Opasraportti

FSci - Degree Programme in Mathematics and Physics (2017 - 2018)

Tutkintorakenteet

Bachelor of Science degree, Degree Programme in Mathematical and Physical Sciences, Major Subject in Mathematics or Physics or (teacher)

Tutkintorakenteen tila: published

Lukuvuosi: 2017-18

Lukuvuoden alkamispäivämäärä: 01.08.2017

General studies, Language and Communication Studies, Other Compulsory Studies (vähintään 10 op)

Optional studies may include other courses (e.g. language studies).

Compulsory studies

A300091: Language and Communication Studies, 0 op
- *Compulsory Studies*
  - 902002Y: English 1 (Reading for Academic Purposes), 2 op
  - 902004Y: English 2 (Scientific Communication), 2 op
  - 901034Y: Second Official Language (Swedish), Written Skills, 1 op
  - 901035Y: Second Official Language (Swedish), Oral Skills, 1 op
- *Optinal language and communication studies*
  - 901018Y: Brush-up Course in Swedish, 2 op

A300090: Other Studies, 0 op
- *Major subject in mathematics: select the code 800012Y. Major subject in physics: select the code 761010Y*
  - 761010Y: Orientation course for new students, 3 op
  - 800012Y: Orientation for New Students, 3 op
- *Compulsory Studies*
  - 030005P: Information Skills, 1 op
  - 521141P: Elementary Programming, 5 op

Optional studies

Studies in Physics (vähintään 15 op)

Major Subject in Physics (teacher), Compulsory Studies in Physics

A325101: Physics, basic studies, 25 - 40 op
- *Studies in Physics*

761108P: Physical world view, 5 op
761118P: Mechanics 1, 5 op
Compulsory
761118P-01: Mechanics 1, lectures and exam, 0 op
761118P-02: Mechanics 1, lab. exercises, 0 op
761115P: Laboratory Exercises in Physics 1, 5 op
Compulsory
761115P-01: Laboratory Exercises in Physics 1, lecture and exam, 0 op
761115P-02: Laboratory Exercises in Physics 1, laboratory exercises, 0 op
761115P-03: Laboratory Exercises in Physics 1, Introduction to LateX, 0 op
761120P: Laboratory Exercises in Physics 2, 5 op
761119P: Electromagnetism 1, 5 op
Compulsory
761119P-01: Electromagnetism 1, lectures and exam, 0 op
761119P-02: Electromagnetism 1, lab. exercises, 0 op

A325102: Physics, intermediate studies, 35 - 60 op
Compulsory Studies
761312A: Electromagnetism 2, 5 op
761309A: Mechanics 2, 5 op
761313A: Atomic physics 1, 5 op
761310A: Wave motion and optics, 5 op
Compulsory
761310A-01: Wave motion and optics, lectures and exam, 0 op
761310A-02: Wave motion and optics, lab. exercises, 0 op
766344A: Nuclear and particle physics, 5 op
763343A: Solid state physics, 5 op
761314A: Thermophysics, 5 op
766384A: B.Sc. seminar, 4 op
766385A: B.Sc. thesis, 6 op
761386A: Maturity test, 0 op

Major Subject in Mathematics (teacher), Compulsory Studies in Physics

A325104: Physics Minor, 15 op
General Studies in Physics
761108P: Physical world view, 5 op
761118P: Mechanics 1, 5 op
Compulsory
761118P-01: Mechanics 1, lectures and exam, 0 op
761118P-02: Mechanics 1, lab. exercises, 0 op
761115P: Laboratory Exercises in Physics 1, 5 op
Compulsory
761115P-01: Laboratory Exercises in Physics 1, lecture and exam, 0 op
761115P-02: Laboratory Exercises in Physics 1, laboratory exercises, 0 op
761115P-03: Laboratory Exercises in Physics 1, Introduction to LateX, 0 op
Optional studies in Physics. When you complete 25 ECTS cr from the physics. Choose the 2 courses below. (60 ECTS cr of minor subject are all selected below)
761119P: Electromagnetism 1, 5 op
Compulsory
761119P-01: Electromagnetism 1, lectures and exam, 0 op
761119P-02: Electromagnetism 1, lab. exercises, 0 op
761313A: Atomic physics 1, 5 op
761314A: Thermophysics, 5 op
761310A: Wave motion and optics, 5 op
Compulsory
761310A-01: Wave motion and optics, lectures and exam, 0 op
761310A-02: Wave motion and optics, lab. exercises, 0 op
If you want to complete 60 ECTS cr in physics. Choose all the courses below
761309A: Mechanics 2, 5 op
761120P: Laboratory Exercises in Physics 2, 5 op
761312A: Electromagnetism 2, 5 op
766344A: Nuclear and particle physics, 5 op
763343A: Solid state physics, 5 op

Studies in Mathematics (vähintään 45 op)

Major Subject in Mathematics (teacher), Compulsory Studies in Mathematics

A325001: Mathematics, basic studies, 25 op
Compulsory Studies
802151P: Introduction to mathematical deduction, 5 op
800119P: Functions and limit, 5 op
802120P: Introduction to Matrices, 5 op
806113P: Introduction to Statistics, 5 op
801195P: Probability Theory, 5 op
A325002: Mathematics, intermediate studies, 35 op
Compulsory Studies
800317A: Continuity and derivative, 5 op
800318A: Integral, 5 op
800328A: Calculus of several variables, 5 op
802320A: Linear Algebra, 5 op
802354A: Basics in Algebra, 5 op
802357A: Euclidean Spaces, 5 op
800331A: Proseminar, 10 op
800300A: Maturity test, 0 op

Studies in Mathematics, Major Subject in Physics (teacher)

A325004: Mathematics Minor, 25 - 120 op
General Studies in Mathematics (min 45 ECTS cr)
802151P: Introduction to mathematical deduction, 5 op
800119P: Functions and limit, 5 op
800317A: Continuity and derivative, 5 op
800318A: Integral, 5 op
802120P: Introduction to Matrices, 5 op
800328A: Calculus of several variables, 5 op
802320A: Linear Algebra, 5 op
806113P: Introduction to Statistics, 5 op
800320A: Differential equations, 5 op
These courses mandatory in Master studies if not included in Bachelor degree
802357A: Euclidean Spaces, 5 op
802354A: Basics in Algebra, 5 op
801195P: Probability Theory, 5 op

Major Subject in Mathematics or Physics, Orientatioin Studies

Recommended Studies for Teachers

761316A: Being a teacher in mathematical subjects, 5 op
800146P: Introduction to teaching, 5 op

Minor subjects

See the study guide

Pedagogic studies for teacher (30 ECTS credits)

Chemistry

Minor studies

Optional courses

The B.Sc. degree is at least 180 credits.

Bachelor of Science, Degree Programme in Mathematical and Physical Sciences, Major Subject in Physics or Mathematics (researcher)

Tutkintorakenteen tila: published

Lukuvuosi: 2017-18

Lukuvuoden alkamispäivämäärä: 01.08.2017

General studies, Language and Communication Studies, Other Compulsory Studies (vähintään 10 op)

Optional studies may include other courses (e.g. language studies).

Compulsory studies

A300091: Language and Communication Studies, 0 op
- *Compulsory Studies*
  - 902002Y: English 1 (Reading for Academic Purposes), 2 op
  - 902004Y: English 2 (Scientific Communication), 2 op
  - 901034Y: Second Official Language (Swedish), Written Skills, 1 op
  - 901035Y: Second Official Language (Swedish), Oral Skills, 1 op
- *Optinal language and communication studies*
  - 901018Y: Brush-up Course in Swedish, 2 op

A300090: Other Studies, 0 op
- *Major subject in mathematics: select the code 800012Y. Major subject in physics: select the code 761010Y*
  - 761010Y: Orientation course for new students, 3 op
  - 800012Y: Orientation for New Students, 3 op
- *Compulsory Studies*
  - 030005P: Information Skills, 1 op
  - 521141P: Elementary Programming, 5 op

Optional studies

Studies in Physics (vähintään 15 op)

Major Subject in Physics, Compulsory Studies in Physics

A325101: Physics, basic studies, 25 - 40 op
- *Studies in Physics*
  - 761108P: Physical world view, 5 op
  - 761118P: Mechanics 1, 5 op
    - *Compulsory*
      - 761118P-01: Mechanics 1, lectures and exam, 0 op
      - 761118P-02: Mechanics 1, lab. exercises, 0 op
  - 761115P: Laboratory Exercises in Physics 1, 5 op
    - *Compulsory*
      - 761115P-01: Laboratory Exercises in Physics 1, lecture and exam, 0 op
      - 761115P-02: Laboratory Exercises in Physics 1, laboratory exercises, 0 op
      - 761115P-03: Laboratory Exercises in Physics 1, Introduction to LateX, 0 op
  - 761120P: Laboratory Exercises in Physics 2, 5 op
  - 761119P: Electromagnetism 1, 5 op
    - *Compulsory*
      - 761119P-01: Electromagnetism 1, lectures and exam, 0 op
      - 761119P-02: Electromagnetism 1, lab. exercises, 0 op

