Opasraportti

LuTK - Department of Mathematical Sciences (2011 - 2012)

Tutkintorakenteet

Bachelor of Science (mathematics)

Tutkintorakenteen tila: published

Lukuvuosi: 2011-12

Lukuvuoden alkamispäivämäärä: 01.08.2011

Compulsory general studies (vähintään 8 op)

902002Y: English 1 (Reading for Academic Purposes), 2 op
902004Y: English 2 (Scientific Communication), 2 op
800008Y: Orientation for New Students, 2 op
901004Y: Swedish, 2 - 3 op

Compulsory major studies (69 op)

The following studies are compulsory for everyone.

800322A: Analysis II, 8 op
801111P: Basic Methods in Mathematics I / math, 10 op
802354A: Basics in Algebra, 5 op
802352A: Euclidean Topology, 4 op
806113P: Introduction to Statistics, 5 op
802151P: Introduction to mathematical deduction, 5 op
802118P: Linear Algebra I, 4 op
802119P: Linear Algebra II, 5 op
800300A: Maturity test, 0 op
801195P: Probability Theory, 5 op
802355A: Rings, Fields and Polynomials, 5 op
801323A: Seminar, 6 op
802353A: Series and Integrals, 6 op

Optional major studies (vähintään 4 op)

In addition to compulsory major studies, students must choose optional studies in major subject as follows:

- students planning teachers studies at least **4 cr**
- others at least **11 cr**

When choosing the optional major studies, student is adviced to take possible demands in the coming master program into account. Notice also that, in the teachers master degree, it is possible to replace (at most) 10 cr advanced courses with intermediate courses in mathematics.

Remark. If optional courses contains courses in statistics, these courses cannot be used in a possible minor subject in statistics.

H325036: Optional intermediate studies in mathematics and statistics, 0 - 180 op

Alternative

805310A: Statistical Inference I, 10 op
806357A: Statistical finance, 5 op
805324A: Time series analysis, 5 op
805328A: Multivariate analysis, 9 op
806353A: Experimental design, 6 op
805334A: Analysis of categorical data, 9 op
800343A: Algebra 2, 8 op
800345A: Differential Equations I, 4 op
800346A: Differential Equations II, 4 op
805339A: The Statistical Foundation of Econometrics, 5 - 6 op
805363A: Experiment planning, 5,5 op
801346A: Introduction to Cryptography, 4 op
805308A: Analysis of longitudinal data, 5 op
801344A: Basic Course on Numerical Computation, 8 op
805309A: Statistical methods in epidemiology, 9 op
801387A: Basic Course on Numerical Analysis, 6 op
801385A: Complex Analysis I, 4 op
801386A: Complex Analysis II, 4 op
801390A: History of Mathematics, 6 op
805396A: Generalized Linear Models, 5 op
801389A: Basic Geometry, 6 op
802312A: Discrete mathematics, 6 op
805398A: An introduction to stochastic modelling, 8 op
805307A: Experimental design, 9 op
806311A: Introduction to Multivariate Methods, 5,5 op
806315A: Bayesian Data Analysis, 10 op
805380A: Clinical biostatistics, 6 op
806308A: Linear Models, 10 op
806318A: Computationally intensive statistical methods, 9 op
806319A: Spatial Data Analysis, 8 op
802328A: Basics in Number Theory, 5 op
806351A: Introduction to Independent Component Analysis, 4 op
806352A: Linear mixed models in the analysis of panel data, 6 op
802331A: Principles to Mathematical Modelling, 8 op
806354A: Introduction to Sampling Methods, 4 op
802360A: Introduction to inverse problems, 4 op
802362A: Introduction to computational inverse problems, 5 op
806330A: Analysis of Market Risk, 5 op
802363A: Metric Spaces, 6 op
800329A: Topology, 8 op
801396A: Introduction to Probability Theory II, 5 op

Minor subjects (vähintään 50 op)

Bachelor studies contains also studies in major and minor subjects. The minimum requirement is that student does either two smaller minor subjects (at least 25 cr each) *OR* one larger minor subject (at least 60 cr).

Minor studies for students in teacher education

The choice of minor subjects defines how students qualify as teachers. Pedagogical studies for teachers forms a natural 30 cr minor subject for those students who are doing teachers studies. The other minor subject should be either physics, chemistry or computer sciences. Any other compinations should be applied separately from the Faculty of Sciences. Notice that when minimum requirements are fullfilled, one is free to choose other minor subjects (taking the study permissions into account).

Remark. Master studies in different programs might contain different requirements for major and minor studies. These requirements should be taken into account when choosing minor studies in Bachelor's degree. More information can be found in the Study Guide.

Other studies

This part contains all courses which are not minor studies, such as, single courses in different subjects, extra language courses, etc. (Also the course "Introduction to LaTeX" belongs here.)

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

802651S: Abstract Measure Theory, 5 op
800009Y: Acting as a Student Tutor, 2 op
802637S: Advanced Problem Solving, 2 - 6 op
802623S: Advanced mathematical modeling, 2 - 24 op
802628S: Advanced studies special course, 2 - 18 op
801694S: Algebra III, 10 op
802330A: Algebra tutorial, 1 op
802656S: Algebraic numbers, 5 op
806623S: An introduction to stochastic modelling, 8 op
802329A: Analysis tutorial, 1 op
800118P: Basic Mathematics for Economics II, 7 op
800117P: Basic Mathematics for Economics I, 7 op
800147P: Basic Methods in Mathematics I / appl., 8 op
806109P: Basic Methods in Statistics I, 9 op
806112P: Basic Methods of Data Analysis, 10 op
806110P: Basic methods in statistics II, 10 op
802322A: Basics in mathematical modelling, 5 op
800667S: Coding Theory, 10 op
802655S: Continued Fractions, 5 op
801698S: Cryptography, 5 op
802649S: Dynamical systems, 10 op
805683S: Econometrics, 5 - 6 op
802107P: Financial Mathematics, 4 op
802638S: Formal Models and Quantitative Methods for Psychology, 5 - 10 op
802647S: Fourier series and the discrete Fourier transform, 10 op
800674S: Fourier transform and distributions, 10 op
802650S: Fractal Geometry, 10 op
802629S: Function estimation, 10 op
800651S: Functional analysis, 10 op
800660S: Group Theory, 10 op
802652S: Hilbert Spaces, 5 op
802636S: Information Theory, 10 op
802654S: Introduction to Distribution Theory, 5 op
802644S: Introduction to Functional Analysis, 10 op
800149P: Introduction to LateX, 2 op
802635S: Introduction to partial differential equations, 10 op
802653S: Lebesgue Measure and Integration Theory, 5 op
802332A: Mathematical Problem Solving, 5 op
805611S: Mathematical statistics II, 10 op
800653S: Matrix Theory, 10 op
802631S: Modern real analysis, 10 op
800104P: Number Systems, 4 op
806604S: Principles of bayesian inference, 10 op

800697S: Pro Gradu Thesis, 20 op
805642S: Pro gradu thesis, 30 op
800698S: Pro gradu thesis, 30 op
805331A: Project seminar I, 6 op
801645S: Special Work in Applied Mathematics, 10 op
802632S: Special course for teachers of mathematics, 10 op
802632S-02: Special course for teachers of mathematics / Correcting tests in mathematics, 3 op
802632S-01: Special course for teachers of mathematics / Lesson plans for teaching mathematics, 4 op
802632S-03: Special course for teachers of mathematics / Other training, 3 op
802633S: Statistical Pattern Recognition, 10 op
805609S: Statistical methods in epidemiology, 9 op
800688S: Theory of Optimization, 10 op
805679S: Time series analysis, 5 op
801643S: Topology, 10 op
805667S: Training report, 5,5 op
802327A: Tutoring, 4 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

902002Y: English 1 (Reading for Academic Purposes), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Language Centre

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:
B2/C1 on the Common European Framework of Reference scale.
Status:
In the Faculty of Science, this course is mandatory for most degree programmes. Please consult the Faculty Study Guide to establish the language requirements for your own degree programme.
Required proficiency level:
English must have been the A1 or A2 language at school or equivalent English skills should have been acquired otherwise.
ECTS Credits:
2 ECTS credits (total work load 54 hours including classroom meetings.
Language of instruction:
Both English and Finnish are used.
Timing:
Biological Sciences: 1st year spring term
Chemistry: 1st year autumn term
Geology: 1st year spring term
Information Processing Science: 1st year spring term
Mathematical Sciences: 1st year spring term
Physical Sciences: 1st year autumn term
Learning outcomes:
In this course, students improve their understanding of written academic English used in texts in Natural Sciences as well as expand their general and scientific vocabulary. Students become aware of their own role in learning and will be able to find and take advantage of useful study materials available on the Internet in order to develop their own language learning strategies, which will enhance their academic English. Students show their awareness and their own responsibility by reflecting on their achievements in a study journal.

