining and defending the results of his/her research in an academic discussion; 5) Will be able to solve the problems of analytical chemistry in teamwork.
	MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: Obligatory for all students studying in the programme.*
		LOKT.06.050 Master seminar in measurement science I (6 ECTS)
		LOFY.01.039 Measurement data processing (3 ECTS)
		LOKT.06.032 Practical chemical analysis (6 ECTS)
		LOKT.06.033 Practical works in chemical analysis and metrology (6 ECTS)
	Metrology and quality management module (9 ECTS)	
	GOALS OF MODULE:	The goal of the module is to provide knowledge and skills on metrology and its application in analytical chemistry and on the quality assurance of measurements and analysis.
	LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Upon completion of the module, the student: 1) Has the knowledge of the main metrological concepts (traceability, measurement uncertainty) and approaches (validation of analysis procedures, reference materials, interlaboratory comparisons) relevant to chemical analysis; 2) Has the knowledge and skills for ensuring and assessing the reliability of analysis results and expressing them correctly; 3) Knows the main principles of quality management and the main quality management systems in laboratories (ISO 17025 and GLP) and is capable of following these requirements.
	MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: Obligatory for all students studying in the programme.*
		LOKT.06.030 Metrology in Chemistry (6 ECTS)
		LTKT.06.015 Quality Systems (3 ECTS)

Socio-economical module (6 ECTS) and language module (6 ECTS)		
GOALS OF MODULE:	To provide socio-economical knowledge of analytical chemistry and language skills at level A1 in one of the following: Swedish; French or Estonian.	
LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Upon completion of the module, the student: 1) Understands the socio-economic impact of analytical chemistry, both at micro- and macro-economy level; understands the economics of functioning of an analytical laboratory; 2) Is able to communicate results of chemical analysis to a non-specialist audience; 3) Is able to communicate, at the level A1, in one of the three languages spoken in partner universities (Swedish, French or Estonian).	
MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: The student has to choose at least two out of the three courses - LOKT.04.072, LOKT.06.034 or MJRI.10.037 - and one a foreign language course.* *Some of the electives of the first study-year are preparatory courses for specific study tracks and are therefore highly recommended for students assigned to the respective study track (specified in column "Preferred study tracks(s)" below).* *At UU the Swedish language course will be counted as extra credits.*	
	Course	**Preferred study track(s)**
	LTKT.06.011 Economic Aspects of Measurements (3 ECTS)	UU, UCBL, AAU
	LOKT.04.072 Environment and Measurement (3 ECTS)	UU, AAU
	LOKT.06.034 Measurements and the Law (3 ECTS)	UU, UCBL, AAU
	HVLC.03.006 French for Beginners I on the Basis of English, Level 0 > A1.1 (6 ECTS)	UCBL
	HVLC.06.010 Swedish for Beginners I (on the Basis of English), Level 0 > A1.2 (6 ECTS).	AAU, UU (extra credits at UU*)
	FLLC.09.001 Estonian for Beginners I, on the Basis of English, Level 0 > A1.1 (6 ECTS)	
	** Students assigned to the UU study track must note that the HVLC.06.010 course will not be counted towards the master's degree at UU. Therefore, in addition to this course, these students have to choose another foreign language course (e.g., HVLC.03.006, FLLC.09.001, etc.).*	
Internship (6 ECTS)		
GOALS OF MODULE:	Student acquires understanding of the analytical chemistry issues in a professional environment at industry, research institution or a professional laboratory as well as the knowledge and skills for performing certain tasks in that professional environment.	
LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Upon completion of the module, the student: 1) Has understanding of the analytical chemistry issues in a professional environment at industry, research institution or a professional laboratory; 2) Has the knowledge and skills for performing certain tasks in professional environment and use the lab equipment; 3) Understand the quality norms and standards practiced in a particular field; 4) Has experienced working in teams and in professional non-educational setting.	
MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: Obligatory for all students studying in the programme.*	
	LOKT.00.023 Practical Speciality Training (6 ECTS)	

EACH Programme structure (4)

Elective courses (9 ECTS)	
GOALS OF MODULE:	The objective of the module is to enhance students' knowledge in analytical chemistry according their liking and interests.
LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Upon completion of the module, the student has acquired further knowledge and skills in analytical chemistry.
MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: The student compiles the elective module independently keeping in mind the II year specialisation and the recommendations of the Programme Director.* *Some of the electives of the first study-year are preparatory courses for specific study tracks and are therefore highly recommended or obligatory for students assigned to the respective study track (specified in column "Preferred study track(s)" below).*

Course
LTKT.02.007 Applied Electrochemistry (3 ECTS)
LOKT.06.047 Atomic Spectroscopy (3 ECTS)
LTKT.06.009 Chemical Analysis Lab for Beginners (3 ECTS)
LOKT.08.005 Chemometrics (6 ECTS)
LTKT.06.014 Estimation of Measurement Uncertainty in Chemical Analysis (1 ECTS)
LOKT.06.061 Introduction to Electroanalysis (3 ECTS)
LTKT.06.016 Introduction to Forensic Analysis (1 ECTS)
LOKT.06.064 LC-MS Methods Validation (2 ECTS)
LOKT.06.016 Liquid Chromatography and Mass Spectrometry (6 ECTS);
LTKT.06.013 Measurement Science in Chemistry Summer School (6 ECTS)
LOKT.10.017 Measurements in Biochemistry (3 ECTS)
LOFY.01.036 Measuring and Instrumentation (3 ECTS)
LOFY.01.037 Modern Metrology (3 ECTS)
LOFY.01.040 Practical Works on Physical Measurement and Calibration (3 ECTS)
LTKT.06.012 Principles and Applications of Fluorescence Spectroscopy (3 ECTS)
LOFY.02.028 Sensors and Sensor Materials (3 ECTS)
LOKT.09.022 Structural Analysis I (3 ECTS)