A325102: Physics, intermediate studies, 35 - 60 op

Compulsory Studies
761312A: Electromagnetism 2, 5 op
761309A: Mechanics 2, 5 op
761313A: Atomic physics 1, 5 op
761310A: Wave motion and optics, 5 op
Compulsory
761310A-01: Wave motion and optics, lectures and exam, 0 op
761310A-02: Wave motion and optics, lab. exercises, 0 op
766344A: Nuclear and particle physics, 5 op
763343A: Solid state physics, 5 op
761314A: Thermophysics, 5 op
766384A: B.Sc. seminar, 4 op
766385A: B.Sc. thesis, 6 op
761386A: Maturity test, 0 op

Marjor Subject in Mathematics, Compulsory Studies in Physics

A325104: Physics Minor, 15 op
General Studies in Physics
761108P: Physical world view, 5 op
761118P: Mechanics 1, 5 op
Compulsory
761118P-01: Mechanics 1, lectures and exam, 0 op
761118P-02: Mechanics 1, lab. exercises, 0 op
761115P: Laboratory Exercises in Physics 1, 5 op
Compulsory
761115P-01: Laboratory Exercises in Physics 1, lecture and exam, 0 op
761115P-02: Laboratory Exercises in Physics 1, laboratory exercises, 0 op
761115P-03: Laboratory Exercises in Physics 1, Introduction to LateX, 0 op
Optional studies in Physics. When you complete 25 ECTS cr from the physics. Choose the 2 courses below. (60 ECTS cr of minor subject are all selected below)
761119P: Electromagnetism 1, 5 op
Compulsory
761119P-01: Electromagnetism 1, lectures and exam, 0 op
761119P-02: Electromagnetism 1, lab. exercises, 0 op
761313A: Atomic physics 1, 5 op
761314A: Thermophysics, 5 op
761310A: Wave motion and optics, 5 op
Compulsory
761310A-01: Wave motion and optics, lectures and exam, 0 op
761310A-02: Wave motion and optics, lab. exercises, 0 op
If you want to complete 60 ECTS cr in physics. Choose all the courses below
761309A: Mechanics 2, 5 op
761120P: Laboratory Exercises in Physics 2, 5 op
761312A: Electromagnetism 2, 5 op
766344A: Nuclear and particle physics, 5 op
763343A: Solid state physics, 5 op

Studies in Mathematics (45 - 70 op)

Major Subject in Physics, Compulsory Studies in Mathematics

A325004: Mathematics Minor, 25 - 120 op
General Studies in Mathematics (min 45 ECTS cr)
802151P: Introduction to mathematical deduction, 5 op
800119P: Functions and limit, 5 op
800317A: Continuity and derivative, 5 op
800318A: Integral, 5 op
802120P: Introduction to Matrices, 5 op
800328A: Calculus of several variables, 5 op
802320A: Linear Algebra, 5 op
806113P: Introduction to Statistics, 5 op

800320A: Differential equations, 5 op
These courses mandatory in Master studies if not included in Bachelor degree
802357A: Euclidean Spaces, 5 op
802354A: Basics in Algebra, 5 op
801195P: Probability Theory, 5 op

Major Subject in Mathematics, Compulsory Studies in Mathematics

A325001: Mathematics, basic studies, 25 op
Compulsory Studies
802151P: Introduction to mathematical deduction, 5 op
800119P: Functions and limit, 5 op
802120P: Introduction to Matrices, 5 op
806113P: Introduction to Statistics, 5 op
801195P: Probability Theory, 5 op
A325002: Mathematics, intermediate studies, 35 op
Compulsory Studies
800317A: Continuity and derivative, 5 op
800318A: Integral, 5 op
800328A: Calculus of several variables, 5 op
802320A: Linear Algebra, 5 op
802354A: Basics in Algebra, 5 op
802357A: Euclidean Spaces, 5 op
800331A: Proseminar, 10 op
800300A: Maturity test, 0 op

Orientation Studies (vähintään 25 op)

Major Subject in Mathematics. Orientation Mathematics (25 ECTS cr)

802355A: Algebraic Structures, 5 op
800321A: Series and Approximation, 5 op

Major Subject in Mathematics. Orientation Statistics (25 ECTS cr)

A326602: Statistics, intermediate studies, 35 op
Compulsory Studies
805305A: Introduction to Regression and Analysis of Variance, 5 op
805306A: Introduction to Multivariate methods, 5 op
Choose from the following 15 ECTS cr
805350A: Estimation and Test Theory, 5 op
805351A: Linear Regression, 5 op
805353A: Statistical Software, 5 op
801396A: Introduction to Probability Theory II, 5 op
805349A: Likelihood and Bayesian Inference, 5 op

Major Subject in Physics. Orientation General Physics (25 credits)

H325104: General Physics, 25 op
Basic and intermediate studies in general physics
766116P: Radiation physics, biology and safety, 5 op
761315A: Laboratory Exercises in Physics 3, 5 op
763312A: Quantum mechanics I, 10 op
At least one of the courses listed below must be chosen
766355A: Basics of space physics, 5 op
761359A: Spectroscopic methods, 5 op

Major Subject in Physics. Orientation Astronomy (25 ECTS credits)

A325704: Astronomy Minor, 25 - 40 op
Compulsory
765114P: Fundamentals of astronomy I, 5 op

765115P: Fundamentals of astronomy II, 5 op
765309A: Galaxies, 5 op
765384A: Physics of the solar system I, 5 op

Choose another: Major Students of Astronomy take 765307A Research project of astronomy and Minor Students of Astronomy take 765308A History of astronomy.

765307A: Research Project of Astronomy I, 5 op
Compulsory
765307A-01: Research Project of Astronomy I: Data processing in astronomy, 0 op
765307A-02: Research Project of Astronomy I: Study project, 0 op
765308A: History of astronomy, 5 op

It is strongly recommended to take at least 15 ECTS cr optional study in Astronomy.

765304A: Celestial mechanics I, 5 - 8 op
765386A: Interstellar Matter, 5 op
765358A: Cosmology, 5 op
765301A: Introduction to Nonlinear Dynamics, 5 op
767303A: Observational Astronomy I, 5 op
767302A: Physics of the solar system II, 5 op
767301A: Time Series Analysis in Astronomy, 5 op

Minor Subject in Physics. Orientation Theoretical Physics (25 ECTS credits)

A325304: Theoretical Physics Minor, 25 op
Intermediate studies in theoretical physics
763312A: Quantum mechanics I, 10 op
763313A: Quantum mechanics II, 10 op
.
761317A: Numerical Programming, 5 op
763314A: Analytical mechanics, 5 op

Major Subject in Physics. Orientation Biomedical Physics (25 ECTS credits)

A326010: Biomedical Physics Minor, 25 op
Compulsory Studies (25 ECTS cr)
764163P: Introduction to Biomedical Physics, 5 op
764125P: Foundations of cellular biophysics, 5 op
766116P: Radiation physics, biology and safety, 5 op
761359A: Spectroscopic methods, 5 op
764338A: Basic Neuroscience, 5 op
Recommended Optional Studies
080925A: Anatomy and Physiology for Biomedical Engineering, 5 op
764322A: Cell membrane biophysics, 10 op
761317A: Numerical Programming, 5 op

Minor Subjects

The Bachelor's degree can also be included as a minor subject in the teaching pedagogical studies 30 ECTS cr.

A minor subject notation can be given to study modules that are worth at least 15 credits.

Pedagogical Studies

Biomedical engineering (BME)

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Minor in Chemistry

Other Minor Studies

Optional courses

The B. Sc. degree must be at least 180 credits.

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

A300091: Language and Communication Studies, 0 op

Opiskelumuoto: Language and Communication Studies
Laji: Study module
Vastuuyksikkö: Faculty of Science
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Compulsory Studies

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

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:

B2/C1 on the Common European Framework of Reference scale.

Status:

This course is mandatory for students who choose English as their foreign language in the following B.Sc. degree programmes:
Faculty of Natural Sciences
•Biology
•Mathematical and Physical Sciences
•Mathematical Sciences
Faculty of Information Technology and Electrical Engineering
•Department of Information Processing Science
Faculty of Technology
•Department of Chemistry
Oulu Mining School
•Geosciences degree programme
Notes:
In Autumn 2017, English 1 is offered separately to 2nd-year students of Mathematical Sciences.

