UNIVERSITY PATHWAY FINLAND

Science – Technology – Economics

Course Guide
Curriculum 2024-2025

Aalto University

Tampere University

UNIVERSITY OF OULU

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Welcome words

A Heartfelt Welcome to the University Pathway Finland (Science & Technology and Economics) Programme!

Here at Aalto University, we take great pride in hosting the inaugural Finnish university Pathway programme in collaboration with Tampere University and the University of Oulu. This distinctive programme presents international students with an exceptional opportunity to prepare and secure admission for degree studies in Finland while continuing their studies from the comfort of their homes.

We aspire to provide you with a enlightening international learning experience and a platform for engaging with fellow international students who will soon be your peers in our Bachelor programs here in Finland. I encourage you to make the most of the instruction delivered by our university educators. Additionally, remember that sharing your unique experiences and ideas with other students from diverse backgrounds is an enriching way to learn. I trust you will derive pleasure from our supplementary social and informative agenda, thoughtfully crafted to complement the course curriculum.

This guide encompasses the Pathway programme's course descriptions, encompassing learning objectives, workloads, instructional schedules, as well as criteria for completion and evaluation of each course. Upon embarking on your educational journey, we will extend an invitation for you to join our digital learning hub on Microsoft Teams. Within this space, you will find comprehensive course descriptions, details about the social program, and additional information aimed at ensuring your academic journey is both seamless and gratifying.

May your time within the University Pathway Finland programme be profoundly inspiring and rewarding!

MATHEMATICS AND PROGRAMMING:

Vectors and Matrices 5 ECTS

Teaching period and exams: 26.8.-17.10.2024
Teaching times: Mondays and Wednesdays 12:15-13:45

Course Content

- Core content:
  - Systems of linear equations: solving using Gaussian elimination.
  - Linear independence of Euclidian space, subspaces, basis, rank, and dimension of Euclidian space.
  - Different techniques for describing lines and planes.
  - Matrices: matrix algebra, matrix product, the transpose metrices, inverse matrices, the determinant of matrices, eigenvalues and eigenvectors. of matrices.
  - Vectors: cross product, dot product and the vector triple product of vectors
  - Using Matlab for vector and matrix calculations.

Learning outcomes

After the course students can solve systems of linear equations using the Gaussian elimination. They are able present systems of linear equations in vector and matrix form and analyse the system's solutions. They are familiar with subspaces of Euclidean spaces, the concepts of base and dimension. In particular, students are able to test if a given set of vectors is linearly independent. Students can use basic matrix operations, are able to calculate determinants, inverse matrices, as well as eigenvalues and eigenvectors of square matrices. Students can to represent various geometric problems using vector algebra and solve them using tools of linear vector algebra. They are able to prove properties of vectors and matrices, justifying each step of the proof. Students can model practical problems using linear algebra and solve them both by hand by using symbolic software.

Completion and grading

- Attending online classes (80 % attendance): Active participation in the online classes accounts for 10% of the final grade. Active participation means presenting one's own solutions for the assignments, commenting other students' presented solutions and answering other students' questions on the course content during the classes.
- Completing assignments: The assignments account for 25% of the final grade. Each week 8 problems are given. It is mandatory to solve the first 6 problems. Problems 7 and 8 are bonus and can be used to compensate for points lost from problems 1 to 6.
- Written and oral exam: The exams account for 65% of the final grade. In the written exam students can earn 30 points and in the oral exam 6 points. The written exam covers mostly practical questions while the oral exam focuses on theory.
- Grading on scale 1-5. Grade 5 if at least 90% of all points acquired; grade 4 if at least 80% but less than 90% of all points acquired; etc. If less than 50% of all points are acquired than the course is failed.
- The exam can be re-taken once.

Course workload

- Online video lectures 14 hrs (study time including study material approximately 42 hrs)
- Synchronous online classes 14 hrs (study time including preparation for classes 42 hrs)
- Math clinic 14 hrs
- Self-study assignments 21 hrs
- Practice, repetition and exam 16 hrs

Analysis A: Limit and Continuity 5 ECTS

Teaching period and exams: 21.10.-12.12.2024

Teaching times: Mondays and Wednesdays 12:15-13:45

Course Content

- Core content:
  - Real numbers
  - The least upper bound and the greatest lower bound
  - The limit of a sequence
  - Bolzano-Weierstrass Theorem
  - The limit of a function and the epsilon-delta proofs
  - Continuity of a function
  - Bolzano's Intermediate Value Theorem

Learning outcomes

This course introduces to the fundamentals of mathematical analysis at an adequate level of rigour. Upon successful completion of the course, a student will be able to:

- Determine the greatest lower bound and the least upper bound in simple cases,
- Study the convergence and the properties of sequences
- Find limits and study continuity of functions
- Use precise definitions to produce rigorous proofs of results that arise in this course using direct and indirect proof, induction and epsilon-delta technique
- Deliver both oral and written presentations of her/his solutions.