Optional subjects (3 ECTS)	
GOALS OF MODULE:	The goal of the module is to learn in accordance with interests and further studies or career.
LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Upon completion of the module, the student has acquired knowledge in the areas studied.
MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: Any courses taught at the University of Tartu or other HEIs that comply with the degree requirements of the involved partner universities*

EACH Programme structure (5)

Specialisation module (30 ECTS)	
GOALS OF MODULE:	During the second academic year, the student studies at one of the following partner universities and specializes in the field of analytical chemistry within the competence of the specific university (the second-year university is assigned during the winter school that takes place between the first and second semesters): **UU**: Organic and bioorganic analysis and multimodal separation techniques - focuses on the analysis of organic, biochemical and biomedical samples with different separation methods and mass spectrometry; **UCBL**: Industrial analytical chemistry module - focuses on analytical chemistry applications in industry, and monitoring and controlling of industrial processes; **AAU**: Electroanalysis module - focuses on electroanalytical chemistry, and the applications and development of chemical sensors (incl. miniaturization). In addition to specialization, the student acquires at least basic knowledge of the local language according to the chosen module (Swedish: UU and AAU, and French: UCBL).
Specialisation module in Uppsala (30 ECTS)	
GOALS OF MODULE:	The student acquires in-depth theoretical knowledge and practical skills in organic and bioorganic analysis and multimodal separation methods.
LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Student who has completed the module: 1) will learn and understand the fundamentals of proteomic and metabolomic approaches in complex biological samples; 2) is familiar with the chemical and physical aspects of separation methods (liquid and gas chromatography and capillary electrophoresis), optimization, detection methods, and can predict how changes in experimental conditions affect the operation of these methods; 3) is familiar with the construction of chromatography, capillary electrophoresis, and mass spectrometry instrumentation; 4) knows what type of information can be obtained from chromatograms, electropherograms and mass spectra, and is capable of interpreting and processing chromatograms and mass spectra; 5) is capable of choosing the suitable method (both, for analysis and detection) for analysis according to the properties of the analytes and matrices, and can justify their choice; 6) is able to plan and perform validation of methodologies and determine the characteristics of the methodology; 7) is able to plan and carry out both qualitative and quantitative analysis with different samples, incl. biological samples.
MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: Obligatory for all students studying in the study-track.*
	1KB154 Applied Analysis of Complex Samples (15 ECTS);
	1KB159 Advanced Mass Spectrometry (15 ECTS)

EACH Programme structure (6)

Specialisation module at University C.B. Lyon 1 (30 ECTS)	
GOALS OF MODULE:	The student acquires the knowledge and skills of all critical parts of industrial analysis that are related to the application of analytical equipment at industrial plants.
LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Student who has completed the module: 1) is familiar with the principles of sampling during industrial analysis, knows the main approaches and constraints of it; 2) is familiar with the construction and characteristics of analytical instruments suitable for industrial analysis, and is capable of installing and using such equipment; 3) is familiar with experimental planning and data analysis, and knows the principles and tools of industrial IT and automation and is able to apply them; 4) is familiar with analytical strategies used in industry and can apply them; 5) is able to choose and implement a suitable industrial analysis and data processing system that takes into account all the limitations of the specific industrial production.

MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: Obligatory for all students studying in the study-track.*
	CHM2303M Sampling on an industrial plant (6 ECTS)
	CHM2209M Instrumentation for industrial analysis (6 ECTS)
	GEP2264M Industrial IT and Automation (3 ECTS)
	CHM2304M Industrial measurement strategy (3 ECTS)
	CHM2060 Data Analysis (3 ECTS)
	CHM1045 Experimental design (3 ECTS)
	CHM2070 Communication and Management (6 ECTS).
Specialisation module at Åbo Akademi University (30 ECTS)	
GOALS OF MODULE:	The student acquires theoretical knowledge and practical skills about electrochemical analysis and chemical sensors.
LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Student who has completed the module: 1) knows the most common electrochemical analysis methods, and the capabilities and limitations of them, and can apply these methods to solve different tasks; 2) is able to define an analysis problem and choose a suitable method for solving it; 3) knows the principles of constructing electrochemical sensors and is familiar with the materials used for building them, can test and characterise the sensors, knows the principles of miniaturization of sensors; 4) knows the measurement strategies and data processing capabilities based on sensors, and is able to implement them.
MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: Courses 410304.0, AK00BL19, 909970.0, and KE00CG27 are obligatory for all students studying in the study-track. In addition, 10 ECTS among elective courses must be chosen. The elective courses are in italics.*
	410304.0 Applied electrochemistry (5ECTS)
	AK00BL19 Chemical sensors and biosensors (5 ECTS)
	909970.0 Swedish as foreign language (5 ECTS)
	KE00CG27 Special project in analytical chemistry (5 ECTS)
	KE00CD66 Applied analytical chemistry (5 ECTS)
	KEMI6429 Bioanalytical techniques (5 ECTS)
	KEMI6513 Functional materials (5 ECTS)
	KEMI6409 LC-MS and its applications (5 ECTS)