Please consult your faculty's Study Guide to establish the language requirements for your own degree program.

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 / 54 hours of work

Language of instruction:

English

Timing:

Biology: 1st year spring term (periods 3 and 4)
Mathematical and Physical Sciences: 1st year autumn term (periods 1 and 2)
Mathematical Sciences (for students in the older programme): 2nd year autumn term (periods 1 and 2)
Chemistry: 1st year autumn term (periods 1 and 2)
Geosciences: 1st year spring term (periods 3 and 4)
Information Processing Science: 2nd year autumn term (period 1) for students who begin in 2017 or later
In Spring 2018, English 1 is offered to 2nd-year students of Information Processing Science.

Learning outcomes:

By the end of the course, you are expected to

- have acquired effective vocabulary-learning techniques
- be able to distinguish parts of words to infer meanings
- be able to utilise your knowledge of text structure and cohesion markers to understand academic texts
- to be able to extract information and learn content from English readings in scientific and professional contexts

Contents:

The course will focus on reading strategies; these include recognising how texts are organised, identifying key points in a text, and understanding words in context. Vocabulary work in the course will focus on: a) academic vocabulary, as used in formal scientific writing, and b) using your knowledge of the meanings of parts of words (affixes) to infer meaning.

Mode of delivery:

Contact teaching and independent study

Learning activities and teaching methods:

The English 1 course is adapted to accommodate many different fields of study, and thus the materials and implementation methods of the course vary. There will be 26 hours of guided teaching events and 28 hours of independent study, either individually or in a group. A more detailed course description and list of homework tasks will be provided by the teacher.

Target group:

Faculty of Natural Sciences: Biology, Mathematical & Physical Sciences
Faculty of Information Technology and Electrical Engineering: Information Processing Science
Faculty of Technology: Chemistry
Oulu Mining School: Geosciences

Prerequisites and co-requisites:

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Recommended optional programme components:

Students are also required to take English 2 902004Y, or English 4 902005Y, AFTER completion of this course.

Recommended or required reading:

Course materials will be provided in electronic form or will be accessible from the university library.

Assessment methods and criteria:

Student work is monitored by continuous assessment, and students are required to participate regularly and actively in all contact teaching provided. During the course, there will be three monthly tests on material covered so far. The assessment of the course is based on the learning outcomes listed above. Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/Fail

Person responsible:

Karen Niskanen

Working life cooperation:

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Other information:

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. Please contact your own faculty for information.

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

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

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 Common European Framework of Reference scale.

Status:

This course is mandatory for students who choose English as their foreign language in the following B.Sc. degree programmes:
Faculty of Natural Sciences:
Biology
Mathematical & Physical Sciences
Mathematical Science (for 2nd year students in spring 2018)
Physical Science (for 2nd year students in autumn 2017)
Faculty of Information Technology and Electrical Engineering:
Information Processing Science (for students who began their studies before autumn 2017)
Faculty of Technology:
Chemistry
Oulu Mining School:
Geoscience degree programme

Note: Information Processing Science students who began their studies in autumn 2017 or later will take English 4 instead.
Please consult your faculty's study guide to establish the language requirements of your own degree programme.

Required proficiency level:

Students taking this course must have had English as the A1 or A2 language at school or have equivalent skills. The course English 1 (902002Y) is a pre-requisite, unless exempted.

ECTS Credits:

2 ECTS credits / 54 hours work.

Language of instruction:

English

Timing:

Biology: 2nd year autumn term (periods 1 and 2)
Mathematic and Physical Sciences 1st year spring term (periods 3 and 4)
Mathematics: 2nd year spring term (for the last time in spring 2018) (periods 3 and 4)
Physics: 2nd year autumn term (for the last time in autumn 2017) (periods 1 and 2)

Information Processing Science: 2nd year autumn term (for the last time in autumn 2017) (periods 1 and 2)
Chemistry: 2nd year spring term (periods 3 and 4)
Geosciences: 2nd year spring term (periods 3 and 4)

Learning outcomes:

By the end of the course, you are expected to have demonstrated the ability to:

- **use appropriate strategies and techniques for communicating effectively** in English in an academic context
- **prepare and present scientific subjects** to your classmates, using appropriate field-related vocabulary.

Contents:

Skills in listening, speaking, and presenting academic topics are practised in the classroom, where there is an emphasis on working in pairs and small groups. Homework is given to support the classroom learning.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

The English 2 course is tailored to the needs of students in different fields of study, and thus the materials and implementation methods of the course vary between groups. The teacher will provide a more detailed schedule and list of homework tasks. There will be 26 hours of guided teaching events and 28 hours of independent work, including both individual and group work.
Individual learning methods: autonomous learning tasks, practice in lecture listening and written tasks in preparation for classroom lessons
Group work: Preparation of presentations in groups

Target group:

2nd year students of Biology, Chemistry, Geoscience, Information Processing Science (older programme)
1st year students of Mathematical and Physical Sciences (new programme)
2nd year students of Mathematical Science (older programme)
2nd year students of Physical Sciences (older programme)

Prerequisites and co-requisites:

Pre-requisite course: 902002Y Englannin kieli 1

Recommended optional programme components:

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Recommended or required reading:

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Assessment methods and criteria:

Continuous assessment is based on regular attendance, active participation in all lessons and the successful completion of all homework tasks.
The assessment of the course is based on the learning outcomes of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass / fail.

Person responsible:

Karen Niskanen

Working life cooperation:

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Other information:

-

901034Y: Second Official Language (Swedish), Written Skills, 1 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication
Opintokohteen kielet: Swedish
Leikkaavuudet:

901060Y Second Official Language (Swedish), Written Skills 1.0 op
ay901034Y Second Official Language (Swedish), Written Skills (OPEN UNI) 1.0 op
901004Y Swedish 2.0 op

901035Y: Second Official Language (Swedish), Oral Skills, 1 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Opintokohteen kielet: Swedish
Leikkaavuudet:

901061Y Second Official Language (Swedish), Oral Skills 1.0 op
ay901035Y Second Official Language (Swedish), Oral Skills (OPEN UNI) 1.0 op
901004Y Swedish 2.0 op

Optinal language and communication studies

901018Y: Brush-up Course in Swedish, 2 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay901018Y Brush-up Course in Swedish (OPEN UNI) 2.0 op

Voidaan suorittaa useasti: Kyllä

Proficiency level:
-
Status:
For students whose proxiciency level in Swedish is not sufficient.
Required proficiency level:
See status
ECTS Credits:
2 ECTS credits
Language of instruction:
Swedish and Finnish
Timing:
before the obligatory Swedish course, see Status
Learning outcomes:
See Contents
Contents:

Throughout the course unit the student brushes up on his/her Swedish skills. Various oral and written exercises aim to improve his/her command of essential grammatical structures and vocabulary and his/her ability to understand spoken Swedish.

Mode of delivery:

contact teaching

Learning activities and teaching methods:

Contact teaching and independent study.

Target group:

See Status

Prerequisites and co-requisites:

See Status

Recommended optional programme components:

before the obligatory Swedish course, see Status

Recommended or required reading:

Will be agreed on in the class.

Assessment methods and criteria:

Active participation and a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass / fail

Person responsible:

See Contact teachers

Working life cooperation:

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Other information:

Registration in WebOodi. Registration is binding and cancellation is subject to a charge unless done before the registration closes.
This course is also offered by the Summer University.

A300090: Other Studies, 0 op

Opiskelumuoto: Other Studies
Laji: Study module
Vastuuyksikkö: Faculty of Science
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Major subject in mathematics: select the code 800012Y. Major subject in physics: select the code 761010Y

761010Y: Orientation course for new students, 3 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761011Y	Orientation course for new students	2.0 op

761011Y-01 Orientation course, Small groups 0.0 op
761011Y-02 Orientation course, Research groups 0.0 op

ECTS Credits:

3 ECTS credits / 80 hours of work

Language of instruction:

Finnish

Timing:

1 st autumn

Learning outcomes:

After the course, the student is able to plan her/his studies and find answers to questions regarding teaching and studying.

Contents:

During the course, older students introduce the new students to the studying environment and the university organization, provide information on the subject matters, aims and prospects related to the field of study, and help with the practical issues connected to the beginning of the studies. The course includes an introduction to different profiles in the degree programme, teacher tutor meetings and guidance for making a personal study plan.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Group work 10-15 h, lectures 10 h, teacher tutor meetings

Target group:

Students in mathematical and physical sciences

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

Coincides with 800012Y

Recommended or required reading:

Handouts

Assessment methods and criteria:

Participation to meetings, producing a personal study plan.