Completion and grading

- Attending online classes (80 % attendance)
- Completing assignments
- Written and oral exam
- Grading on scale 1-5
- The exam can be re-taken once

Course workload

- Online video lectures 14 hrs (study time including study material approximately 42 hrs)
- Synchronous online classes 14 hrs (study time including preparation for classes 42 hrs)
- Math clinic 14 hrs
- Self-study assignments 21 hrs
- Practice, repetition and exam 16 hrs

MATHEMATICS AND PROGRAMMING:

Differential and integral calculus 5 ECTS

Teaching period and exams: 13.1.-27.2.2025
Teaching times: Mondays and Wednesdays 12:15-13:45

Course Content

- Core content:
  - Antiderivative and basic integration techniques. Proper and improper integrals.
  - Ordinary linear differential equations of first and second order. Separable first order differential equations.
  - Limit of a sequence, increasing and decreasing sequences.
  - Series (geometric, with positive terms, alternating, Taylor series) and their convergence.

- Complementary knowledge:
  - Applications of integration in, e.g., determining areas and volumes of geometrical shapes, and computing the length of a curve.
  - Higher order differential equations. Modeling specific real world problems, such as growth of populations, with differential equations.
  - Approximating a function with a polynomial.
  - Using Matlab as a tool in solving the exercise problems.

- Specialist knowledge
  - Numerical integration, trapezoid rule and Simpson's formula. Computing the Riemann sums.
  - Existence and uniqueness results, matrix notation for linear systems.
  - Testing convergence. Computing limits and integrals using series. Estimating the error in polynomial approximations of functions.

Learning outcomes

On this course the students learn basic techniques such as integration by parts and changing of integration variables in integration of simple functions. The students learn to compute antiderivatives of rational functions and to analyze and compute improper integrals. The students also learn to solve simple separable differential equations, compute general solutions of homogeneous second order differential equations with constant coefficients, and to compute the particular solution of a nonhomogeneous differential equation using the method of undetermined coefficients. After the course the students are capable of analyzing the limit of a sequence, computing the sum of a geometric series, and testing the convergence of a series with positive terms. The students also learn how to determine the interval of convergence of a power series, form Taylor polynomials of functions, and simple Taylor series. The students learn present their solutions orally as well as in written form.

Completion and grading

- Attending online classes (80 % attendance). Active participation in the online classes accounts for 10% of the final grade. Active participation means presenting one's own solutions for the assignments, commenting other students' presented solutions and answering other students' questions on the course content during the classes.
- Completing assignments. The assignments account for 30% of the final grade.
- Written and oral exam. The exams account for 60% of the final grade.
- Grading on scale 1-5. Grade 5 if at least 90% of all points acquired; grade 4 if at least 80% but less than 90% of all points acquired; etc. If less than 50% of all points are acquired than the course is failed.
- The exam can be re-taken once.

Course workload

- Online video lectures 14 hrs (study time including study material approximately 42 hrs)
- Synchronous online classes 14 hrs (study time including preparation for classes 42hrs)
- Math clinic 14 hrs
- Self-study assignments 21 hrs
- Practice, repetition and exam 16 hrs

Programming I, 5 ECTS

Teaching period and exams: 3.3.-28.4.2025
Teaching times: Mondays and Wednesdays 12:15-13:45

Course Content

- Core content:
  - Basic principles
  - Data types & operators
  - User input & output
  - Control Structures
  - Modular programming
  - Arrays
  - Strings
  - Pointers
  - Structures
  - File Handling

Learning outcomes

After the course, the student will be able to:

- Implement programs in C programming language.
- Identify and use the basic control structures in a program.
- Understand and apply the concept of modularity in a program.
- Define and apply structures and files to handle data in a program.
- Find and fix errors in the programs.

Completion and grading

- Attending online classes and practice hours (60 % attendance, monitored).
- Programming tasks (completing all mandatory tasks acceptably, on time).
- Mid-term quiz & final exam (minimum required points).
- The final exam can be re-taken once.
- Final grading on a scale 1-5.