EACH Programme structure (7)

EACH Programme structure (8)

Masters' thesis (30 ECTS)	
GOALS OF MODULE:	Student develops practical skills in planning, executing and reporting of scientific research in the field of analytical chemistry.
LEARNING OUTCOMES OF MODULE (to be attained/developed/professional knowledge and skills, general competencies, etc.)	Upon completion of the module, the student: 1) Is intimately familiar with one specific field of analytical chemistry and can formulate the arguments/statements to be presented at defence. 2) Is able to pose and critically analyse the arguments presented in field-specific sources and to argue and justify his/her positions; 3) Knows the general principle of research ethics and can evaluate the scientific level of the research and its degree of application linked to particular area of research; 4) Can structure and deliver a public presentation and participate in academic discussions; 5) Knows the principles and requirements for scientific work and can formulate their work results accordingly.
MODULE COURSES AND PRINCIPLES OF CHOOSING THEM BY STUDENTS	*Principles of module selection: Obligatory for all students.* *One of the following courses at the second-year university (depending on the assigned study track):*
	UU: 1KB052 Degree Project E in Chemistry (30 ECTS)
	UCBL: Master's thesis in Analytical Chemistry (30 ECTS)
	AAU: AK00BD96 Master's thesis in Analytical Chemistry (30 ECTS)
	At UT, one of the above mentioned courses will be transferred as: LOKT.00.002 Master's Thesis (30 ECTS)

Peculiarities of both programmes

- International programme
  - Students with **different backgrounds**
  - Introductory tests in some courses
  - Some **levelling activities** may be necessary
- Some of the topics are still new to university programmes
  - Harmonization underway

- **If you feel that studies are too difficult, come and talk to us!**

COVID-19

- The expectation is that teaching will proceed in as normal way as possible
  - In EACH and AMS most studies will be in hybrid mode

- Nevertheless, COVID-19 is not over!
- Do not come to lecture/seminar/lab with slightest illness symptoms!
- info (Self-isolation, testing, vaccination, etc):
  - https://ut.ee/en/corona
  - https://www.kriis.ee/en

- If not in Estonia: find as good Internet connection as you can!

Some more things (1)

- **Optional** courses
  - Also electives can be selected for optional
- **Master's thesis** (30 ECTS)
  - Research work in a research group
  - Mostly during year 2
  - EACH: in 2nd year university **EACH only**
  - Must be at least "potentially publishable“
  - Will be graded
- **Internship placement**
  - Usually during summer between year 1 and 2
  - Presentation has to be made during the 2nd year
  - Previous experience can count, ask Ivo Leito
  - Lyon study track is special **EACH only**
    - Internship is an intrinsic part of the studies at Lyon
    - No need to do an extra internship between year 1 and 2

Some more things (2)

- **Winter School** **EACH only**
  - Jan 30 – Feb 3, 2023 (probably) in Lyon
  - https://each.ut.ee/EACH/each-winter-school/

- **Summer School**
  - Summer 2023 (dates and venue to be decided)
  - http://www.msc-euromaster.eu/
  - https://each.ut.ee/EACH/msc-summer-school-2022-successfully-finished/

AMS

EACH

Study progress requirements

- Study administration: **SIS** (ois2.ut.ee)
  - Development still ongoing
- The overall programme is **120 ECTS**
- Minimum numbers of ECTS:
  - I semester: 24 ECTS
  - I year: 54 ECTS
    - but **60 is VERY STRONGLY RECOMMENDED!** **EACH only**
    - Special situation with Swedish language at UU **EACH only**
    - Special situation at UCBL (60 ECTS is mandatory during year 1)
- Please check: **EACH only** **EACH only**
  - https://each.ut.ee/EACH/study-regulations/
- If problems: contact Anu Teearu

Autumn and spring

- Course that takes place in autumn as a rule **does not** take place in spring
  - **All obligatory courses that run in Autumn 2022 should be taken in Autumn 2022**
    - They cannot be taken in spring 2023
  - **EACH: if you cannot pass an obligatory 1st year course you cannot go to the second year and cannot graduate from EACH**
    - In such cases we offer possibility to transfer to AMS
      - But then you will need to start paying tuition fee
  - (Low probability: Spring semester labs may run into summer)
- If problems:
  - First, talk to teacher, then contact Ivo Leito

Registration to courses

- **Registration:**
  - You have to **register** yourself to courses
  - Via **SIS**, normally until **12.09.2022**
  - If for some reason you did not manage to register
    - **please go to the course anyhow!**
    - Ask Anu
  - Languages: insert your situation here: https://docs.google.com/spreadsheets/d/1Dps57TrcQZj1V6ec4mwm7krdMYDwr1R0XJlediuacl0/edit?usp=sharing
  - Questions, problems related to registration: Anu
  - All courses will be on your transcript
    - You cannot leave out courses where you had bad grades
- **Cancellation:**
  - Normally possible until **13.09.2022**
    - Or two weeks from start of the course
  - Later cancellation: only in the case of very special circumstances
    - Contact Ivo