Grading:

pass/fail

Person responsible:

Saana-Maija Huttula

Working life cooperation:

No work placement period

800012Y: Orientation for New Students, 3 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

3 ECTS cr

Language of instruction:

Finnish

Timing:

1st year, 1st and 2nd period

Learning outcomes:

After the course, the student is able to plan her/his studies and find answers to questions regarding teaching and studying.

Contents:

During the course, older students introduce the new students to the studying environment and the university organization, provide information on the subject matters, aims and prospects related to the field of study, and help with the practical issues connected to the beginning of the studies. The course includes an introduction to different profiles in the degree programme, teacher tutor meetings and guidance for making a personal study plan.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Group work 10-15 h, lectures 10 h, teacher tutor meetings

Target group:

Students in mathematical and physical sciences

Prerequisites and co-requisites:

No

Recommended optional programme components:

Coincides with 761010Y

Recommended or required reading:

Handouts

Assessment methods and criteria:

Participation to meetings, producing a personal study plan.

Grading:

Pass/fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Compulsory Studies

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opettajat: Ursula Heinikoski
Opintokohteen kielet: Finnish
Leikkaavuudet:

030004P	Introduction to Information Retrieval	0.0 op

ECTS Credits:

1 ECTS credits

Language of instruction:

Finnish

Timing:

Architecture 3. spring semester, period I; biochemistry 3. autumn semester; biology 3. autumn semester, period I; chemistry 3. autumn semester, period II; computer science and engineering 2. spring semester, period IV; electrical engineering 3. spring semester, period III; geosciences 2. spring semester, period IV; geography 1. and 3. spring semester, *period ///;* industrial engineering and management 3. year*;* information processing sciences 1. year; mathematics and physics 1. spring semester; mechanical engineering 3. year; mining engineering and mineral processing 3. year; process and environmental engineering 1. year, period I. Master's degree students in Industrial Engineering and Management 1st year.

Learning outcomes:

Upon completion of the course, the students:
- can search scientific information,
- can use the most important databases of their discipline,
- know how to evaluate search results and information sources,
- can use the reference management tool

Contents:

Scientific information retrieval process, the most important databases and publication channels of the discipline, evaluation of the reliability of information sources and RefWorks reference management tool.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises, a group assignment.

Learning activities and teaching methods:

Training sessions 8 h, group working 7 h, self-study 12 h

Target group:

Compulsory for all bachelor degree students of Faculty of information technology and electrical engineering, Faculty of Technology, Oulu mining school, Oulu School of architecture and Faculty of science. Optional for students of biochemistry. Compulsory also for the Master's degree students in Industrial Engineering and Management who have not earlier studies in information skills.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material Tieteellisen tiedonhankinnan opas http://libguides.oulu.fi/tieteellinentiedonhankinta

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Ursula Heinikoski

Working life cooperation:

-

Other information:

-

521141P: Elementary Programming, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Oja, Mika Rautiainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521141P Elementary Programming (OPEN UNI) 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS Cr

Language of instruction:

Lectures and learning material are in Finnish. The course can be completed in English by self-studying from a book, completing assignments and exercises on the course learning environment, and delivering a final project.

Timing:

Fall, period 1. There is an option to extend the course to the 2nd period in cases where completing in one period doesn't fit the student's schedule.

Learning outcomes:

1. Is capable of solving problems in the computer's terms

2. Understands the basic concepts of programming

3. Knows the basics of the Python programming language

4. Is able to implement programs independently

5. Is able to use the internet to find information about programming

Contents:

Problem solving with programming, basic concepts of programming, writing Python code.

Mode of delivery:

Web-based teaching + face-to-face teaching

Learning activities and teaching methods:

30h of exercise groups, 105h self-studying in the web.

Target group:

1 st year students of computer science and engineering, electrical engineering, medical and wellness technology and industrial and engineering management, 2nd year students of physics, and other students of the University of Oulu

Prerequisites and co-requisites:

None.

Recommended optional programme components:

The course provides a basis for subsequent programming courses.

Recommended or required reading:

Web material in an online learning environment. Address will be announced at the beginning of the course.

Assessment methods and criteria:

The course is completed by passing all learning assignments, programming exercises and a final exercise project. Read more about assessment criteria at the University of Oulu webpage
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass/fail.

Person responsible:

Mika Oja

Working life cooperation:

-

Other information:

-

A325101: Physics, basic studies, 25 - 40 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Studies in Physics

761108P: Physical world view, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Laura Timonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

761112P Physical world view 3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Autumn

Learning outcomes:

After the course student can see the position of physics in the advancement of scientific world view and technology. The student has a comprehensive view of different learning and studying methods (s)he can use later on.

Contents:

The forming of key concepts in physics, using models and observations in advancing both classical and modern physics. The meaning of applying physics in modern society. Getting to know different areas of physics research.

Mode of delivery:

Multiform teaching

Learning activities and teaching methods:

48 h face-to-face teaching, 85 h independent work including course work and group work

Target group:

Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Feynman, R. The Character of Physical Law, Penguin Books 1992 (or equivalent, there are several prints). The original Massenger Lectures by Richard Fenyman in 1965 (7x55min) can be found online with search "Richard Feynman messenger lectures".

Assessment methods and criteria:

Passed course work or final exam

Grading:

Numerical grading scale 0-5, where 0 = fail

Person responsible:

Laura Timonen

Working life cooperation:

No

Other information:

https://wiki.oulu.fi/display/761112P/

761118P: Mechanics 1, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op
766323A	Mechanics	6.0 op
761323A	Mechanics	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work
- 761118P-01, Lectures and exam (4 cr)
- 761118P-02, Lab. exercises (1 cr)

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton’s laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Both parts (761118P-01 and 761118P-02) will be graded separately. The final grade of the course is the weighted average of the grades of part 1 (4 cr) and part 2 (1 cr).
761118P-01: Three midterm exams or final examination
761118P-02: Two laboratory exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761118P

Compulsory

761118P-01: Mechanics 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P-02	Basic mechanics, lab. exercises	0.0 op
761111P-01	Basic mechanics, lectures and exam	0.0 op
761111P	Basic mechanics	5.0 op
761121P	Physical Measurements I	3.0 op
761101P	Basic Mechanics	4.0 op
761323A	Mechanics	6.0 op
766323A	Mechanics	6.0 op

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course: Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Three small midterm exams or final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

Course website

761118P-02: Mechanics 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P-01	Basic mechanics, lectures and exam	0.0 op
761111P-02	Basic mechanics, lab. exercises	0.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op

761323A Mechanics 6.0 op
766323A Mechanics 6.0 op

Other information:

Course website

761115P: Laboratory Exercises in Physics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P Physical Measurements I 3.0 op
761121P-01 Physical measurements I, exam 0.0 op
761121P-02 Physical measurements I, lab. exercises 0.0 op
800149P Introduction to LateX 2.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Spring

Learning outcomes:

The student can safely make physical measurements, use different measurement tools, read different scales, handle the data, calculate the error estimations and make a sensible report of his laboratopy measurements.

Contents:

The skill to make laboratory measurements is important for physicists. This is an introductory course how to make physical measurements and how to treat the measured data. Laboratory works are made in groups. The laboratory security is an essential part also in physics. Measurements are made with different instruments. As a result the most probable value is determined as well as its error. The skills obtained during this course can be applied in the other laboratory courses Laboratory exercises in physics 2 and 3.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 10 h, exercises 20 h (5 x 4 h). Five different works will be made during the course in groups. Self-study 103 h.

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites.

Recommended optional programme components:

800149P Introduction to LaTex

Recommended or required reading:

Lecture material is in Finnish. Work instructions are available also in English.

Assessment methods and criteria:

Written reports of the experiments and one written examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Compulsory

761115P-01: Laboratory Exercises in Physics 1, lecture and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01	Physical measurements I, exam	0.0 op
761121P-02	Physical measurements I, lab. exercises	0.0 op
761121P	Physical Measurements I	3.0 op

Ei opintojaksokuvauksia.

761115P-02: Laboratory Exercises in Physics 1, laboratory exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01	Physical measurements I, exam	0.0 op
761121P-02	Physical measurements I, lab. exercises	0.0 op
761121P	Physical Measurements I	3.0 op

Ei opintojaksokuvauksia.