Learning outcomes: By completing the tasks of the course, students will

- have acquired effective vocabulary learning techniques by being able to distinguish parts of words to infer meanings
- expand their academic vocabulary by using Internet resources such as on-line dictionaries
- understand and be able to construct basic grammatical structures used in formal written English
- be able to utilize text structure and cohesion markers when reading academic texts
- be able to apply effective reading techniques and have necessary skills to extract global and detailed information with considerable ease and speed from general texts related to Natural Sciences as well as texts /textbooks of their own field

Learning activities and teaching methods:
The course is carried out in multi-mode, with instruction and student tasks both in class and in the Optima learning environment.
Target group:
1st year students of Biology, Chemistry, Geology, Information Processing Science, Physics, and Mathematics.
Recommended or required reading:
Set books for substance studies; journal articles in print and on-line. Further information will be given in the first lesson.
Assessment methods and criteria:
Active and regular participation in classroom sessions, completing the learning tasks (in class and Optima Learning Environment) including the study journal. These are prerequisites for participation in the end of term examination. Exemptions from the examination can be given for excellent work during the course.

N.B. Students with grades laudatur or eximia in their A1 English school-leaving examination can be exempted from this course and will be granted the credits by the Faculty of Science.
Grading:
Pass/Fail
Person responsible:
Aila Syrjäkari-Roberts
Other information:
Course registration: Registration for the autumn term will take place from 12.00, 5th September to 12.00, 12th September in WebOodi. The spring term registration will take place from 12.00, 1st December to 12.00, 9th January in WebOodi.
Examinations:
Autumn term end of course examination will take place on Friday, 9th December, at 8.30 - 10.30 in lecture theatre LX. The registration for the examination will take place from 8.00, 1st December to 12.00, 8th December in WebOodi.

Spring term end of course examination will take place on Friday, 4th May, at 8.30 - 10.30 in lecture theatre LX. The registration for the examination will take place from 8.00, 25th April to 12.00, 2nd May in WebOodi.
Resit examinations: Two resit examinations are allowed on the dates set by the language centre (language centre retake examination days).

902004Y: English 2 (Scientific Communication), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Language Centre

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay902004Y	English 2 (Scientific Communication) (OPEN UNI)	2.0 op

Proficiency level:
B2/C1 on the CEFR scales for Speaking , Listening , Writing
Status:
This course is mandatory for all 2nd year students (except **geographers**) who will have English as their foreign language in their B.Sc. degree. This includes the students who were exempted from ‘Reading for Academic Purposes'(902002Y). Please consult the faculty study guide to establish the language requirements on your own degree programme.
Required proficiency level:

Students taking this course must have had English as the A1 or A2 language at school or the equivalent English skills should have been acquired otherwise. The course 'Reading for Academic Purposes' (902002Y) is a pre-requisite, unless exempted.
ECTS Credits:
The student workload is 53 hrs work/ 2 ECTS credits.
Language of instruction:
English
Timing:
Biology : 2nd year autumn term
Chemistry: 2nd year spring term
Geosciences : 2nd year spring term
Information Processing Science : 2nd year autumn term
Mathematical Sciences : 2nd year spring term
Physical Sciences : 2nd year autumn term
Learning outcomes:
The aim of this course is to develop students' oral/aural fluency in a range of general, scientific and academic communication situations.
Skills in pronunciation, listening and speaking are practised in the course.

Learning outcomes: By the end of the course, you are expected to have:

1. provided evidence of oral fluency in pair work communication and small group discussions.
2. developed effective language learning strategies through autonomous homework.
3. demonstrated the ability to present scientific subjects, using appropriate field-related vocabulary.
4. demonstrated lecture listening skills in field related situations.

Contents:
Skills in listening, speaking, and giving presentations are practised in the course. Homework tasks include autonomous work to support the classroom learning and the task of preparing and presenting a scientific presentation.
Recommended or required reading:
Course materials will be provided by the teacher and a copy fee will be charged.
Assessment methods and criteria:
Pass / fail. Assessment is based on regular attendance, active participation in all lessons and the successful completion of all homework tasks.
Alternative method of course completion : An optional exemption test is offered twice per year. See exemption exam details and schedule. The student can only participate in the exemption exam once.
Person responsible:
Jolene Gear

800008Y: Orientation for New Students, 2 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Timing:
First year (autumn term)
Learning outcomes:
After the course the student is familiar with objectives and curriculum of the degree program. Moreover, the student is familiarized with the correct study methods and learning environment. After the course, the student is also able to search information from, for instance, university library and databases.
Contents:
The aim of the course is to familiarise the student with university studies, learning environment, provide the student with information on the history and current weight of mathematical sciences in the society as well as the objectives and curriculum of the degree programme.
Person responsible:
Student advisor

901004Y: Swedish, 2 - 3 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Language Centre
Opintokohteen kielet: Swedish
Leikkaavuudet:

901035Y	Second Official Language (Swedish), Oral Skills	1.0 op
901034Y	Second Official Language (Swedish), Written Skills	1.0 op
ay901004Y	Swedish (OPEN UNI)	2.0 op

Ei opintojaksokuvauksia.

800322A: Analysis II, 8 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

800328A	Calculus of several variables	5.0 op
802351A	Vector Calculus	5.0 op

ECTS Credits:
8 cr
Language of instruction:
Finnish
Timing:
Second year, periods 1-2
Learning outcomes:
On successful completion of this course, the student will be able to
- differentiate multivariate functions
- apply the derivative to minimization problems
- define and use multidimensional integrals

Contents:
The course deals with multidimensional real calculus. The topology of R^n is reviewed, after which differential and integral calculus is derived for vector-valued functions of multiple arguments are derived.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
56 h lectures, 28 h exercises
Target group:
Major and minor students
Prerequisites and co-requisites:
Linear algebra I
Linear algebra II
Euclidean topology
Series and integrals

Recommended or required reading:
Lecture notes
Assessment methods and criteria:
Midterm exams or final exam
Grading:
1-5
Person responsible:
Maarit Järvenpää
Working life cooperation:

No

801111P: Basic Methods in Mathematics I / math, 10 op

Voimassaolo: - 01.02.2013
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Adams, R. A.,
Opintokohteen kielet: Finnish
Leikkaavuudet:

802154P	Elementary functions	3.0 op
802155P	Continuity and limit	4.0 op
802156P	Derivative	4.0 op
ay801111P	Basic Methods in Mathematics I / math	10.0 op

ECTS Credits:
10 cr
Learning outcomes:
After completing the course the student
- knows how to deduce and prove the essential results of the course
- knows how to use different methods of proving theorems
- knows how to use different functions and complex numbers
- understands the concepts of the limit and continuity and is able to calculate limits
- understands the meaning of the derivative and knows how to use it in practice
- knows how to integrate

Contents:
The essential concepts of the course are functions, complex numbers, the concept of limit, continuity, derivative, its applications and the integral calculus. Most of the concepts are familiar from the upper secondary school because the functions are real valued. The basics of calculus and integral calculus are necessary for the subsequent studies. The main object of the course is to familiarize the student with mathematical concepts and methods, such as definitions, theorems and proving them. A new kind of outlook is required to take the step from upper secondary school to the university. The student should have the ability to make calculations and to deduce results after completing the course. Several short and easy proofs are examined to introduce different methods of proving theorems.
Person responsible:
Kari Myllylä

802354A: Basics in Algebra, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay802354A	Number Theory and Groups (OPEN UNI)	5.0 op
800333A	Algebra I	8.0 op

ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish

Timing:
1. year, 3. period
Mode of delivery:
Face-to-face teaching
Target group:
Major and minor students
Prerequisites and co-requisites:
802151P Introduction to mathematical deduction
Recommended or required reading:
Lecture notes
Assessment methods and criteria:
Midterm exam or final exam
Grading:
1-5
Person responsible:
Kari Myllylä
Working life cooperation:
No

802352A: Euclidean Topology, 4 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Maarit Järvenpää

Opintokohteen kielet: Finnish

Leikkaavuudet:

802357A Euclidean Spaces 5.0 op

ECTS Credits:
4 ECTS credits
Language of instruction:
Finnish
Timing:
First year, 3. period
Learning outcomes:
After the course student is able to
- define elementary topological concepts (open and closed sets, accumulation point, etc)
- handle sequences of real numbers
- proof fundamental theorems related to continuous functions
Contents:
The courses goal is to expand students knowledge and understanding of continuous functions. Course considers basic topology of n-dimensional Euclidean space. Important concepts are, for instance, open and closed sets, compactness and completeness.
Mode of delivery:
Face-to-face teaching
Target group:
Major and minor students
Prerequisites and co-requisites:
Introduction to mathematical deduction
Elementary functions
Limit and continuity
Derivative

Assessment methods and criteria:
Midterm exam or final exam
Grading:
1-5

Person responsible:
Maarit Järvenpää
Working life cooperation:
No

806113P: Introduction to Statistics, 5 op

Voimassaolo: 01.01.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Läärä Esa

Opintokohteen oppimateriaali:
Wild, Christopher J. , , 2000
Grönroos, Matti (2) , , 2003

Opintokohteen kielet: Finnish

Leikkaavuudet:

806118P	Introduction to Statistics	5.0 op
806119P	A Second Course in Statistics	5.0 op
806116P	Statistics for Economic Sciences	5.0 op

ECTS Credits:
5 cr
Language of instruction:
Finnish
Timing:
First year, 3. period
Learning outcomes:
On successful completion of this course, the student will be able to
- present the dataset by using graphics, tables and statistics
- apply appropriate statistical techniques for analyzing solutions to simple real-world problems
- interpret listing of some statistical software