Autumn timetable

2022/2023. academic year autumn semester

Time	Course code	Course title	Location	Week(s)	Group(s)	Lecturer(s)
Monday						
9.15 - 12.00	SVMJ.04.020	Introduction to MATLAB (seminar)	Narva mnt 18 - 2017	5-12		Mustafa Hakan Eratalay
~~9.15 - 13.00~~	~~LTKT.06.009~~	Chemical Analysis Lab for Beginners (practical session)	Ravila 14A - 1098	2-16		Irja Helm
14.15 - 16.00	LTKT.06.015	Quality Systems (lecture) Mandatory Mandatory	Ravila 14A - 1020	2-16		Alo Rüütel
Tuesday						
8.15 - 10.00	HVLC.06.010	Swedish for Beginners I (on the Basis of English), Level 0 > A1.2 (practical session)	Lossi 3 - 223	1-16		Kristina Mullamaa
8.15 - 10.00	HVLC.03.006	French for Beginners I (on the Basis of English), Level 0 > A1.1 (practical session)	Lossi 3 - 117	1-16		Reet Alas
10.15 - 12.00	MTMS.01.099	Mathematical Statistics (lecture)	Narva mnt 18 - 1020	1-16		Oleksandr Chepizhko
14.15 - 16.00	LOKT.06.047	Atomic Spectroscopy (lecture)	Ravila 14A - 1020	2-16		Päärn Paiste
Wednesday						
8.15 - 10.00	LOFY.01.036	Measuring and Instrumentation (lecture) Mandatory	W. Ostwaldi tn 1 - A102	1-16		Koit Mauring
10.15 - 12.00	LOKT.08.005	Chemometrics (lecture)	Ravila 14A - 1021	1-16		Geven Piir
12.15 - 14.00	LOKT.06.032	Practical Chemical Analysis (lecture) Mandatory Mandatory	Ravila 14A - 1100	1-16		Koit Herodes, Ivo Leito
14.15 - 16.00	LOKT.09.022	Structural Analysis I (lecture)	Ravila 14A - 1022	1-16		Anton Mastitski
16.15 - 18.00	LOKT.06.050	Master's Seminar in Measurement Science I (seminar) Mandatory Mandatory	Ravila 14A - 1020	1-16		Ivo Leito

Small changes are still possible!

AMS

EACH

Autumn timetable

Thursday

8.15 - 10.00	HVLC.06.010	Swedish for Beginners I (on the Basis of English), Level 0 > A1.2 (practical session)	Lossi 3 - 223	1-16		Kristina Mullamaa
8.15 - 10.00	HVLC.03.006	French for Beginners I (on the Basis of English), Level 0 > A1.1 (practical session)	Lossi 3 - 117	1-16		Reet Alas
8.15 - 10.00	MTMS.01.099	Mathematical Statistics (practical session)	Narva mnt 18 - 1007	1-16	1. rühm	Nicholas Lupul
10.15 - 12.00	MTMS.01.099	Mathematical Statistics (practical session)	Narva mnt 18 - 1007	1-16	2. rühm	Nicholas Lupul
10.15 - 12.00	LOFY.01.037	Modern Metrology (lecture) Mandatory	W. Ostwaldi tn 1 - A111	2-16		Martin Vilbaste
12.15 - 16.00	LTKT.06.009	Chemical Analysis Lab for Beginners (practical session)	Ravila 14A - 1098	~~2-13,15-16~~		~~Astrid Darnell~~ Irja Helm
16.15 - 20.00	SVSV.00.002	How to Build a Startup Company (seminar)	Narva mnt 18 - 1021	3,4,9,11,13		Maret Ahonen
16.15 - 20.00	SVSV.00.002	How to Build a Startup Company (seminar)	Narva mnt 18 - 1021	5		Maret Ahonen
16.15 - 20.00	SVSV.00.002	How to Build a Startup Company (practical session)	Narva mnt 18 - 1021	7,14,15		Maret Ahonen

Friday

10.15 - 12.00	LOFY.01.039	Measurement Data Processing (lecture) Mandatory Mandatory	W. Ostwaldi tn 1 - B103	1-16		Erko Jakobson
12.15 - 14.00	LOKT.06.032	Practical Chemical Analysis (lecture) Mandatory Mandatory	Ravila 14A - 1021	1-16		Koit Herodes, Ivo Leito
14.15 - 16.00	LOKT.08.005	Chemometrics (seminar)	Ravila 14A - 1051	1-16		Geven Piir

Small changes are still possible!

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Organisation of courses, Exam times

- Do not come to lecture/seminar/lab with slightest illness symptoms!
- Info from teacher is superior to SIS
- Attending courses – info from teacher (physical, online or hybrid)
- Academic calendar:
  - SIS
  - https://each.ut.ee/EACH/study-regulations/ **EACH only**
- Course organisation is usually explained during the first class
  - **Please be present (or be online)**
  - **Please respect starting times!**
- Exam times are agreed between students and teachers
  - Please take initiative!
- EACH Winter school **EACH only**
  - EACH students must have exams of compulsory courses before Winter school
  - Winter school is **compulsory** for EACH students

Moodle, Big Blue Button

- Moodle (https://moodle.ut.ee/)
  - Course materials, forums
  - Submission of homeworks, exam tasks
  - Every course has a Moodle page
    - Link in SIS
- Big Blue Button (BBB)
  - For on-line lectures/seminars
    - Usually will be recorded
  - Link(s) on course's Moodle page
  - Google Chrome is needed

Starting times, Deadlines, Academic honesty

- Always be present (physically or online) **few minutes before** the announced starting time!