761115P-03: Laboratory Exercises in Physics 1, Introduction to LateX, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01	Physical measurements I, exam	0.0 op

761121P-02 Physical measurements I, lab. exercises 0.0 op

761121P Physical Measurements I 3.0 op

800149P Introduction to LateX 2.0 op

Ei opintojaksokuvauksia.

761120P: Laboratory Exercises in Physics 2, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Alanko

Opintokohteen kielet: Finnish

Leikkaavuudet:

766106P Laboratory exercises in physics 2 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1. spring - 3. autumn

Learning outcomes:

After completing the course, the student can rather independently work with the most important measuring instruments used in physics and has experience in planning and conducting different measurements. The student is also able to critically assess her/his own results and report them to a group of peers.

Contents:

The laboratory exercises (1/3 - 1/2 ECTS per exercise) train the student in applying measurements to research into different physical phenomena. The exercises include practising how to plan the measurements, learning how to use the measuring instruments, processing and assessing the results, and drawing up scientific reports. Some of the exercises can be chosen according to the student´s own interest.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Per one exercise, 4 h of measurements in the laboratory and 5-9 h of preparation and drawing up a report independently.

Target group:

No specific target qroup

Prerequisites and co-requisites:

Recommended: 761121P Laboratory exercises in physics 1.

Recommended optional programme components:

Each exercise is closely related to a basic or intermediate course in physics, because the phenomena connected to the measurements and their theory are discussed in the lectures for the courses.

Recommended or required reading:

The exercise work instructions and guidelines for the work report, which can be found on the website of the course.

Assessment methods and criteria:

Adequate familiarization with the phenomenon under scrutiny and the measurements before the exercise (oral or written questions), successfully completing the guided measurements, reporting on the exercise (the work report will be graded). Read more about assessment criteria at the University of Oulu webpage.

Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Seppo Alanko
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/766106P/

761119P: Electromagnetism 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op
761113P	Electricity and magnetism	5.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

Ei opintojaksokuvauksia.

Compulsory

761119P-01: Electromagnetism 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P	Electricity and magnetism	5.0 op
761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

Ei opintojaksokuvauksia.

761119P-02: Electromagnetism 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics

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

761113P Electricity and magnetism 5.0 op
761113P-01 Electricity and magnetism, lectures and exam 0.0 op
761113P-02 Electricity and magnetism, lab. exercises 0.0 op
766319A Electromagnetism 7.0 op
761103P Electricity and Magnetism 4.0 op

Ei opintojaksokuvauksia.

A325102: Physics, intermediate studies, 35 - 60 op

Opiskelumuoto: Intermediate Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory Studies

761312A: Electromagnetism 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Anita Aikio
Opintokohteen kielet: Finnish
Leikkaavuudet:

766319A Electromagnetism 7.0 op

Ei opintojaksokuvauksia.

761309A: Mechanics 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

761313A: Atomic physics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Saana-Maija Aho

Opintokohteen kielet: Finnish

Leikkaavuudet:

766326A Atomic physics 1 6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Second autumn term

Learning outcomes:

Student can explain the development of the atomic model. Student is able to describe some interaction mechanisms of electromagnetic radiation and matter. Student can resolve easy quantum mechanical problems. Student can describe the principles used when the wave functions and energies of some simple systems are determined. Student can take advantage of the periodic table of elements in finding the chemical and physical properties of atoms based on its electronic structure.

Contents:

In the beginning of the course, the historical events which led to the development of the quantum mechanics and the modern atomic model in the early 20th century are discussed. In this context, the interaction processes between matter and electromagnetic radiation, like black-body radiation, the photoelectric effect, and scattering, are examined. In quantum mechanics, particles are usually described with the aid of wave functions. De Broglie wavelength, the group and phase velocities of particles, and Heisenberg uncertainty principle serve as an introduction to the wave properties of particles. The Bohr's atomic model, electronic transitions of atoms, and emission spectra of atoms are also discussed. The first touch to the quantum mechanics is the solutions of wave functions and energies for some simple systems, like hydrogen atom, are described. Additionally, many-electron atoms are discussed briefly. Some modern research methods which are used to study the atomic and molecular physics are introduced. Applications which exploit the atom physical phenomena in everyday life are also discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 7, self-study 80 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Books: A. Beiser: Concepts of Modern Physics, McGraw-Hill Inc

Assessment methods and criteria:

Group excercises, lectures, webexcercises or one final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Saana-Maija Huttula

Working life cooperation:

No work placement period

Other information:

Lectured for the first time in autumn 2018, period 1. Replaces the course 766326A Atomic physics 1, 6 ECTS cr.

761310A: Wave motion and optics, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Alanko

Opintokohteen kielet: Finnish

Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish. The course material and exercises are available in English.

Timing:

First spring

Learning outcomes:

The student is able to treat different types of waves by methods of general theory of wave motion. The student is also able to solve problems related to basic optics and apply her/his knowledge to teaching and research in physics.

Contents:

General principles of wave motion, sound, electromagnetic waves, propagation of light, image formation in mirrors and lenses, optical instruments, interference, Fraunhofer diffraction, diffraction grating, laser principles.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, 2 laboratory exercises (3 hours/exercise), self-study 90 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

Basic skills in mathematics

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

H. D. Young and R. A. Freedman, University Physics, Addison-Wesley, 2000 ja 2004, F. L. Pedrotti ja L. S. Pedrotti, Introduction to optics, Prentice-Hall, 2. ed., 1993 ja E. Hecht, Optics, (3rd ed.), Addison Wesley Longman, 1998.

Assessment methods and criteria:

Two written intermediate examinations or one final examination

Grading:
Numerical grading scale 0 – 5, where 0 is fail
Person responsible:
Seppo Alanko
Working life cooperation:
No work placement period

Compulsory

761310A-01: Wave motion and optics, lectures and exam, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

Ei opintojaksokuvauksia.

761310A-02: Wave motion and optics, lab. exercises, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

Ei opintojaksokuvauksia.

766344A: Nuclear and particle physics, 5 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766330A-01	Structure of matter, part 1: Solid state physics	0.0 op
766330A-02	Structure of matter, part 2: Nuclear and particle physics	0.0 op
766334A	Structure of matter II	2.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

The student knows the structure and key properties of atomic nuclei, the most important ways in which the nuclei undergo radioactive decay, and is familiar with some technological applications based on nuclear properties and radioactivity. The student can explain fission and fusion reactions.
The student knows the key varieties of subatomic particles, their properties and interactions. The student can explain main principles of particle accelerators and detectors, and how they are used in research.

Contents:

This course deals with the structure and properties of nuclei, nuclear forces, nuclear models, radioactivity, nuclear reactions, properties and interactions of fundamental particles, and unified theories of fundamental interactions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 8 exercises (16 h), self-study 87 h

Target group:

Primarily for the students of the degree programme in physics.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics 1 (766326A), Electromagnetism (766319A). An important supporting course is Thermophysics (766328A/766348A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Textbooks: H. D. Young and R. A. Freedman: University Physics, 13th edition, Pearson Addison-Wesley, 2012, or earlier editions (in part), R. Eisberg and R. Resnick: Quantum physics of atoms, molecules, solids, nuclei, and particles, John Wiley & Sons (in part). Additional material available from the web pages of the course.
Course material availability can be checked here.

Assessment methods and criteria:

Final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Minna Patanen

Working life cooperation:

No work placement period

Other information:

Course website

763343A: Solid state physics, 5 op

Voimassaolo: 01.12.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766330A	Structure of matter	6.0 op
766330A-02	Structure of matter, part 2: Nuclear and particle physics	0.0 op
766330A-01	Structure of matter, part 1: Solid state physics	0.0 op
763333A	Structure of matter I	4.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

To learn to explain the basics of solid state physics such as lattice structure, binding interactions, lattice vibrations, band structure and its effect on conductivity, conductivity of semiconductors, the interaction between light and matter, magnetism and superconductivity, and to apply these to different materials.

Contents:

The rapid development of technology is largely based on understanding the properties of the solid state. There are many interesting phenomena in solid state physics, which are consequences of very large number of particles and their interactions. The course starts with symmetry of crystal lattices and their experimental determination. Different binding forces of solids are discussed. Lattice vibrations and their contribution to specific heat are studied. Especial emphasis is put on electronic structure, and it is used to explain the electric conduction in metals, insulators and semiconductors. Also experimental methods, magnetism and superconductivity are discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, exercises 16 h, self-study 87 h

Target group:

Primarily for the students of the degree programme in physics.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics 1 (766326A), Electromagnetism (766319A). An important supporting course is Thermophysics (766322A/766348A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

E. Thuneberg: Kiinteä aineen fysiikka (lecture notes), C. Kittel: Introduction to solid state physics.

Assessment methods and criteria:

Examination

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Erkki Thuneberg

Working life cooperation:

No work placement period

Other information:

https://noppa.oulu.fi/noppa/kurssi/763343a/

761314A: Thermophysics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Perttu Lantto
Opintokohteen kielet: Finnish
Leikkaavuudet:

766348A	Thermophysics	7.0 op
766328A	Thermophysics	6.0 op
761328A	Thermophysics	4.0 op

Ei opintojaksokuvauksia.