Contents:
The course presents probabilistic techniques for studying uncertainty, and to illustrate how such techniques can be applied to make statistical analysis and interpretation of data in simple one variable
settings. Topics include descriptive statistics, basics of probability theory, random variables and their distributions, sampling distributions, estimation, confidence intervals, and hypothesis testing. One
aim is also to get basic knowledge from some statistical software.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
32 h lectures, 24 h exercises from which 16 h are normal exercises and 8 h computer exercises.
Target group:
Major and minor students
Prerequisites and co-requisites:
802151P Introduction to mathematical deduction
801195P Introduction to probability theory
802118P Linear algebra I

Assessment methods and criteria:
Final exam
Grading:
1-5
Person responsible:
Esa Läärä
Working life cooperation:
No

802151P: Introduction to mathematical deduction, 5 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay802151P	Introduction to mathematical deduction (OPEN UNI)	5.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish
Timing:
First period at the first semester.
Learning outcomes:
After completing the course, student
- is able to use different methods proving techniques
- is able to use basic set theoretic concepts and definitions
- is able to define and apply basic definitions related to functions

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 30h, exercises 18h
Target group:
Major and minor students
Recommended or required reading:
Lecture notes
Assessment methods and criteria:
Final exam
Grading:
1-5
Person responsible:
Maarit Järvenpää
Working life cooperation:
No

802118P: Linear Algebra I, 4 op

Voimassaolo: 16.10.2012 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:
Lay, David C. , , 2003

Opintokohteen kielet: Finnish

Leikkaavuudet:

802120P	Introduction to Matrices	5.0 op

ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish

Timing:
First semester, 2. period
Learning outcomes:
On successful completion of this course, the student will be able to
- solve linear systems of equations ja apply them to linear algebraic problems
- know matrices and their basic properties
- know basic properties of linear spaces
Contents:
The aim is to familiarise the student with the basics of linear algebra: systems of linear equations, vector space R^n and matrix algebra.
Mode of delivery:
Face-to-face
Learning activities and teaching methods:
35 h lectures, 21 h exercises
Target group:
Major and minor students
Prerequisites and co-requisites:
802151P Introduction to mathematical deduction
Recommended or required reading:
Lecture notes
Assessment methods and criteria:
Midterm exams or final exam
Grading:
1-5
Person responsible:
Esa Järvenpää
Working life cooperation:
No

802119P: Linear Algebra II, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:

Lay, David C. , , 2003

Opintokohteen kielet: Finnish

Leikkaavuudet:

802320A Linear Algebra 5.0 op

ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish
Timing:
First year, 4. period
Learning outcomes:
On successful completion of this course, the student will be able to
- basic properties of inner product spaces
- linear mappings, their matrix representation, and eigen values
- determinants and apply them to problems relating to matrices and linear mappings
Contents:
The aim of the course is to provide the student with the knowledge needed in almost all later courses in mathematics: Abstract vector spaces and subspaces, Linear independence and bases, Inner product spaces, Linear mappings, Determinants, Eigenvalues and Eigenvectors, Hermitian matrices and quadratic forms.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
35 h lectures, 21 h exercises
Target group:

Major and minor students
Prerequisites and co-requisites:
802119P Linear algebra I
Recommended or required reading:
Lecture notes
Assessment methods and criteria:
Midterm exam or final exam
Grading:
1-5
Person responsible:
Esa Järvenpää
Working life cooperation:
No

800300A: Maturity test, 0 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
0 cr
Language of instruction:
Finnish/Swedish
Timing:
Third year
Target group:
Major students
Grading:
Pass/Fail

801195P: Probability Theory, 5 op

Voimassaolo: 01.01.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:
Tuominen, P., , 1993
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish (possible also in English)
Timing:
First year, 2. period
Learning outcomes:
On successful completion of this course, the student will be able to
- solve simple practical problems associated with probability
- solve simple theoretical problems associated with probability
- derive the basic properties of probability, starting from the axioms
Contents:
The course is an introduction to Probability. After review of high school curriculum material, the axiomatic approach to Probability is introduced. The most important concepts are the probability space, conditional probability, independence, a random variable as well as its distribution and expected value.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
32 h lectures, 16 h exercises
Target group:
Major students
Prerequisites and co-requisites:
802151P Introduction to mathematical deduction
80xxxxP Elementary functions
Assessment methods and criteria:
Midterm exams or final exam
Grading:
1-5
Person responsible:
Lasse Holmström
Working life cooperation:
No

802355A: Rings, Fields and Polynomials, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Myllylä

Opintokohteen kielet: Finnish

Leikkaavuudet:

800333A	Algebra I	8.0 op

ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish
Timing:
Second year, 1. period
Mode of delivery:
Face-to-face teaching
Target group:
Major students
Prerequisites and co-requisites:
802354A Number theory and groups
Recommended or required reading:
Lecture notes
Assessment methods and criteria:
Midterm exam or final exam
Grading:
1-5
Person responsible:
Kari Myllylä
Working life cooperation:
No

801323A: Seminar, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

800331A Proseminar 10.0 op

Ei opintojaksokuvauksia.

802353A: Series and Integrals, 6 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peter Hästö
Opintokohteen kielet: Finnish
Leikkaavuudet:

800318A Analysis 3 5.0 op
802164P Series and Integral 5.0 op

ECTS Credits:
6 ECTS credits
Language of instruction:
Finnish (possible also in English)
Timing:
First year, 4. period
Mode of delivery:
Face-to-face teaching
Target group:
Major and minor students
Prerequisites and co-requisites:
80xxxxP Elementary functions
80xxxxP Limit and continuity
80xxxxP Derivative
802352A Euclidean topology

Recommended or required reading:
Lecture notes
Assessment methods and criteria:
Midterm exams or final exam
Grading:
1-5
Person responsible:
Peter Hästö
Working life cooperation:
No

H325036: Optional intermediate studies in mathematics and statistics, 0 - 180 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Study module
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Alternative

805310A: Statistical Inference I, 10 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Pawitan, Yudi , , 2001
Sprott, D. A. , , 2000
Kalbfleisch, J. G. , , 1985
Opintokohteen kielet: Finnish
Leikkaavuudet:

805349A	Likelihood Inference	5.0 op
805350A	Estimation and Test Theory	5.0 op

Ei opintojaksokuvauksia.

806357A: Statistical finance, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jussi Klemelä
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

805324A: Time series analysis, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jussi Klemelä
Opintokohteen oppimateriaali:
Harvey, Andrew C. , , 1993
Lütkepohl, Helmut , , 1991
Hamilton, James D. , , 1994
Opintokohteen kielet: Finnish

ECTS Credits:

5 cr

Learning outcomes:

After finishing the course, a student can apply linear, nonlinear and nonparametric modeling of time series. A student learns how to choose between alternative time series models and can apply computer programs to fit time series models. Furthermore, a student learns to read scientific articles about time series.

Contents:

The course covers basic concepts of time series analysis: stationarity, autocorrelation, spectral distribution and periodogram. Linear time series analysis includes explanation, prediction, parameter estimation and model diagnostics in ARMA models. Nonlinear time series analysis includes threshold models and

heteroskedastic time series models (ARCH and GARCH). Furthermore, nonlinear nonparametric smoothing is covered (time space smoothing and state space smoothing) and nonparametric estimation of spectral densities. Nonparametric function estimation includes kernel estimation, local polynomial regression and additive modeling.

Recommended or required reading:

Fan, J. ja Yao, Q. (2005). Nonlinear Time Series, Springer.

Person responsible:

Jussi Klemelä

805328A: Multivariate analysis, 9 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

806353A: Experimental design, 6 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

805319A	Experimental design	5.0 op
805663S	Experimental design	5.0 op

Ei opintojaksokuvauksia.

805334A: Analysis of categorical data, 9 op

Voimassaolo: - 28.02.2011
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Agresti, Alan , , 1990
Christensen, Ronald , , 1990
McCullagh, Peter , , 1989
McCulloch, Charles E. , , 2001
Opintokohteen kielet: Finnish

ECTS Credits:

9 cr

Learning outcomes:

A student who has succesfully completed the course is supposed to
- be familiar with generalized linear models and to be able to use them when studying discrete data
- be able to model the behaviour of ordinal dependent variables
- be able to make use of so-called mixed models while studying discrete or ordinal data

Contents:

The course deals with the analysis of contingency tables and with models for qualitative and ordinal dependent variables. Models for truncated dependent variables are also briefly touched. A majority of these models can be interpreted as generalised linear models (GLIM). This is why the essentials of the GLIM-theory and the corresponding phraseology is presented. So-called generalised mixed linear models (including random effects) and the estimation of their parameters by the GEE and the ML methods are also discussed. The course can be taken either as a graduate course or as an undergraduate course. It consists of 52 hours of lectures and 36 hours of excercises in the computer lab.