- Deadline is a **DEADLINE**
  - In general non-negotiable
  - **Do not leave your assignments to the last minute!**

- Academic honesty is a must
  - **Any form of plagiarism is unacceptable!**
    - May lead to expulsion from the programme
    - If in doubt, what is allowed, ask Ivo

Selecting EACH students for study tracks

- You have **two possibilities** to express your preference:
  - Preliminary: when you submitted application (in the motivation letter)
  - Definitive: during Winter school
    - January 2023
    - see https://each.ut.ee/EACH/each-winter-school/
- Students are selected taking into account
  - Their preference
  - Grades of compulsory courses obtained during the first semester at Tartu
  - (Possibly interview or presentation during Winter school)
  - (Knowledge of local language)
- **Final decisions** are made during Winter school in **Jan 2023**

Study track preferences: current status

- Your current preferences and tentative maximum numbers of students:

Study track	UU	UCBL	AAU
First preference	**7**	**12**	**2**
Second preference	**8**	**4**	**9**
Tentative maximum number for study track:	5	8	8

Aspects to take into account in selecting study track

- **Research fields** in the 2nd year universities
- **Competition** for the 2nd year universities
  - Your grades at Tartu matter!
- **Language** skills and what language you study at Tartu
  - French vs Swedish
- **Practicalities**
  - See next slide

On Nov 29, 2022 the 2nd year academics will meet you and present the study tracks (maybe online)

Sometime in Dec we will organise Skype sessions with 2nd year students

Comparison of study track practicalities

https://each.ut.ee/EACH/practical-information/

Aspect	UU	UCBL	AAU	Comments
Workload and the difficulty level of studies compared to Tartu University	Highly competitive. Courses are intense with lectures followed by lab works and report writing. Exams are of 6 hours and 6 hours feels like a blink when you solve the paper. Typically lower grades are obtained than in Tartu.	Highly varied: periods of high intensity alternate with periods of low intensity. However, all of the exams are in one week. Typically lower grades are obtained than in Tartu.	Similar to Tartu, perhaps more flexible. Similar grades to Tartu.	At UU some of the students who were top at Tartu do not feel top students at UU
Level of programme organization and guidance	OK	Could be better	OK	
Knowledge of English needed	Above average	Average (can be compensated in part by knowledge of French)	Average	
Cost of living, including accommodation	High Even some of the EU scholarship holders were almost shocked when they learned about the cost of e.g. accommodation. Bus per ride 3.4 €; monthly pass 60 €; students prefer biking to bus in UU.	Tolerable If you rent an apartment, the government gives you small money, but you have to apply for it. The application process is long and tedious.	Tolerable The student lunch is highly subsidized. The monthly bus ticket is expensive although it is reduced for students. Student organisation fee in autumn semester.	

If you are in a 2nd year university and cannot get the support you need, please contact Anu or Ivo

Aspect	UU	UCBL	AAU	Comments
Possibility of getting financial support for those without EU scholarship	Unlikely Industrial internship will not necessarily be paid.	In spring semester the industry will pay. Industrial internships pay more than internships in labs. In autumn semester it *may be* possible to earn small money (e.g. 500 € per month) by helping professors (e.g. with translation).	Up to now some students at AAU were linked to companies, which paid some money. But then the thesis work is related to the interests of the company.	Internships in Estonia can be paid or not but are mostly not paid
Climate	As in Estonia	Warmer than in Estonia	As in Estonia	
Possibility to plan ahead that you go to this university	Impossible at present	Probably possible	Probably possible	
The tentative (not binding) maximum number of students	5	8	8	EU students can go to UU without limits
Necessity of local language for routine life	English is enough	Local language is very strongly recommended	English is in principle enough, but 2nd year students recommend learning Swedish for two semesters in Year 1	