766384A: B.Sc. seminar, 4 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761385A-01	B.Sc. thesis	0.0 op
761385A-02	Seminar	0.0 op

ECTS Credits:

4 ECTS cr

Language of instruction:

Finnish

Timing:

3rd autumn

Learning outcomes:

The student is familiar with the special requirements of a scientific text and is aware of physics' common practices in scientific writing. The student has the basic knowledge of scientific writing enabling the student to write her/his B.Sc. thesis under a supervision. The student learns important scientific communication skills necessary in scientific research in physics.

Contents:

Both written and oral reporting is essential part of the scientific research. During the course, the students participate in the seminars, act as opponents and present a seminar talk. The course gives basic knowledge of scientific writing so that the student can start to write her/his B. Sc. thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 10 h, seminar talk, act as an opponent (ca 20 h), self-study 77 h

Target group:

Compulsory for Bachelor of Science in physics. In seminars 80 % obligatory attendance.

Prerequisites and co-requisites:

Introduction to information retrieval (030005P).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Material available from the web pages of the course.

Assessment methods and criteria:

Students have to attend the lectures (ca. 80 %) and be an opponent for two seminar talks. Students have to give a seminar talk, which is graded (0-5). Possible homework.

Grading:

Numerical grading scale 0 – 5, where 0 = fail.

Person responsible:

Marko Huttula

Working life cooperation:

No work placement period

Other information:

Course website

766385A: B.Sc. thesis, 6 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761385A-02	Seminar	0.0 op
761385A-01	B.Sc. thesis	0.0 op

ECTS Credits:

6 credits

Language of instruction:

Finnish or English

Timing:

3rd year

Learning outcomes:

The student can carry out research work, search information and write scientific reports about the subject.

Contents:

Both written and oral reporting is essential part of the scientific research. In the course, the students write a candidate thesis. The candidate thesis is about 20 pages. Thesis is written about subject given by and under supervision of a senior researcher.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Self-study 160 h.

Target group:

Compulsory for Bachelor of Science in physics.

Prerequisites and co-requisites:

Introduction to information retrieval (030005P).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Material available from the web pages of the course.

Assessment methods and criteria:

B.Sc. thesis

Grading:

Numerical grading scale 0 – 5, where 0 = fail.

Person responsible:

Marko Huttula

Working life cooperation:

No work placement period

Other information:

Course website ???

761386A: Maturity test, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A325104: Physics Minor, 15 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

General Studies in Physics

761108P: Physical world view, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Laura Timonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

761112P Physical world view 3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Autumn

Learning outcomes:

After the course student can see the position of physics in the advancement of scientific world view and technology. The student has a comprehensive view of different learning and studying methods (s)he can use later on.

Contents:

The forming of key concepts in physics, using models and observations in advancing both classical and modern physics. The meaning of applying physics in modern society. Getting to know different areas of physics research.

Mode of delivery:

Multiform teaching

Learning activities and teaching methods:

48 h face-to-face teaching, 85 h independent work including course work and group work

Target group:

Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Feynman, R. The Character of Physical Law, Penguin Books 1992 (or equivalent, there are several prints). The original Massenger Lectures by Richard Fenyman in 1965 (7x55min) can be found online with search "Richard Feynman messenger lectures".

Assessment methods and criteria:

Passed course work or final exam

Grading:

Numerical grading scale 0-5, where 0 = fail

Person responsible:

Laura Timonen

Working life cooperation:

No

Other information:

https://wiki.oulu.fi/display/761112P/

761118P: Mechanics 1, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op
766323A	Mechanics	6.0 op
761323A	Mechanics	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work
- 761118P-01, Lectures and exam (4 cr)
- 761118P-02, Lab. exercises (1 cr)

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton’s laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Both parts (761118P-01 and 761118P-02) will be graded separately. The final grade of the course is the weighted average of the grades of part 1 (4 cr) and part 2 (1 cr).
761118P-01: Three midterm exams or final examination
761118P-02: Two laboratory exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761118P

Compulsory

761118P-01: Mechanics 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Basic Studies

Laji: Partial credit

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P-02	Basic mechanics, lab. exercises	0.0 op
761111P-01	Basic mechanics, lectures and exam	0.0 op
761111P	Basic mechanics	5.0 op
761121P	Physical Measurements I	3.0 op
761101P	Basic Mechanics	4.0 op
761323A	Mechanics	6.0 op
766323A	Mechanics	6.0 op

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton’s laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course: Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Three small midterm exams or final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

Course website

761118P-02: Mechanics 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P-01	Basic mechanics, lectures and exam	0.0 op
761111P-02	Basic mechanics, lab. exercises	0.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op
761323A	Mechanics	6.0 op
766323A	Mechanics	6.0 op

Other information:

Course website

761115P: Laboratory Exercises in Physics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P	Physical Measurements I	3.0 op

761121P-01 Physical measurements I, exam 0.0 op

761121P-02 Physical measurements I, lab. exercises 0.0 op

800149P Introduction to LateX 2.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Spring

Learning outcomes:

The student can safely make physical measurements, use different measurement tools, read different scales, handle the data, calculate the error estimations and make a sensible report of his laboratopy measurements.

Contents:

The skill to make laboratory measurements is important for physicists. This is an introductory course how to make physical measurements and how to treat the measured data. Laboratory works are made in groups. The laboratory security is an essential part also in physics. Measurements are made with different instruments. As a result the most probable value is determined as well as its error. The skills obtained during this course can be applied in the other laboratory courses Laboratory exercises in physics 2 and 3.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 10 h, exercises 20 h (5 x 4 h). Five different works will be made during the course in groups. Self-study 103 h.

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites.

Recommended optional programme components:

800149P Introduction to LaTex

Recommended or required reading:

Lecture material is in Finnish. Work instructions are available also in English.

Assessment methods and criteria:

Written reports of the experiments and one written examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Compulsory

761115P-01: Laboratory Exercises in Physics 1, lecture and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01 Physical measurements I, exam 0.0 op
761121P-02 Physical measurements I, lab. exercises 0.0 op
761121P Physical Measurements I 3.0 op

Ei opintojaksokuvauksia.

761115P-02: Laboratory Exercises in Physics 1, laboratory exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01 Physical measurements I, exam 0.0 op
761121P-02 Physical measurements I, lab. exercises 0.0 op
761121P Physical Measurements I 3.0 op

Ei opintojaksokuvauksia.

761115P-03: Laboratory Exercises in Physics 1, Introduction to LateX, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01 Physical measurements I, exam 0.0 op
761121P-02 Physical measurements I, lab. exercises 0.0 op
761121P Physical Measurements I 3.0 op
800149P Introduction to LateX 2.0 op

Ei opintojaksokuvauksia.

Optional studies in Physics. When you complete 25 ECTS cr from the physics. Choose the 2 courses below. (60 ECTS cr of minor subject are all selected below)

761119P: Electromagnetism 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Leikkaavuudet:

761113P-01 Electricity and magnetism, lectures and exam 0.0 op
761113P-02 Electricity and magnetism, lab. exercises 0.0 op
761113P Electricity and magnetism 5.0 op
766319A Electromagnetism 7.0 op
761103P Electricity and Magnetism 4.0 op

Ei opintojaksokuvauksia.

Compulsory

761119P-01: Electromagnetism 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P Electricity and magnetism 5.0 op
761113P-01 Electricity and magnetism, lectures and exam 0.0 op
761113P-02 Electricity and magnetism, lab. exercises 0.0 op
766319A Electromagnetism 7.0 op
761103P Electricity and Magnetism 4.0 op

Ei opintojaksokuvauksia.

761119P-02: Electromagnetism 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P Electricity and magnetism 5.0 op
761113P-01 Electricity and magnetism, lectures and exam 0.0 op
761113P-02 Electricity and magnetism, lab. exercises 0.0 op
766319A Electromagnetism 7.0 op
761103P Electricity and Magnetism 4.0 op

Ei opintojaksokuvauksia.