Person responsible:

Markku Rahiala

800343A: Algebra 2, 8 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Niemenmaa Markku

Opintokohteen oppimateriaali:
Herstein, I. N., , 1996

Opintokohteen kielet: Finnish

Leikkaavuudet:

800323A	Field extensions	5.0 op
802333A	Permutations, Fields and Galois Theory	10.0 op

ECTS Credits:

8 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- compute with permutations and deal with their applications
- solve equations of third and fourth degree
- work with the structures of different finite fields

Contents:

The aim is to introduce three main topics which are related to each other: Elementary number theory: division algorithm, greatest common divisor, prime numbers and congruences. Group theory: group axioms, subgroups. Lagrange's theorem, homomorphisms and factor groups. Commutative ring theory: fields, polynomial rings, quotient rings and finite fields.

Person responsible:

Markku Niemenmaa

800345A: Differential Equations I, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:
Boyce, William E., , 2005
Nagle, R. Kent, , 1996
Zill, Dennis G., , 2001

Opintokohteen kielet: Finnish

Leikkaavuudet:

800320A	Differential equations	5.0 op

ECTS Credits:

4 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- recognize the concerning differential equation and choose the proper method and solve it
- notice the conditions that guarantee the uniqueness of the solution
- understand what implicit solution means

Contents:

The course consist ordinary differential equations. First order differential equations like separable, homogeneous, linear, exact and those that can be transform to them with suitable substitutions are studied and solved by algebraic methods (for example separation of variables). Iterative methods and numerical methods are applied in some cases to obtained an approximate solution or a numerical solution. Higher order linear differential equations with constant coefficients that appear in applications are considered and also second order linear differential equations with continuous coefficients. The basis of how to solve finite systems of differential equations is given. Power series method is applied to solve some second order linear differential equations like Legendre equation.

Person responsible:

Martti Kumpulainen

800346A: Differential Equations II, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:

Nagle, R. Kent, , 1996
Folland, Gerald B., , 1992
Zill, Dennis G., , 2001

Opintokohteen kielet: Finnish

Leikkaavuudet:

802334A A Second Course in Differential Equations 5.0 op

ECTS Credits:

4 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- apply method of Frobenius to solve second order linear differential equations
- proof the basic properties of Bessel functions, Legendre polynomials and Hermite polynomials
- calculate the Fourier-series of a given piecewise continuous function
- apply integral transformations to solve some integral equations and ordinary differential equations with constant coefficients
- recognize heat and wave equations and choose the proper method to solve them

Contents:

The course consist second order ordinary differential equation that are important in applications and partial differential equations like heat and wave eqautions. Method of Frobenius is introduced to solve second order ordinary differential equation. Some special functions (like Gamma function and Bessel functions) are considered and also orthogonal polynomials (Legendre polynomials and Hermite polynomials). The basics how to calculate Fourier-series for a piecewise continuous function is given. Last, basics of integral transformations (Laplace-transformation and Fourier-transformation) are studied, and how to apply them and the method of separation of variable in some cases to heat and wave equations.

Person responsible:

Martti Kumpulainen

805339A: The Statistical Foundation of Econometrics, 5 - 6 op

Voimassaolo: 01.06.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jussi Klemelä

Opintokohteen oppimateriaali:

Hayashi, Fumio , , 2000
Gourieroux, Christian , , 1995
Gourieroux, Christian , , 1995
Harvey, Andrew C. , , 1990

Opintokohteen kielet: Finnish

Leikkaavuudet:

805683S The statistical foundations ofeconometrics 5.0 op

ECTS Credits:

5/6 cr

Learning outcomes:

The course familiarizes students with applications of statistical models when inferences are made on economic phenomena. The principles of statistical inference on economic phenomena are the same as those of general statistical inference but there are some special issues that make the inference different in economics than in other application areas of statistics. After finishing the course, a student can apply both linear regression and nonlinear regression and a student is able to apply the generalized method of moments as well as the method of instrumental variables. A student can diagnose the validity of the assumptions of the linear regression model and tune his inferences accordingly.

Contents:

The course starts with the study of the linear regression model, and covers asymptotic inference related to the linear regression model, tests of the parameter restrictions and tests of a structural change. Besides linear regression, also nonlinear regression and the generalized method of moments is covered, as well as inference based on instrumental variables and problems stemming from measurement errors.
Inference under heteroscedasticity and autocorrelated disturbances is included. The basic theory of time series analysis (cointegration and autoregressive conditional heteroscedasticity) and the basic theory of panel data is included.

Recommended or required reading:

William H. Greene: Econometric Analysis (Prentice Hall)

Person responsible:

Jussi Klemelä

805363A: Experiment planning, 5,5 op

Voimassaolo: - 01.01.2013

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

801346A: Introduction to Cryptography, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

802336A Introduction to Cryptography 5.0 op

ECTS Credits:

4 cr

Learning outcomes:

After completeing the course, student
- knows the principles of sime traditianl symmetric key methods
- knows how public key methods (RSA, discrete logarithm, knapsack) work
- is familiar with the possibility to use and apply number theory in cryptography

Contents:

The course considers some traditianl symmetric key methods (affine system, matrix cryptography) and three public key methods, namely RSA, discrete logarithm and knapsack.

Person responsible:

Keijo Väänänen

805308A: Analysis of longitudinal data, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:
Peter J. Diggle et al., , 2002
Hsiao, Cheng , , 2003
McCulloch, Charles E. , , 2001
Fitzmaurice, Garrett M. , , 2004

Opintokohteen kielet: Finnish

ECTS Credits:

5 cr

Learning outcomes:

A student who has succesfully completed the course is supposed to
- be familiar with so-called mixed models for both discrete and continuous dependent variables
- be able to make use of these mixed models while studying longitudinal data

Contents:

The purpose of the course is to teach the students, how one can simultaneously study depedencies between observed variables and variations between individuals in the panel. Linear and non-linear mixed models, variograms and so-called growth curve models are introduced as central inferential tools for these studies. Model diagnostics, dynamic ARX-type models and the GMM estimation principle also get a lot of attention. A major part of the course deals with modelling continuous dependent variables, but cases of qualitative, ordinal and count depedendent variables are covered as well. The course can be taken either as a graduate course or as an undergraduate course. It consists of 52 hours of lectures and 36 hours of excercises in the computer lab.

Person responsible:

Markku RAhiala

801344A: Basic Course on Numerical Computation, 8 op

Voimassaolo: 01.03.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Erkki Laitinen

Opintokohteen oppimateriaali:
Haataja Juha, Rahola J., Ruokolainen J., , 1998
Opintokohteen kielet: Finnish

ECTS Credits:

8 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- program using Fortran the basic numerical problems
- exploit the libraries of the University's IT center for solving numerical problems

Contents:

The lecture course is focused to methods how to program and solve numerical problems by computer. The lectures consist of following topics: Fortran95 programming language related to numeric, basics of Unix operating system, numerical and graphical libraries in solving numerical problems.

Person responsible:

Erkki Laitinen

805309A: Statistical methods in epidemiology, 9 op

Voimassaolo: 01.06.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Läärä Esa

Opintokohteen oppimateriaali:
Santos Silva, Isabel dos , , 1999
Clayton, David , , 1993
Rothman, Kenneth J. , , 1998
Opintokohteen kielet: Finnish

801387A: Basic Course on Numerical Analysis, 6 op

Voimassaolo: 01.03.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Erkki Laitinen

Opintokohteen oppimateriaali:
Atkinson, Kendall, , 1993
Opintokohteen kielet: Finnish

ECTS Credits:

6 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- implement efficient numerical algorithms for solving basic numerical problems
- approximate the error of numerical results

Contents:

The lecture course is focused to numerical methods, which can be used for solving numerically mathematical problems which analytical solution is unknown or complicated to construct. The lectures consist of following topics: Computer arithmetic, nonlinear equations, systems of linear equations, interpolation, integration, derivation and differential equations.

Person responsible:

Erkki Laitinen

801385A: Complex Analysis I, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Arhippainen, Jorma Eemil

Opintokohteen oppimateriaali:
Lang, Serge, , 1999
Spiegel, Murray R., , 1964
Opintokohteen kielet: Finnish

ECTS Credits:

4 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- know the basic properties of algebrai and toplogical structure of complex numbers
- know the basic properties of complex functions
- be able to apply theory of complex numbers to different fields of pure and applied mathematics

Contents:

The course deals basic theory of complex numbers. After a brief introduction to algebraic properties of complex numbers, such basic results as polar coordinate representation, De Moivre formulas and topology on complex plane will be considered. For the complex functions the concepts of limit, continuity and derivate will be studied. Some basic properties of analytic functions will be considered and Cauchy-Riemann formulas will be proved. Finally basic theory of pathintegral of complex functions will be studied.

Person responsible:

Jorma Arhippainen

801386A: Complex Analysis II, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:
Lang, Serge, , 1999
Spiegel, Murray R., , 1964
Opintokohteen kielet: Finnish

ECTS Credits:

4 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- derive and prove core results of complex analysis
- apply theory of complex analysis to many structures of analysis

Contents:

The course deals with fundamendal results on complex analysis such as Cauchy integral theorem and Cauchy integral formulas. As application some important corollaries of them will be proved such as Liouville Theorem, Fundamental theorem of algebra and Maximum principle. Further, after brief introduction to power series the presentaion of analtic functions by using power series will be studied. After Laurent repsentation of complex functions theory of residues will be considered and as applicatio this theory wiil be used to calculate certain type of definite integrals.