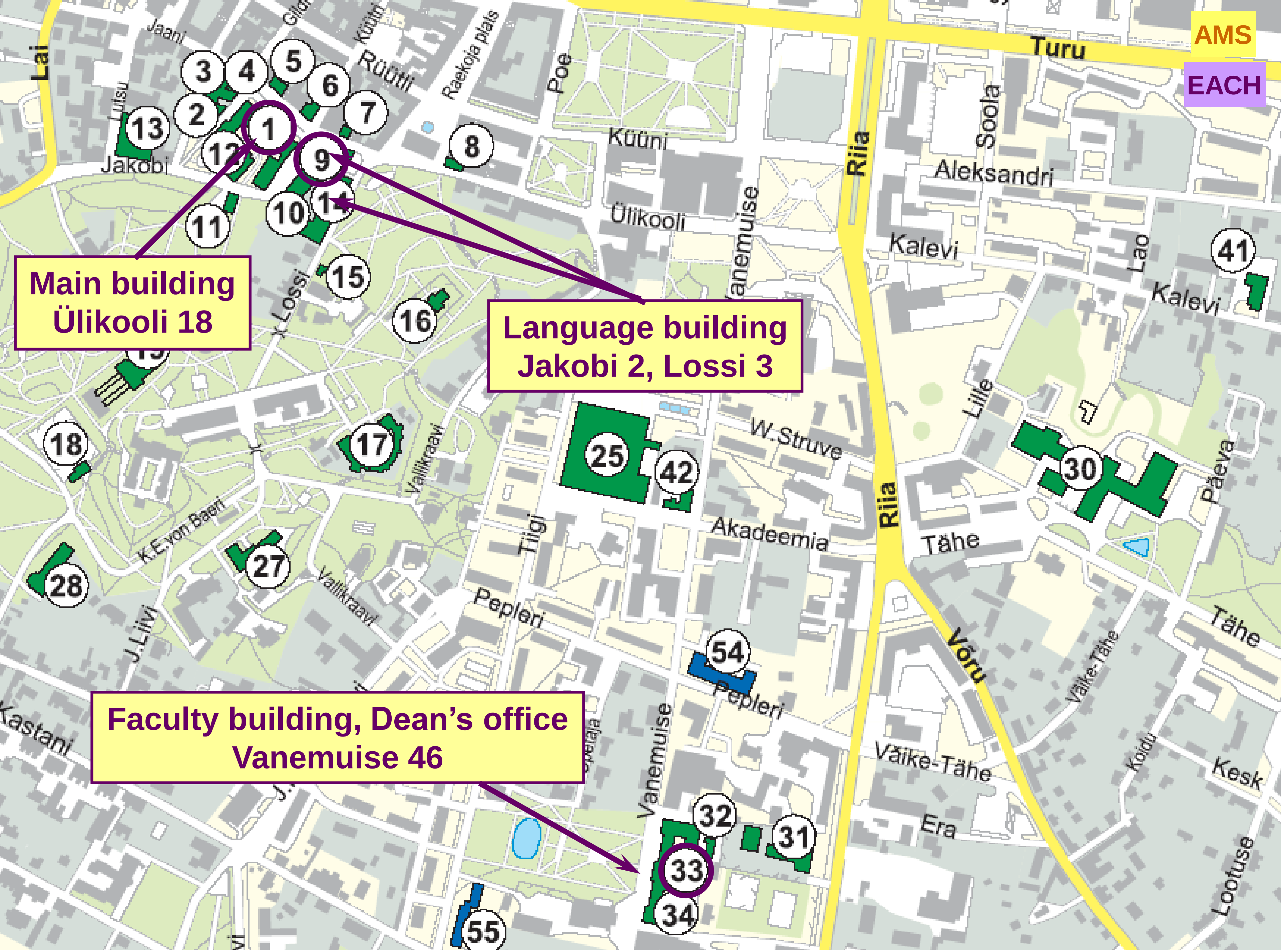
Aspect	UU	UCBL	AAU	Comments
Options with thesis project	Thesis topics: many are of high-level science. However, not everyone would get proteomics or metabolomics (other possibilities: environmental analysis, novel analytical tools, etc)	Usually very practical, related to the needs of industry. Work at industry is very interesting, highly educational, providing networking opportunities and learning in a different environment. At the same time, you are strongly expected to be constructive in accepting the place in industry that is offered for you. This is not "shopping". Finding the places in companies is a lot of effort for Jérôme and colleagues.	Most are related to sensors or industrial (in the latter case industry usually pays money)	
Possibility of paper publication	If the thesis work goes well then you are encouraged by supervisor for publication.	Publishing on the basis of MSc thesis may be possible	Publishing on the basis of MSc thesis may be possible	
Prospects after degree	PhD admission in UU is highly competitive. Swedish language is required for job unless you have strong recommendation for a job.	Several people found jobs immediately at the same industries where they worked	Most people who have graduated have found either job or PhD position	I would not expect big employment problems with a degree from any of the 2nd year universities
The City	Smaller city than Lyon and quite University-centric	Beautiful, international community very big and highly active, activities and contents for every taste	Smaller city than Lyon	

Locations of teaching

- Chemistry building "*Chemicum*" Ravila 14a
  - Ground floor is publicly accessible