761313A: Atomic physics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail

Opettajat: Saana-Maija Aho

Opintokohteen kielet: Finnish

Leikkaavuudet:

766326A Atomic physics 1 6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Second autumn term

Learning outcomes:

Student can explain the development of the atomic model. Student is able to describe some interaction mechanisms of electromagnetic radiation and matter. Student can resolve easy quantum mechanical problems. Student can describe the principles used when the wave functions and energies of some simple systems are determined. Student can take advantage of the periodic table of elements in finding the chemical and physical properties of atoms based on its electronic structure.

Contents:

In the beginning of the course, the historical events which led to the development of the quantum mechanics and the modern atomic model in the early 20th century are discussed. In this context, the interaction processes between matter and electromagnetic radiation, like black-body radiation, the photoelectric effect, and scattering, are examined. In quantum mechanics, particles are usually described with the aid of wave functions. De Broglie wavelength, the group and phase velocities of particles, and Heisenberg uncertainty principle serve as an introduction to the wave properties of particles. The Bohr's atomic model, electronic transitions of atoms, and emission spectra of atoms are also discussed. The first touch to the quantum mechanics is the solutions of wave functions and energies for some simple systems, like hydrogen atom, are described. Additionally, many-electron atoms are discussed briefly. Some modern research methods which are used to study the atomic and molecular physics are introduced. Applications which exploit the atom physical phenomena in everyday life are also discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 7, self-study 80 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Books: A. Beiser: Concepts of Modern Physics, McGraw-Hill Inc

Assessment methods and criteria:

Group excercises, lectures, webexcercises or one final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Saana-Maija Huttula

Working life cooperation:

No work placement period

Other information:

Lectured for the first time in autumn 2018, period 1. Replaces the course 766326A Atomic physics 1, 6 ECTS cr.

761314A: Thermophysics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Perttu Lantto
Opintokohteen kielet: Finnish
Leikkaavuudet:

766348A	Thermophysics	7.0 op
766328A	Thermophysics	6.0 op
761328A	Thermophysics	4.0 op

Ei opintojaksokuvauksia.

761310A: Wave motion and optics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish. The course material and exercises are available in English.

Timing:

First spring

Learning outcomes:

The student is able to treat different types of waves by methods of general theory of wave motion. The student is also able to solve problems related to basic optics and apply her/his knowledge to teaching and research in physics.

Contents:

General principles of wave motion, sound, electromagnetic waves, propagation of light, image formation in mirrors and lenses, optical instruments, interference, Fraunhofer diffraction, diffraction grating, laser principles.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, 2 laboratory exercises (3 hours/exercise), self-study 90 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

Basic skills in mathematics

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

H. D. Young and R. A. Freedman, University Physics, Addison-Wesley, 2000 ja 2004, F. L. Pedrotti ja L. S. Pedrotti, Introduction to optics, Prentice-Hall, 2. ed., 1993 ja E. Hecht, Optics, (3rd ed.), Addison Wesley Longman, 1998.

Assessment methods and criteria:

Two written intermediate examinations or one final examination

Grading:

Numerical grading scale 0 – 5, where 0 is fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Compulsory

761310A-01: Wave motion and optics, lectures and exam, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

Ei opintojaksokuvauksia.

761310A-02: Wave motion and optics, lab. exercises, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op

761114P Wave motion and optics 5.0 op
761114P-01 Wave motion and optics, lectures and exam 0.0 op
761114P-02 Wave motion and optics, lab. exercises 0.0 op
766329A Wave motion and optics 6.0 op
761104P Wave Motion 3.0 op

Ei opintojaksokuvauksia.

If you want to complete 60 ECTS cr in physics. Choose all the courses below

761309A: Mechanics 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

761120P: Laboratory Exercises in Physics 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766106P Laboratory exercises in physics 2 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1. spring - 3. autumn

Learning outcomes:

After completing the course, the student can rather independently work with the most important measuring instruments used in physics and has experience in planning and conducting different measurements. The student is also able to critically assess her/his own results and report them to a group of peers.

Contents:

The laboratory exercises (1/3 - 1/2 ECTS per exercise) train the student in applying measurements to research into different physical phenomena. The exercises include practising how to plan the measurements, learning how to use the measuring instruments, processing and assessing the results, and drawing up scientific reports. Some of the exercises can be chosen according to the student´s own interest.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Per one exercise, 4 h of measurements in the laboratory and 5-9 h of preparation and drawing up a report independently.

Target group:

No specific target qroup

Prerequisites and co-requisites:

Recommended: 761121P Laboratory exercises in physics 1.

Recommended optional programme components:

Each exercise is closely related to a basic or intermediate course in physics, because the phenomena connected to the measurements and their theory are discussed in the lectures for the courses.

Recommended or required reading:

The exercise work instructions and guidelines for the work report, which can be found on the website of the course.

Assessment methods and criteria:

Adequate familiarization with the phenomenon under scrutiny and the measurements before the exercise (oral or written questions), successfully completing the guided measurements, reporting on the exercise (the work report will be graded). Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/766106P/

761312A: Electromagnetism 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Anita Aikio
Opintokohteen kielet: Finnish
Leikkaavuudet:

766319A	Electromagnetism	7.0 op

Ei opintojaksokuvauksia.

766344A: Nuclear and particle physics, 5 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766330A-01	Structure of matter, part 1: Solid state physics	0.0 op
766330A-02	Structure of matter, part 2: Nuclear and particle physics	0.0 op
766334A	Structure of matter II	2.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

The student knows the structure and key properties of atomic nuclei, the most important ways in which the nuclei undergo radioactive decay, and is familiar with some technological applications based on nuclear properties and radioactivity. The student can explain fission and fusion reactions.
The student knows the key varieties of subatomic particles, their properties and interactions. The student can explain main principles of particle accelerators and detectors, and how they are used in research.

Contents:

This course deals with the structure and properties of nuclei, nuclear forces, nuclear models, radioactivity, nuclear reactions, properties and interactions of fundamental particles, and unified theories of fundamental interactions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 8 exercises (16 h), self-study 87 h

Target group:

Primarily for the students of the degree programme in physics.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics 1 (766326A), Electromagnetism (766319A). An important supporting course is Thermophysics (766328A/766348A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Textbooks: H. D. Young and R. A. Freedman: University Physics, 13th edition, Pearson Addison-Wesley, 2012, or earlier editions (in part), R. Eisberg and R. Resnick: Quantum physics of atoms, molecules, solids, nuclei, and particles, John Wiley & Sons (in part). Additional material available from the web pages of the course.
Course material availability can be checked here.

Assessment methods and criteria:

Final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Minna Patanen

Working life cooperation:

No work placement period

Other information:

Course website

763343A: Solid state physics, 5 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766330A Structure of matter 6.0 op
766330A-02 Structure of matter, part 2: Nuclear and particle physics 0.0 op
766330A-01 Structure of matter, part 1: Solid state physics 0.0 op
763333A Structure of matter I 4.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

To learn to explain the basics of solid state physics such as lattice structure, binding interactions, lattice vibrations, band structure and its effect on conductivity, conductivity of semiconductors, the interaction between light and matter, magnetism and superconductivity, and to apply these to different materials.

Contents:

The rapid development of technology is largely based on understanding the properties of the solid state. There are many interesting phenomena in solid state physics, which are consequences of very large number of particles and their interactions. The course starts with symmetry of crystal lattices and their experimental determination. Different binding forces of solids are discussed. Lattice vibrations and their contribution to specific heat are studied. Especial emphasis is put on electronic structure, and it is used to explain the electric conduction in metals, insulators and semiconductors. Also experimental methods, magnetism and superconductivity are discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, exercises 16 h, self-study 87 h

Target group:

Primarily for the students of the degree programme in physics.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics 1 (766326A), Electromagnetism (766319A). An important supporting course is Thermophysics (766322A/766348A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

E. Thuneberg: Kiinteä aineen fysiikka (lecture notes), C. Kittel: Introduction to solid state physics.

Assessment methods and criteria:

Examination

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Erkki Thuneberg

Working life cooperation:

No work placement period

Other information:

https://noppa.oulu.fi/noppa/kurssi/763343a/

A325001: Mathematics, basic studies, 25 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory Studies

802151P: Introduction to mathematical deduction, 5 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay802151P	Introduction to mathematical deduction (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS cr

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 techniquesis
- able to use basic set theoretic concepts and definitionsis
- able to define and apply basic definitions related to functions

Contents:

The course in an introduction to mathematical deduction and introduces different types of proof techniques. The course covers the concepts familiar from upper secondary school studies more profound way. Main concepts in this course are basic set theory and functions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h

Target group:

Major and minor students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/Fail

Person responsible:

Marko Leinonen

Working life cooperation:

-

800119P: Functions and limit, 5 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Salmi
Opintokohteen kielet: Finnish
Leikkaavuudet:

802162P	Continuity and Limit	5.0 op
802155P	Continuity and limit	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year, 1st period

Learning outcomes:

Upon completing the course the student is
- able to apply the triangle inequality and make approximations
- able to manipulate elementary functions such as polynomials and trigonometric functions
- able to define the limit of a sequence and the limit of a function as well as apply these definitions
- able to apply different techniques to determine limits.