Person responsible:

Jorma Arhippainen

801390A: History of Mathematics, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Matti Lehtinen

Opintokohteen oppimateriaali:

Boyer, Carl B., , 1994
Boyer, Carl B., , 1994
Fauvel John, Gray J., , 1990

Opintokohteen kielet: Finnish

Leikkaavuudet:

800332A History of Mathematics 5.0 op

ECTS Credits:

6 cr

Contents:

The aim of the course is to provide the student a general conception of the history of mathematics. The main emphasis is on the calculations. Contents: Egyptian and Babylonian mathematics; Euclid and the Elements, Archimedes and Apollonius; Roman era; India and China; the islamic world; medieval mathematics; the rise of algebra; Descartes, Fermat; Newton and Leibniz, the beginning of calculus.

805396A: Generalized Linear Models, 5 op

Voimassaolo: 01.03.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

801389A: Basic Geometry, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

801399A Geometry 5.0 op

ECTS Credits:

6 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- prove simple geometric claims
- solve simple geometric problems with the help of ruler and compass
- solve basic applied problems of school geometry

Contents:

School geometry (801389A) The course presents the core material in Finnish junior high school and high school geometry courses. It is mainly meant for those students who study to become mathematics, physics and chemistry teachers. The first part of this course is classic Euclidean plane geometry and the second part is solid geometry. Students become familiar with geometric proof and how to solve simple geometric problems with the help of ruler and compass. Geometric results are used to solve problems. The second part considers spatial geometry and starts with how lines and planes can situate in ordinary three dimensional space. Basic geometric properties of solids like cube, ball and cone are considered and methods how to calculate their surface aries and volumes are presented.

802312A: Discrete mathematics, 6 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Marko Rinta-aho
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

805398A: An introduction to stochastic modelling, 8 op

Voimassaolo: - 01.09.2012
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Läärä Esa
Opintokohteen oppimateriaali:
Severini, Thomas A. , , 2005
Mood, Alexander M. , , 1974
Giri, Narayan C. , , 1975
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

805307A: Experimental design, 9 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Hyon-Jung Kim-Ollila
Opintokohteen kielet: English

Ei opintojaksokuvauksia.

806311A: Introduction to Multivariate Methods, 5,5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

806315A: Bayesian Data Analysis, 10 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Hyon-Jung Kim-Ollila
Opintokohteen oppimateriaali:
Andrew Gelman et al., , 2004
Lee, Peter M. , , 1997
Opintokohteen kielet: English

Ei opintojaksokuvauksia.

805380A: Clinical biostatistics, 6 op

Voimassaolo: - 01.09.2012
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Läärä Esa
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

806308A: Linear Models, 10 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Leena Ruha
Opintokohteen oppimateriaali:
Draper, Norman Richard , , 1980
Cook, R. Dennis , , 1999
Sen, Ashish , , 1997
Opintokohteen kielet: Finnish

ECTS Credits:

10 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- understand both the potentials and the limitations of regression models

- apply regression models as well as variance and covariance analyses while studying continuous dependent variables
- diagnose specification errors in linear models

Contents:

The course starts with an introduction to models postulating conditional distributions for continuous dependent variables and to the expectations of these conditional distributions, the so-called regression functions. Special attention will be paid to families of models that allow a meaningful formulation in terms of regression functions, linear with respect to the parameters. The estimation and testing theory concerning these models will be presented fairly thoroughly, but the main emphasis of the course still lies on the practical side: The limitations in the applicability of regression models will be made very clear and the use of both graphics and tests in model diagnostics get very much attention. Other graphical representations, helpful in understanding the information content of the data are also presented. Much time will also be devoted to cases, where the observational units can be divided into groups or categories according to some qualitative factors ("analysis of variance" and "analysis of covariance"). The course is compulsory for a curriculum in statistics and consists of 52 hours of lectures and 42 hours of excercises in the computer lab.

Person responsible:

Markku Rahiala

806318A: Computationally intensive statistical methods, 9 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

806319A: Spatial Data Analysis, 8 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802328A: Basics in Number Theory, 5 op

Voimassaolo: 01.06.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Tapani Matala-aho
Opintokohteen oppimateriaali:
Hardy, G. H., , 1979
Rosen, Kenneth H., , 1993
Opintokohteen kielet: Finnish

Learning outcomes:

As usual in my mathematical studies I shall be able to solve problems arising from the subject and to prove essential theorems starting from the given definitions using the tools applied in the course. More detailed; For example, when I pass the course with the grade 1/5, I shall recognize most definitions and I am able to

solve closely related problems. Also I am able to rewrite short proofs with some understanding. When I pass the course with the grade 5/5, then I shall understand well the given definitions with the proofs of the theorems deduced from them. Further, I am able to solve challenging problems which demand independent deductions with several stages and applications of appropriate tools.

Contents:

In our lectures we consider arithmetical properties of the common numbers involved in studing mathematics and in particular number theory. Also the methods will get a special interest. Examples of the numbers under the research will be binomials, continued fractions, sums of powers and some numbers sharing a name with the mathematicians Bernoulli, Euler, Fermat, Fibonacci, Heron, Lucas, Mersenne, Neper, Pythagoras, Stirling, Wilson and Wolstenholme. From the tools we mention congruences of rational numbers and polynomials, difference operators, generating series, irrationality considerations, matrix presentations, recurrences and telescopes.

806351A: Introduction to Independent Component Analysis, 4 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

806352A: Linear mixed models in the analysis of panel data, 6 op

Voimassaolo: 01.08.2009 - 01.09.2012
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802331A: Principles to Mathematical Modelling, 8 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Martti Kumpulainen
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

806354A: Introduction to Sampling Methods, 4 op

Voimassaolo: 01.01.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Läärä Esa
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802360A: Introduction to inverse problems, 4 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Sari Lasanen

Opintokohteen kielet: Finnish

ECTS Credits:

4 cr

Language of instruction:

Finnish. Alternatively, a book examination in English.

Learning outcomes:

Upon completion, the student will be able to

- recognise several inverse problems
- describe typical properties of inverse problems
- solve simple inverse problems with accurate and inaccurate data

Contents:

1. Examples of inverse problems and their typical properties
2. Well-posed and ill-posed problems
3. Least squares solutions
4. Tikhonov regularization
5. Statistical inverse problems

Learning activities and teaching methods:

Lectures 4x45 min / week. Exercises 2x45 min /week.

Target group:

Suitable for major and minor students.

Prerequisites and co-requisites:

- 802118P Linear Algebra I
- 802119P Linear Algebra II

Also recommended:

- 800322A Multidimensional Analysis (or Analysis II)
- 801396A Introduction to Probability Theory II
- 802352A Euclidian Topology
- 800345A Differential Equations I

Assessment methods and criteria:

Exam.

Other information:

This course does not contain numerical programming tasks. Computer-aided computations are contained in a separate course
802362A Introduction to Computational Inverse Problems.

802362A: Introduction to computational inverse problems, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Orispää
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

806330A: Analysis of Market Risk, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jussi Klemelä
Opintokohteen kielet: Finnish
Leikkaavuudet:

806630S Market Risk Analysis 5.0 op

Ei opintojaksokuvauksia.

802363A: Metric Spaces, 6 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Mahmoud Filali
Opintokohteen kielet: Finnish

Learning outcomes:

The course gives the required background to more advanced courses in topology and analysis. After this course, the student is able to define and proof basic properties of metric spaces.

Contents:

The course includes the basics of metric spaces: Defintions and examples, Interior and closure, convergence, continuous functions, Baire theorem, compactness,
contractions, the implicit function theorem. The course ends by recalling and generalizing the classic theorems of real analysis.

800329A: Topology, 8 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Mahmoud Filali
Opintokohteen oppimateriaali:
Vala K., Suominen K., , 1990
Opintokohteen kielet: Finnish

ECTS Credits:

8 cr

Learning outcomes:

On successful completion of this course, the student will be able to follow more advanced topology and analysis.

Contents:

The course presents the very basics of topology that mathematics students should know. It starts with elementary set theory, then it goes on covering metric spaces including Baire's theorem; topological spaces and convergence in topological spaces; separation axioms including Urysohn's lemma and Tietze extension theorem; compact spaces including Tyconoff theorem; and ends with connected spaces.

Person responsible:

Mahmoud Filali

801396A: Introduction to Probability Theory II, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Tuominen, P., , 1993
Opintokohteen kielet: Finnish

ECTS Credits:

4 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- understand probability theory deeper than before
- apply various stocastic models
- derive the basic results associated with the new concepts introduced

Contents:

The course is a direct continuation for the course Probability Theory I. The new concepts include for instance the moments of a distribution, the probability generating function, the Law of Large Numbers, the Central Limit Theorem as well as two-dimensional distibutions.

Person responsible:

Lasse Holmström

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

802651S: Abstract Measure Theory, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Esa Järvenpää
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

800009Y: Acting as a Student Tutor, 2 op

Opiskelumuoto: General Studies

Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

802637S: Advanced Problem Solving, 2 - 6 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peter Hästö
Opintokohteen kielet: English

802623S: Advanced mathematical modeling, 2 - 24 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Erkki Laitinen
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

802628S: Advanced studies special course, 2 - 18 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

801694S: Algebra III, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Tapani Matala-aho
Opintokohteen kielet: Finnish

Learning outcomes:
As usual in my mathematical studies I shall be able to solve problems arising from the subject and to prove essential theorems starting from the given definitions using the tools applied in the course. More detailed; For

example, when I pass the course with the grade 1/5, I shall recognize most definitions and I am able to solve closely related problems. Also I am able to rewrite short proofs with some understanding. When I pass the course with the grade 5/5, then I shall understand well the given definitions with the proofs of the theorems deduced from them. Further, I am able to solve challenging problems which demand independent deductions with several stages and applications of appropriate tools.