Locations of teaching

- Physics building „*Physicum*“ Ostwaldi 1



AMS
EACH
Main building
Ülikooli 18
Language building
Jakobi 2, Lossi 3
Faculty building, Dean's office
Vanemuise 46
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Küüni
Ülikooli
Riia
Soola
Turu
Aleksandri
Kalevi
Lao
Vanemuise
Lossi
Vallikraavi
W.Struve
Akadeemia
Tiigi
Lille
Päeva
Tähe
K.E.von Baeri
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J.Liivi
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Väike-Tähe
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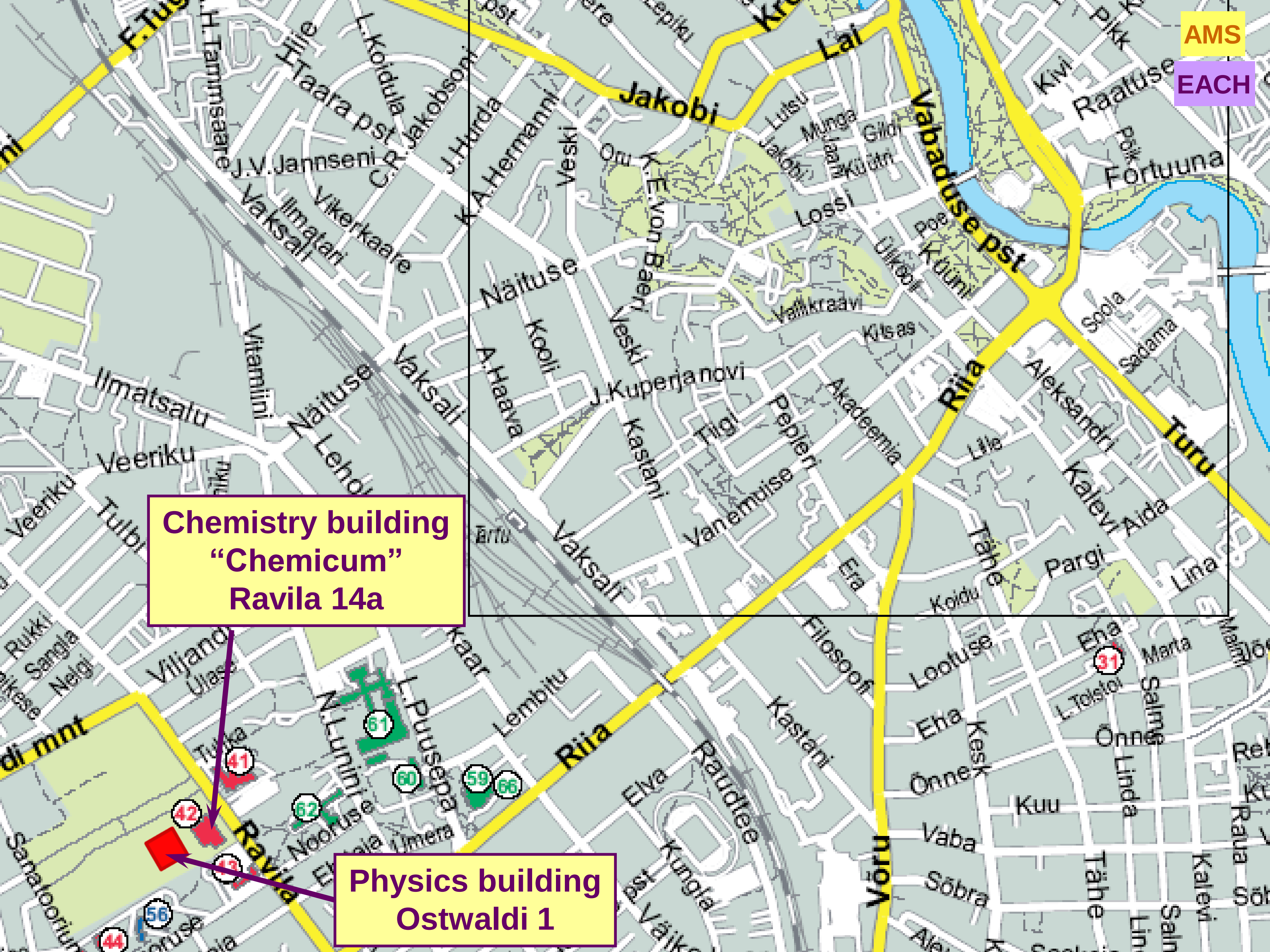
AMS
EACH
Chemistry building
“Chemicum”
Ravila 14a
Physics building
Ostwaldi 1
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L.Puusepa
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Rukki
Sangla
Nelgi
Sanatooriumi
Tartu
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Academic Coordination and Development

Ivo Leito, academic coordinator

- ivo.leito@ut.ee, +372 5 184 176,
  Skype: leitoivo (preferred),
  Messenger: Ivo Leito
  (Ravila 14a – 4034)

– Academic questions:

  – contents of courses, some course is too difficult, teacher is not supportive, which electives to take, finding supervisor, choosing study track, internship placement ...

Administrative Coordinator

Anu Teearu, administrative coordinator

- anu.teearu@ut.ee, (Ravila 14a – 4030)

– Practical/technical questions:

- stipends, health insurance, admin documents, transfer to 2nd year, travel to Winter school …
- At 2nd year university: first local people, if no help, then Anu or Ivo

Study specialist

Urve Soonets, study specialist

- Urve.soonets@ut.ee,
  Ravila 14a – secretariat

– Study-administrative questions

- Registration to courses,
  credit transfer, student exchange

- Please start with Ivo or Anu

Tutor

- **Merili Tammiste**
  - merili.tammiste@ut.ee (student of EACH)

- Everything related to „student life“

UNIVERSITY OF TARTU
1632

EACH AMS

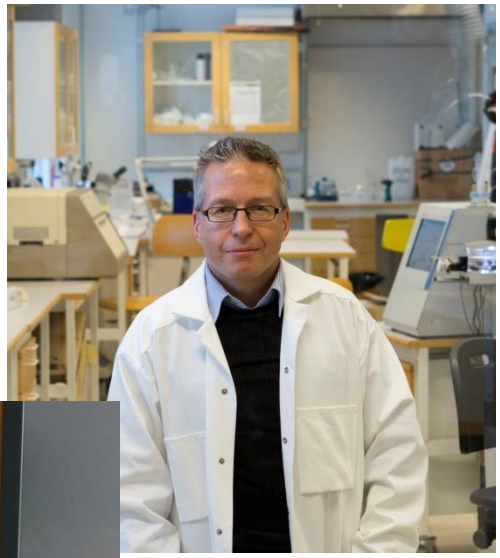
Study Abroad Centre

https://sisu.ut.ee/gettingstarted/

- Central support unit for international students
  - Ülikooli 18 – 134, the „Main building“
  - Web explains, whom to contact
- Problems not directly related to the study programme
  - visa, residence permit, dormitory, bank account …
  - Contact details available: https://sisu.ut.ee/gettingstarted/contact-us#