Course workload

- Live lectures on Zoom 14 hrs OR possibly 20 hrs
- Guided practice hours 14 hrs OR possibly 20 hrs
- Independent programming practice and assignments ~ 85h OR possibly 75h
- Quizzes and exams (+ preparing) ~ 20 hrs

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FINNISH LANGUAGE AND STUDY SKILLS FOR FINNISH UNIVERSITIES:

Survival Finnish 3 ECTS

Teaching period and exams: 4.4.-19.5.2025
Teaching times: Mondays, Wedenesday and Fridays 12:15-13:45

Course Content

- Core content:
  - Greetings and introducing yourself.
  - Telling about your background and current situation.
  - Asking and answering typical questions in social situations and services on and off campus.
  - Knowledge of the city regions of Helsinki, Espoo and Tampere.
  - The essential characteristics of the Finnish way of life and culture.

Learning outcomes

After the course, the student is familiar with the basics of Finnish language and culture. The student will be able to introduce oneself in Finnish, talk about their general background and current situation using ordinary phares. The student will have tools to manage in common social situations and services on and off campus in Finnish. They will also have tools and strategic skills to learn more Finnish on their own. The student will recognize the main characteristics of Finnish way of life and culture, be able to talk about them, and compare their own culture with that of Finland.

Completion and grading

- Attending online classes (80 % attendance)
- Completing assignments and an exam at the end of the course
- The exam can be re-taken once

Course workload

- Synchronous online classes 24 h
- Self-study assignments and homework 42 h
- Course portfolio and self-evaluation 10 h
- Exam and preparation for the exam 5 h

Finland studies 2 ECTS

Teaching period and exams: 29.8.-16.10.2022
Teaching times: Tuesday, Wednesday and Thursday 10:15-11:45

Course Content

- Core content:
  - The Finnish education system and the Nordic welfare state.
  - The key elements of studying at a Finnish university.
  - Study strategies.
  - Studying in a foreign language.
  - Student wellbeing and study support.
  - Extracurricular activities and student life in Finnish universities.
  - Practical advice for everyday living in Finland.

Learning outcomes

After the course, the student understands what studying at a Finnish university is like and knows the values on which the Finnish education system is based. The student will be able to apply study strategies and time management into their studies and critically reflect upon themselves as learners. The student will have tools to find more information on their future studies in Finland.

Completion and grading

- Attending online classes (80 % attendance)
- Completing assignments
- Grading pass/fail

Course workload

- Synchronous online classes 8 h
- Asynchronous online lectures 4 h
- Self-study assignments and homework 32 h
- Presentation and preparation for the presentation 8 h
- Peer and self-evaluation 2 h

English for Pathway students 5 ECT

Teaching period and exams: 20.8.2024-21.3.2025
Teaching times: Fridays 12:15-13:45

Course Content

In this course, you will practice all four modalities of academic English: speaking, listening, reading, and writing. The course includes two asynchronous self-study online components: reading and writing (1 credit) and speaking and listening (1 credit). Beyond these self-study components, you will have synchronous online lessons with a teacher, small group discussions with your peers, and other online activities.

The course will cover the following topics:

- Engaging in small talk
- Academic discussion skills (seminar-style)
- Presentation skills
- Giving and receiving feedback on spoken and written texts
- Avoiding plagiarism and academic integrity
- Academic style in word choice and grammar

Learning outcomes

After the course, the student understands how to use academic written and spoken English in a university setting. For written skills, the student will be able to select appropriate academic vocabulary, produce well-structured, grammatically sound written texts, employ strategies to avoid plagiarism, and utilize various organizational structures when writing essays for different purposes. For spoken skills, students will be able to interact in academic social settings using appropriate conventions (e.g., conversation markers, small talk devices, language for agreeing and disagreeing) and deliver an oral presentation related to a topic in their area of study. The students will also reflect on how academic written and spoken English differs from English use in daily life and engage in constructive practices of giving and receiving feedback.

Completion and grading

- Attending online classes (80 % attendance)
- Completing assignments and an exam at the end of the course
- Exam can be made up, in case of documented illness, but not retaken
- Grading on a scale of 1-5

Course workload

- Synchronous online classes 19,5 h
- Small group teacher meetings (3 x 30m) 1.5 h
- Small group peer meetings 15 h
- Self-study assignments and homework 54 h
- Other assignments and homework 40 h
- Exam and preparation for the exam 5 h

Contact

Aalto University
pathway@aalto.fi
pathway.aalto.fi