Contents:

In the lectures we consider the following structures and tools of mathematics: axiomatic set theory, modules and algebras, gategories and functors, exact sequences, tensor products, simplex complexes, cycle-, boundary- and homology groups and chain maps.

802330A: Algebra tutorial, 1 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peter Hästö
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802656S: Algebraic numbers, 5 op

Voimassaolo: 01.01.2012 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

806623S: An introduction to stochastic modelling, 8 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Läärä Esa
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802329A: Analysis tutorial, 1 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peter Hästö
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

800118P: Basic Mathematics for Economics II, 7 op

Voimassaolo: - 31.07.2020
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish
Leikkaavuudet:

802159P	Basic method in Analysis for Economic Sciences	5.0 op
802160P	Matrices and optimization for Economic Sciences	5.0 op

ECTS Credits:
7 cr
Learning outcomes:
After completing the course the student
- masters the basic operations and properties of matrices
- knows how to utilize matrices with solving simultaneous equations, optimization and constructing different models
- knows the basics of linear optimization
- knows how to calculate with complex numbers
- knows how to integrate and how to calculate an area with definite integral
- knows the idea behind differential equations and knows how to solve them
- knows the idea behind difference equations and knows how to solve them
- is prepared to utilize the aforementioned items with his/her subsequent courses

Contents:
The aim of the course is to create a base for mathematics used in economics. The essential item of the course are the basic operations of matrices and their utilization in mathematical exercises. The course starts on basics and proceeds to solve simultaneous equations with multiple variables and demanding optimization problems with constraints. Those problems that are more difficult than the ones presented in Basic Mathematics for Economics I (800117P) are now solved with matrices. The student will familiarize herself with regression analysis and Input-Output-Analysis. Some linear optimization and differentiation with vectors are also presented. Another essential item of the course is the integral and its applications. The main applications within the course are within the fields of differential equations.
Person responsible:
Kari Myllylä

800117P: Basic Mathematics for Economics I, 7 op

Voimassaolo: - 01.02.2013
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish

ECTS Credits:
7 cr
Learning outcomes:
After completing the course the student is able to
- process functions of a different type
- solve different equations and inequalities
- define and use the concepts of limit and continuity

- define the derivative and knows how to apply it to practical problems
- solve different optimization problems
- utilize the aforementioned items with his/her subsequent courses

Contents:
The aim of the course is to create a base for mathematics used in economics. First part of the cource concerns with the same concepts that are taught in upper secondary school. These items are for example equations, inequalities, functions, limits of functions, continuity and derivative. Some of the economical applications of the concepts are also introduced. The second part of the course concerns the extreme values of different functions, aka. optimization. The examination of the extreme values will be done with the help of derivative. The emphasis will be on the functions with one variable. The most challenging case will be an optimization of a function with two variables and some constraints. The constraints can be either equations or inequalities.

Person responsible:
Kari Myllylä

800147P: Basic Methods in Mathematics I / appl., 8 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Arhippainen, Jorma Eemil

Opintokohteen oppimateriaali:

Aatos Lahtinen, Erkki Pehkonen, , 1987
Aatos Lahtinen, Erkki Pehkonen, , 1988
Adams, R. A.,

Opintokohteen kielet: Finnish

Leikkaavuudet:

802161P	Introduction to Real Functions	5.0 op
802154P	Elementary functions	3.0 op
802155P	Continuity and limit	4.0 op

Ei opintojaksokuvauksia.

806109P: Basic Methods in Statistics I, 9 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Päkkilä

Opintokohteen oppimateriaali:

Grönroos, Matti (2) , , 2003
Heikkilä, Tarja , , 1998
Helenius, Hans , , 1989
Ranta, Esa (2) , , 1991
Wild, Christopher J. , , 2000

Opintokohteen kielet: Finnish

Leikkaavuudet:

806119P	A Second Course in Statistics	5.0 op
806116P	Statistics for Economic Sciences	5.0 op
806117P	Analysis of continuous response variable	5.0 op
ay806109P	Basic Methods in Statistics I (OPEN UNI)	9.0 op

ECTS Credits:
9 cr

Learning outcomes:
On successful completion of this course, the student will be able to
- use basic methods of collecting and describing data
- apply methods of statistical inference in some simple situations
- interpret listing of some statistical software

Contents:
Principles of collecting data and describing data with suitable tables, graphs and numerical measures are treated. The basic idea of estimation and statistical tests will be presented as well as some of the most common used confidence intervals and statistical tests. One aim is also to give basic knowledge from some statistical software.

Person responsible:
Marjatta Mankinen (economics) and Jari Päkkilä (others)

806112P: Basic Methods of Data Analysis, 10 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Päkkilä

Opintokohteen oppimateriaali:

Armitage, P. , , 2002

Opintokohteen kielet: Finnish

Leikkaavuudet:

805305A Introduction to Regression and Analysis of Variance 5.0 op

ECTS Credits:
10 cr

Learning outcomes:
On successful completion of this course, the student will be able to
- analyze continuous and categorial response in the most common experimental and observational studies
- critically evaluate chosen model
- use some statistical software

Contents:
Skills for performing statistical analyses and inferences on the basis of data obtained in common experimental and observational studies are expanded and deepened. Topics included are e.g. (1) principles of collection, description, and modelling of, and inference on statistical data; (2) basic methods of analysing continuous outcome variables, like comparison of groups, analysis of variance, regression analysis, residuals and model diagnostics, nonparametric methods, treatment of correlated and lifetime (censored) observations; (3) and basic methods of analysing binary, categorical and count data.

Person responsible:
Esa Läärä

806110P: Basic methods in statistics II, 10 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:

Armitage, P. , , 2002
Grönroos, Matti (2) , , 2003
Ranta, Esa (2) , , 1991

Opintokohteen kielet: Finnish

ECTS Credits:
10 cr

Learning outcomes:

On successful completion of this course, the student will be able to
- analyze continuous and categorical response in the most common experimental and observational studies
- critically evaluate chosen model
- use some statistical software

Contents:
Skills for performing statistical analyses and inferences on the basis of data obtained in common experimental and observational studies are expanded and deepened. Topics included are e.g. (1) principles of collection, description, and modelling of, and inference on statistical data; (2) basic methods of analysing continuous outcome variables, like comparison of two groups, one-way and two-way analysis of variance, regression analysis, residuals and model diagnostics, nonparametric methods, treatment of correlated and lifetime (censored) observations; (3) and basic methods of analysing binary, categorical and count data.

Person responsible:
Marjatta Mankinen

802322A: Basics in mathematical modelling, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Erkki Laitinen

Opintokohteen kielet: Finnish

800667S: Coding Theory, 10 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen oppimateriaali:
Roman, Steven, , 1992

Opintokohteen kielet: Finnish

ECTS Credits:
10 cr

Learning outcomes:
After completing the course, student
- knows the basic principles of coding theory
- is familiar with important error-correcting codes
- sees how algebra and number theory can be applied in the modern information technology

Contents:
The course presents the basics of error-correcting block codes neede in modern information technology. Main idea is to consider that basic properties of finite fields and to apply this theory in constructing the codes such as cyclic codes like BCH- and RS-codes, Reed-Muller codes and Goppa codes.

Person responsible:
Keijo Väänänen

802655S: Continued Fractions, 5 op

Voimassaolo: 01.01.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

801698S: Cryptography, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Tapani Matala-aho
Opintokohteen oppimateriaali:
Trappe, Wade; Washington, Lawrence C., , 2005
Menezes, Alfred J.; van Oorschot, Paul C.; Vanstone, Scott A. , , 1997
Opintokohteen kielet: Finnish

Learning outcomes:
As usual in my mathematical studies I shall be able to solve problems arising from the subject and to prove essential theorems starting from the given definitions using the tools applied in the course. More detailed; For example, when I pass the course with the grade 1/5, I shall recognize most definitions and I am able to solve closely related problems. Also I am able to rewrite short proofs with some understanding. When I pass the course with the grade 5/5, then I shall understand well the given definitions with the proofs of the theorems deduced from them. Further, I am able to solve challenging problems which demand independent deductions with several stages and applications of appropriate tools.
Contents:
In our lectures we study mathematical basics of encrypting, key exchange and signature systems. As examples, we mention elementary group and number theory used in primality tests and factoring, complexity estimates of computations-in particular in finite fields, repeated squaring and discrete logarithm in finite cyclic groups- applied in multiplicative groups of finite fields and addition groups of elliptic curves. Deduction of addition formulae in projective and affine Weierstrass elliptic curves. Diffie-Hellman key exchange, ElGamal encrypting and signature systems in finite cyclic groups applied in finite fields or in elliptic curves defined over finite fields. DSA, ECDSA, Massey-Omura. Some algorithms and tests: AKS, Fermat, Lenstra , Lucas, Miller-Rabin, Pohlig-Hellman, Pollard's p-1 and rho, pseudoprimes, quadratic sieve, Solovay-Srassen.