Academic leaders at second year universities

- Prof. Jonas Bergquist (UU)
  - A worldwide leader in biomedical LC and MS



- Prof. Jérôme Randon (UCBL)
  - Founder of the unique industrial analysis programme at Lyon

- Prof. Johan Bobacka (AAU)
  - His work on miniature sensors is „probing“ the future of analytical chemisry

Communication with teachers

- The most common way: **e-mail**
  - If no response in 4 days – resend
  - If no response after 3 mails – find another way
- Some prefer **Skype**
  - Ivo Leito
- **Facebook, Messenger, etc**: Teachers typically do not use Facebook for communication

How to communicate with Ivo?

- If you want **slow responses** or want **just to inform Ivo** use e-mail
  - Typical response time: **4-6 days**
  - But: use CC liberally (my address in CC means that it is for my information but I am not expected to answer)

- If you want **fast responses**, use Skype or Messenger

(24/7, messages, not calls)

  - Typical response time: **few minutes to few hours**

Please be communicative

- Correct e-mail in SIS
- Correct mobile phone number in SIS
  - If you get new phone number in second year University, put it into SIS **EACH only**
- Please **use ut.ee email address** or connect it with an email address you frequently use
  - UT overall information is sent to ut.ee email
  - teachers may also use ut.ee email address

Some more things

- Your contact and bank data in SIS
- Order in classroom and lab
  - Always do as teacher says
  - Do not come to lecture/seminar/lab with slightest illness symptoms!
- IT (arvutiabi@ut.ee)
  - MS Office 365: https://wiki.ut.ee/display/AA/Microsoft+Office+365+paigaldamine
  - Avoiding loss of data: clouds

    (UT options: https://wiki.ut.ee/pages/viewpage.action?pageId=39553421)
- Why we generally do not make exceptions?
- Letters of recommendation
  - Ask early, give information
- Library, Printer, Mailbox
- Group photo

Study agreements

- These are listed on each.ut.ee/EACH/student-agreement/
  - They are pretty final, some changes will be added
- Anu will inform when and how the agreement can be signed
- If questions, please consult Anu

Scholarships

- **EU scholarship**
  - monthly scholarship: 1000 euros
  - travel contribution: 1st half paid out in September/October 2022 and 2nd half in September 2023
  - installment contribution: 1000 euros for partner country students
- First payment will be done once you have arrived in Tartu and opened a bank account here
  - The payment will include the travel allowance for year I, the montly allowances starting from Sept 2022, and, if applicable, the installation contribution.
- No additional agreement needed – terms are in Study Agreement
- The end date of your studies depends on 2nd year university
  - Probably: UCBL Aug 2023, UU Jun 2023, AAU Aug 2023

Other scholarships

- Not abundant possibilities unfortunately
- Programme websites
- **Research** Scholarships **First of all for AMS**
  - paid by research groups where you do your thesis work
- Some other options:
  - https://ut.ee/en/content/scholarship-information
- Erasmus+ mobility (not for EACH EU scholarship holders)
  - http://www.ut.ee/en/erasmus
  - Traineeship/internship outside Estonia
  - Student exchange **First of all for AMS**
  - EACH students for the 2nd year **EACH only**

Other details

- Estonian ID number - *isikukood* (from your card of residency) - send to Anu and add to the SIS
- See more info: https://sisu.ut.ee/gettingstarted/arrival-abc (Checklist for Degree-seeking students)
- Scholarships
  - Cannot be paid in cash
  - EACH only • UU, AAU: scholarships are paid to Estonian bank accounts only
  - EACH only • UCBL: scholarships can be paid to French bank accounts
- Banks in Estonia and their service fees: https://tartuwelcomecentre.ee/basics/banking/

Health insurance (EACH scholarship holders only)

- Read the conditions carefully
- If hospitalised, immediately inform the insurance provider – AON in collaboration with AWP P&C S.A. Dutch Branch (h.o.d.n. Allianz Global Assistance)
  - 24/7 helpline: **+ 31 20 592 97 78**
  - **Claims can be submitted via** https://www.aonstudentinsurance.com/students/en/claims/
    (keep your original receipts & policy reports for one year after submission of the claim)
- Be ready to cover your expences first and then be reimbursed

Lab skills

- **Introductory lab course**
  - labware calibration, titration, simple instrumental analysis
  - MS Excel: Readability in spreadsheet, simple calculations, calibration graph, linearity, residuals.

- **Levelling course to those who have little experince**
  - Form *My experience with various analytical techniques*
  - Background test (6 excercise, 3 h time limit)

- **Timing/organisation: you will be contacted by Irja Helm**

  - Please read about lab and Excel basics: http://each.ut.ee/EACH/wp-content/uploads/2019/08/Study-materials-for-Anal-Chem-lab.pdf

Safety in labs

- Do not come to lecture/seminar/lab with slightest illness symptoms!
- Highly important
- Modern labs, safety equipment according to EU standards is available
  - Lab coats, goggles, cloves provided by us
- You will undergo safety instruction in the beginning of practical courses
- Safety rules in UT labs:
  - https://each.ut.ee/EACH/study-regulations/ (bottom of page)
- (Hopefully not needed: Face masks, gloves, disinfectants)