802649S: Dynamical systems, 10 op

Voimassaolo: 01.01.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Esa Järvenpää
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

805683S: Econometrics, 5 - 6 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jussi Klemelä
Opintokohteen oppimateriaali:

Harvey, Andrew C. , , 1990
Hayashi, Fumio , , 2000
Gourieroux, Christian , , 1995
Gourieroux, Christian , , 1995
Opintokohteen kielet: Finnish
Leikkaavuudet:

805339A The statistical foundations ofeconometrics 5.0 op

ECTS Credits:
5/6 cr
Language of instruction:
Finnish
Learning outcomes:
The course familiarizes students with applications of statistical models when inferences are made on economic phenomena. The principles of statistical inference on economic phenomena are the same as those of general statistical inference but there are some special issues that make the inference different in economics than in other application areas of statistics. After finishing the course, a student can apply both linear regression and nonlinear regression and a student is able to apply the generalized method of moments as well as the method of instrumental variables. A student can diagnose the validity of the assumptions of the linear regression model and tune his inferences accordingly.
Contents:
The course starts with the study of the linear regression model, and covers asymptotic inference related to the linear regression model, tests of the parameter restrictions and tests of a structural change. Besides linear regression, also nonlinear regression and the generalized method of moments is covered, as well as inference based on instrumental variables and problems stemming from measurement errors.
Inference under heteroscedasticity and autocorrelated disturbances is included. The basic theory of time series analysis (cointegration and autoregressive conditional heteroscedasticity) and the basic theory of panel data is included.
Recommended or required reading:
William H. Greene: Econometric Analysis (Prentice Hall)
Person responsible:
Jussi Klemelä.

802107P: Financial Mathematics, 4 op

Voimassaolo: 01.09.2011 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

802158P Mathematics for Economic Sciences 7.0 op

Learning outcomes:
On successful completion of this course, the student will be able to
- solve different problems related simple, periodic and continuous compoundings
- form different types of compound bases
- solve problems related to loans and investments
- form and apply different indeces

Contents:
The course begins with the basics mathematics of intrest rates, including simple, periodic and continuous compoundings. The first part also considers the differences between compounding bases and gives methods to translating different compounding periods. Related concepts to loans and investments are also included. The second part relates to the theory of indeces. In this part, special kind of index types are formed, for instance, consumer price index, Laspeyres index, Paaschen index, Marshall-Edgeworth index and Fisher index.

802638S: Formal Models and Quantitative Methods for Psychology, 5 - 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peter Hästö
Opintokohteen kielet: Finnish

ECTS Credits:
5 cr or 10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- manipulate and deal with formal models from psychology.
- implement the same using appropriate computer software.
Contents:
This course is organized within an Erasmus Intensive Program of the same name. Each year there is a two week seminar in one of the countries participating in the network. The 10 credit course consists of participation in two seminars or participation in one seminar and a written assignment.
Person responsible:
Peter Hästö

802647S: Fourier series and the discrete Fourier transform, 10 op

Voimassaolo: 01.01.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Valeriy Serov
Opintokohteen kielet: English

Ei opintojaksokuvauksia.

800674S: Fourier transform and distributions, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Valeriy Serov
Opintokohteen oppimateriaali:
Stein, Elias M.; Shakarchi R., , 2003
Taylor, Michael E., , 1996
Grafakos Loukas, , 2004
Stakgold, Ivar , , 1998
Opintokohteen kielet: Finnish

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- calculate the Fourier transform of a given integrable function on the line
- perform basic operations, such as differentiation, convolution and Fourier transformation, on distributions
- use Fourier transform to find, and provide estimates for, fundamental solutions of partial differential operators
- formulate direct and inverse scattering problems for the Schrödinger operator
Contents:

Fourier transform in Schwartz spaces, Riemann - Lebesgue lemma, Hausdorff - Young inequality, tempered distributions and their Fourier transform, Sobolev spaces, homogeneous distributions, fundamental solution of PDO, Schrödinger operator with singular potential, inverse scattering problem, Born approximation.
Person responsible:
Valeriy Serov

802650S: Fractal Geometry, 10 op

Voimassaolo: 01.01.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Maarit Järvenpää
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802629S: Function estimation, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Lasse Holmström
Opintokohteen kielet: Finnish

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- describe the basic characteristics of nonparametric function estimation methods
- apply these estimation methods to practical problems
- derive some of the basic theoretical results for kernel estimators
Contents:
The course is an introduction to nonparametric estimation of functions with a particlular emphasis on kernel methods. The objects of estimation are the probability density function and the regression function.
Person responsible:
Lasse Holmström

800651S: Functional analysis, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- derive and prove basic results in functional analysis.
- apply the results and methods of the course in various problems both in pure and applied mathematics.
Contents:

The course presents the theory of Banach and Hilbert spaces, Banach fixed point theorem, basic theory of operators, Baire category theorem, principle of uniform boundedness, open mapping theorem, closed graph theorem, Hahn-Banach theorem, compact operators and their spectrum.
Person responsible:
Mikael Lindström

800660S: Group Theory, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Niemenmaa Markku
Opintokohteen kielet: Finnish

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- use different proving techniques related to the theory
- prove the Sylow theorems and deal with their applications
- prove important results in the theory of finite solvable groups
Contents:
Aim: To provide the student with the basics of group theory and its development during the past hundred years.
Basics of group theory, permutations, studies on the arithmetical
Person responsible:
Markku Niemenmaa

802652S: Hilbert Spaces, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

800624S	Analysis III	10.0 op

ECTS Credits:
5 ECTS credits
Assessment methods and criteria:
Read more about assessment criteria at the University of Oulu webpage.

802636S: Information Theory, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Lasse Holmström
Opintokohteen oppimateriaali:
Ash, Robert, , 1990
Cover, Thomas M.; Joy, Thomas A., , 2006
Gallager, Robert G., , 1968

MacKay, David J. C., , 2003
Opintokohteen kielet: Finnish

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- explain the basic concepts and results of information theory
- solve mathematical information theoretic problems
- derive the central results of the theory
Contents:
The course is an introduction Claude Shannon's mathematical theory of communication. The focus is on the information content of an information source, compression of information, coding, transmission of coded information through an information channel as well as decoding of the received message.
Person responsible:
Lasse Holmström

802654S: Introduction to Distribution Theory, 5 op

Voimassaolo: 01.01.2011 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802644S: Introduction to Functional Analysis, 10 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Mahmoud Filali
Opintokohteen kielet: Finnish

Learning outcomes:
If we think of functional analysis as infinite dimensional linear algebra, then the course offers the tools and the ways to handle this infinite dimension. After completing the course successfully, the student will be able to follow almost any material on functional analysis.
Contents:
After recalling some basic definitions on linear algebra and giving the basic definitions concerning normed spaces, we present the uniform boundedness principle and the open mapping theorem. In this first part of the course, the relative compactness of the unit ball in a normed space is studied under the norm topology. Hahn-Banach Theorem is presented in its various forms: algebraic, analytic and geometric, and followed by Krein-Milman Theorem. We end up with the weak topology on normed spaces and the weak* topology on Banach duals. The relative compactness of the unit ball is studied with respect to these two topologies.
Person responsible:
Mahmoud Filali

800149P: Introduction to LateX, 2 op

Opiskelumuoto: Basic Studies
Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761115P Laboratory Exercises in Physics 1 5.0 op

761115P-03 Laboratory Exercises in Physics 1, Introduction to LateX 0.0 op

ECTS Credits:
2 cr
Learning outcomes:
After completing the course the student
- knows the operational principle of LaTeX
- knows how to prepare basic documents using LaTeX
- knows the basic commands needed in mathematical texts
- is able to use different environments (e.g. equation environments)
- is able to recognize and repair errors
- is able to produce papers and theses using LaTeX

Contents:
The course is an introduction to LaTeX document preparation system. This course provides basic knowledge and tools for the usage of LaTeX.
Person responsible:
Janne Oinas

802635S: Introduction to partial differential equations, 10 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Valeriy Serov

Opintokohteen oppimateriaali:
Colton, David, , 1988
Kress, Rainer, , 1999
Folland, Gerald B. , , 1995

Opintokohteen kielet: Finnish

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- solve linear and quasi-linear partial differential equations of first order using the method of characteristics
- apply the method of separation of variables to solve initial-boundary value problems for heat, wave and Laplace equations
- verify that a given function is a fundamental solution of a partial differential operator
- use single and double layer potentials to solve boundary value problems for Laplacian

Contents:
Linear and nonlinear equations of the first order, trigonometric Fourier series, Laplace equation in R^n and in bounded domains, potential theory, Green's function, Heat equation in R^n and in bounded domains, Wave equation in R^n and in bounded domans, d'Alembert formula for any dimensions, Fourier method.
Person responsible:
Valeriy Serov

802653S: Lebesgue Measure and Integration Theory, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Mikael Lindström
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802332A: Mathematical Problem Solving, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Peter Hästö
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

805611S: Mathematical statistics II, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jussi Klemelä
Opintokohteen oppimateriaali:
Lehmann, E. L. , , 2001
Migon, H. S. , , 1999
Opintokohteen kielet: Finnish
Leikkaavuudet:

805627S	Theory of Statistical Inference	5.0 op

Ei opintojaksokuvauksia.

800653S: Matrix Theory, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen oppimateriaali:
Lancaster, Peter , , 1985
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802631S: Modern real analysis, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Learning outcomes:
On successful completion of this course, the student will be able to
- derive and prove basic results of modern real analysis.
- apply the results and methods of modern real analysis in different topics of mathematics, like in the theory of partial differential equations.

Contents:
The course presents Lebesgue spaces (Hölder's and Minkowski's inequalities, completeness, dual spaces), the Vitali covering theorem, the Hardy-Littlewood maximal function, approximation with smooth functions using convolution, Lebesgue's density theorem, Sobolev's inequalities.

800104P: Number Systems, 4 op

Voimassaolo: 01.03.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

800347A Number systems 5.0 op

Learning outcomes:
After a succesful completion of this course, student is able to define construct the most commonly used number systems (natural numbers, integers, rationals and reals).

Contents:
The course considers basics arithmetic and algebra in the concept of most common number systems (natural numbers, integers, rationals and reals). The course begins with the construction of natural numbers and continues, through integers and rational numbers, to the construction of real numbers.

Recommended optional programme components:
Basic methods in mathematics I

806604S: Principles of bayesian inference, 10 op

Voimassaolo: - 01.09.2012

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Hyon-Jung Kim-Ollila

Opintokohteen oppimateriaali:
Andrew Gelman et al., , 2004
Lee, Peter M. , , 1997

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

800697S: Pro Gradu Thesis, 20 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

805642S: Pro gradu thesis, 30 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

800698S: Pro gradu thesis, 30 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

805331A: Project seminar I, 6 op

Voimassaolo: 23.04.2007 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

801645S: Special Work in Applied Mathematics, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

802632S: Special course for teachers of mathematics, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Maarit Järvenpää

Opintokohteen kielet: Finnish

Leikkaavuudet:

802641S	Special Course for Teachers of Mathematics: Training	2.0 op
802640S	Special Course for Teachers of Mathematics: High School Mathematics	3.0 op
802639S	Special Course for Teachers of Mathematics: Content Planning	5.0 op

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- combine mathematical thinking and teaching
- plan mathematical tasks which support profound mathematical understanding rather than computational proceedures
Contents:
This module aims at bridging the gap between the mathematical content in the BSc with the skills needed for teaching at schools. It consists of the following parts:

Content planning (4 cr)

This part involves planning and implementing tutorials for conceptual understanding for freshmen. The planning is done as group work and it is supported by a seminar.

Matriculation exam questions (3 cr)

This part is delivered by the normal school teachers. It covers scoring of the national exam's questions.

Other (3 cr)

This part contains practical experience of working as a teacher of mathematics, e.g. as a tutor.

Person responsible:
Peter Hästö

802632S-02: Special course for teachers of mathematics / Correcting tests in mathematics, 3 op

Opiskelumuoto: Advanced Studies

Laji: Partial credit

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Maarit Järvenpää

Opintokohteen kielet: Finnish

Leikkaavuudet:

802640S	Special Course for Teachers of Mathematics: High School Mathematics	3.0 op
802641S	Special Course for Teachers of Mathematics: Training	2.0 op
802639S	Special Course for Teachers of Mathematics: Content Planning	5.0 op

Person responsible:
Pekka Salmi.

802632S-01: Special course for teachers of mathematics / Lesson plans for teaching mathematics, 4 op

Opiskelumuoto: Advanced Studies

Laji: Partial credit
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Maarit Järvenpää
Opintokohteen kielet: Finnish
Leikkaavuudet:

802639S	Special Course for Teachers of Mathematics: Content Planning	5.0 op
802640S	Special Course for Teachers of Mathematics: High School Mathematics	3.0 op
802641S	Special Course for Teachers of Mathematics: Training	2.0 op

Person responsible:
Pekka Salmi.

802632S-03: Special course for teachers of mathematics / Other training, 3 op

Opiskelumuoto: Advanced Studies
Laji: Partial credit
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Maarit Järvenpää
Opintokohteen kielet: Finnish
Leikkaavuudet:

802641S	Special Course for Teachers of Mathematics: Training	2.0 op
802640S	Special Course for Teachers of Mathematics: High School Mathematics	3.0 op
802639S	Special Course for Teachers of Mathematics: Content Planning	5.0 op

Person responsible:
Pekka Salmi.

802633S: Statistical Pattern Recognition, 10 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Lasse Holmström
Opintokohteen oppimateriaali:
Duda, Richard O. , , 2001
Theodoridis, Sergios , , 2002
Webb, A. R , , 2002
Opintokohteen kielet: Finnish

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- describe the most important classical classification and feature extraction methods that are based on continous distributions.
- apply these methods to practical problems.
- derive the mathematical results that motivate some of the classification and feature extraction methods.

Contents:

Pattern recognition consists of measuring and observing natural objects, analysis of these measurements and recognition of objects on the basis this analysis. The course is an introduction to the concepts and theory of statistical pattern recognition which focuses on the automatic, probability theory based classification of objects based on features derived from the measurements.
Person responsible:
Lasse Holmström

805609S: Statistical methods in epidemiology, 9 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Läärä Esa

Opintokohteen oppimateriaali:
Santos Silva, Isabel dos , , 1999
Clayton, David , , 1993
Rothman, Kenneth J. , , 1998
Opintokohteen kielet: Finnish

800688S: Theory of Optimization, 10 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Erkki Laitinen

Opintokohteen oppimateriaali:
Luenberger, David G. , , 1984
Peressini, Anthony L. , , 1988
Opintokohteen kielet: Finnish

Leikkaavuudet:

802666S Linear Optimization 5.0 op

ECTS Credits:
10 cr
Learning outcomes:
On successful completion of this course, the student will be able to
- identify the correct methods for solving the conventional optimization problems
- implement the most typical numerical algorithms for solving linear and nonlinear optimization problems
Contents:
The lecture course is focused to methods, which can apply for solving essential optimization problems of technical and economical sciences. The lectures consist of following topics: Linear programming, convex sets and functions and nonlinear convex optimization. The topics are considered theoretically and also numerical algorithms for problem solution are presented.
Person responsible:
Erkki Laitinen

805679S: Time series analysis, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jussi Klemelä

Opintokohteen oppimateriaali:

Harvey, Andrew C. , , 1993
Lütkepohl, Helmut , , 1991
Hamilton, James D. , , 1994

Opintokohteen kielet: Finnish

ECTS Credits:
6 cr
Learning outcomes:
After finishing the course, a student can apply linear, nonlinear and nonparametric modeling of time series. A student learns how to choose between alternative time series models and can apply computer programs to fit time series models. Furthermore, a student learns to read scientific articles about time series.
Contents:
The course covers basic concepts of time series analysis:
stationarity, autocorrelation, spectral distribution and periodogram.
Linear time series analysis includes explanation, prediction, parameter estimation and model diagnostics in ARMA models. Nonlinear time series analysis includes threshold models and heteroskedastic time series models (ARCH and GARCH). Furthermore, nonlinear nonparametric smoothing is covered (time space smoothing and state space smoothing) and nonparametric estimation of spectral densities.
Nonparametric function estimation includes kernel estimation, local polynomial regression and additive modeling.
Recommended or required reading:
Fan, J. ja Yao, Q. (2005). Nonlinear Time Series, Springer.
A. Harvey: Time Series Models, Philip Allan (2. painos) H. Lutkepohl: Introduction to Multiple Time Series Analysis, Springer (2. painos) J. Hamilton: Time Series, Princeton University Press The MIT Press.
Person responsible:
Jussi Klemelä

801643S: Topology, 10 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Mahmoud Filali

Opintokohteen kielet: Finnish

ECTS Credits:
10 cr
Learning outcomes:
After completion of the course, the student should be able to follow more advanced courses or seminars on abstract harmonic analysis.
Contents:
This is an advanced course, aimed to final year students and to postgraduate students. The course covers topological groups and their uniform structures; subgroups, Quotient groups and product groups; and invariant pseudo-metrics on groups. The last part of the course presents some basics on compact semigroups with some examples such as Ellis group and semigroup compactifications
Person responsible:
Mahmoud Filai

805667S: Training report, 5,5 op

Voimassaolo: - 01.09.2012

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Department of Mathematical Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802327A: Tutoring, 4 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Mathematical Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish
Leikkaavuudet:

800324A Practical training 5.0 op

ECTS Credits:
4 op
Learning outcomes:
After completing the course the student
- understands that the teacher needs to have an excellent competence in the subject he or she is teaching
- has achieved some experience in teaching and counceling mathematics
- is able to handle various different situations related with teaching

Contents:
Tutoring is a method of student councelling in the Department of Mathematical Sciences. The students acting as tutors are on duty in a tutoring room which is located in the Department. They help younger students with their problems that are related to courses. An important task for the tutors is to help the 1st year students with the excercises of the basic courses (Basic methods in Mathematics I, Linear Algebra I, Analysis I). Some of the tutors have been deputy teachers on the course Algebra I. Their duty was to help other students to solve the excercises independently.
Person responsible:
Kari Myllylä