Contents:

The course concerns real-valued functions of one variable. In particular elementary functions are defined and the monotonicity of functions is studied. The notion of absolute value is reviewed and applied to approximation. Also the triangle inequality is used in approximation. The central concept is the limit of a function, which is introduced via the limit of a sequence. The aim of the course is to improve deductive skills as well as computational skills.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Introduction to mathematical deduction 802151P is recommended to be taken simultaneously (or earlier).

Recommended optional programme components:

-

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam, exercises

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Other information:

Replaces the course 802161P Introduction to real functions.

802120P: Introduction to Matrices, 5 op

Voimassaolo: 01.06.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

802118P Linear Algebra I 4.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

1. year, 4. periodi

Learning outcomes:

After completing the course the student is able to
- apply arithmetic operations of matrices
- solve system of linear equations by matrix methods
- study linear depence and linear indepence of vectors
- recognize the subspace of R^n and understands the concepts of basis and dimension of a vector space
- analyse matrices by the parameters and the vectors.

Contents:

Vectors and matrices, Systems of linear equations, determinant of a matrix, subspaces of R^n, linear depence and linear indepence of vectors, base, dimension, eigenvalues and eigenvectors of a matrix, diagonalization.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, Exercises 14 h

Target group:

Major and minor studies

Prerequisites and co-requisites:

802151P Introduction to Mathematical Deduction

Recommended or required reading:

Lecture notes

Grossman, S.I. : Elementary Linear Algebra, David C. Lay: Linear Algebra and Its Applications.

Assessment methods and criteria:

Final exam

Grading:

Fail, 1-5

Person responsible:

Marko Leinonen

Working life cooperation:

-

806113P: Introduction to Statistics, 5 op

Voimassaolo: 01.01.2011 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Hanna Heikkinen
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 ECTS cr

Language of instruction:

Finnish

Timing:

4th period. 1st or 2nd year of studies.

Learning outcomes:

Upon completion of the course, student will be
- able to identify and define the main principles of statistical research, collection of the data and analysis
- able to apply basic methods of descriptive statistics and statistical inference in simple quantitative research using a statistical software
- able to critically evaluate results of the statistical research presented in media
- prepared for teaching statistics in secondary school and high school
- prepared for participating in a group.

Contents:

- the nature and the meaning of statistics
- data and the acquisition of them: observations, variables, measuring and designs of a study
- the descriptive statistics of empirical distributions: tables, graphical presentations and descriptive measures of center, variation and dependence
- the most important probability distributions
- the principles and the basic methods of statistical inference: random sample, sample statistics, point estimation, confidence intervals and statistical testing of hypotheses.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 16 h (partly compulsory) / instructed group work (28 h) / independent work 80 h. Group works will be returned. Additional independently implemented learning diary tasks. Independent work contains also preparation for group work and peer assessment.

Target group:

Students of mathematics and physics and other interested students.

Prerequisites and co-requisites:

The recommended prerequisite prior to enrolling for the course is the completion of the courses: 802151P Introduction to mathematical deduction and 800119P Functions and limit.

Recommended optional programme components:

After the course, student is able to continue other statistics courses.

Recommended or required reading:

Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. Practical works and learning diaries are assessed weekly. In addition web tests. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria is available in the beginning of the course. In addition one compulsory lecture and peer assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Hanna Heikkinen

Working life cooperation:

No

801195P: Probability Theory, 5 op

Voimassaolo: 01.01.2011 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

2nd year, 2nd period.

Learning outcomes:

Upon completing the 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. In the beginning high school level probability is reviewed and after that axiomatic treatment of the theory starts. The central concepts discussed include probability space, conditional probability, independence, and random variable together with its distribution and expected value.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h of lectures, 14 h of exercises, 91 h of independent study

Target group:

Mathematics majors and minors

Prerequisites and co-requisites:

Integral 800318A

Recommended optional programme components:

-

Recommended or required reading:

Lectures.
Text book: Pekka Tuominen, "Todennäköisyyslaskenta I", Limes ry, Helsinki.

Assessment methods and criteria:

Final exam and small tests.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Hanna Heikkinen

Working life cooperation:

-

A325002: Mathematics, intermediate studies, 35 op

Opiskelumuoto: Intermediate Studies
Laji: Study module
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory Studies

800317A: Continuity and derivative, 5 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Salmi
Opintokohteen kielet: Finnish
Leikkaavuudet:

802163P	Derivative	5.0 op
802156P	Derivative	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year, 2nd period

Learning outcomes:

Upon completing the course the student is
- able to define the concept of continuous function and apply this definition in examples and deductions
- able to determine derivatives of functions
- able to apply derivative to study functions
- able to appy the concepts of continuity and derivative in various problems, including deductions

Contents:

The course concerns continuity and derivative of real-valued functions of one variable. The central topics are the intermediate value theorem, the chain rule, the derivative of inverse functions, the mean value theorem and its applications. Differential calculus is also applied to various problems. The aim of the course is to improve mathematical thinking as well as computational skills.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Functions and limit 800119P, Introduction to mathematical deduction 802151P

Recommended optional programme components:

-

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam, exercises

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

no

Other information:

Replaces the course 802163P Derivative.

800318A: Integral, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Ville Suomala

Opintokohteen kielet: Finnish

Leikkaavuudet:

802164P	Series and Integral	5.0 op
802353A	Series and Integrals	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year 3rd period

Learning outcomes:

After completing the course, the student
- understands the connection between derivative and extremal values
- manages the basics of integration theory
- understands the connection and differences between definite and indefinite integral
- is able to understand the connetcion between the integral and the derivative

Contents:

Higher order derivatives, extremal values, Taylor polynomials, Riemann integral, The fundamental theorem of Calculus, Eksponent function and logarithm, integration by parts, integration by substitution, imporper integral

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, independent work

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Functions and limit, Continuity and derivative

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Ville Suomala

Working life cooperation:

no

Other information:

Replaces the course 802164P Series and integral.

800328A: Calculus of several variables, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Salmi
Opintokohteen kielet: Finnish
Leikkaavuudet:

802351A	Vector Calculus	5.0 op
800322A	Multidimensional analysis	8.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd year, 1st period

Learning outcomes:

After completing the course the student is able to:
- operate functions of several variables
- apply derivates of functions of several variables
- calculate multiple integrals

Contents:

The course concerns calculus of severable variables. The central concepts of the course are partial derivative, gradient, divergence, curl and multiple integral. Integral theorems related to functions of several variables are also presented. In addition power series are introduced. The course offers basic tools for applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h study a part of which may be guided

Target group:

Mathematics and physics major and minor students

Prerequisites and co-requisites:

Continuity and derivative 800317A, Integral 800318A, Introduction to matrices 802120P

Assessment methods and criteria:

Final exam

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Other information:

Replaces the course 802351A Vector calculus

802320A: Linear Algebra, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

802119P	Linear Algebra II	5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish and English

Timing:

2nd year, 2nd period

Learning outcomes:

On successful completion of this course, the student will be able to
- apply the definition of linear space and concepts associated with linear spaces such as basis
- work with linear mappings and their matrix representations
- apply the definition of inner product space and concepts associated with inner product spaces such as orthogonality
- prove results related to linear spaces

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 and concepts associated with linear mappings such as kernel, eigenvalues and eigenvectors.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

Mathematics majors and minors students

Prerequisites and co-requisites:

802120P Introduction to Matrices

Recommended optional programme components:

-

Recommended or required reading:

http://cc.oulu.fi/~tma/OPETUS.html

Assessment methods and criteria:

Final exam

Grading:

1-5, fail

Person responsible:

Tapani Matala-aho

Working life cooperation:

No

Other information:

-

802354A: Basics in Algebra, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
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 cr

Language of instruction:

Finnish

Timing:

1. year, 3. period

Learning outcomes:

After completing the course, student is able to

- derive and proof main results in the course
- use and apply different proof techniques
- recognize algebraic structures and the concepts
- see connections and differences between different algebraic structures

Contents:

The course includes basics in arithmetics and algebraic structures, such as, congruence, residue classes, prime numbres, Euclidean algorithm, the fundamental theorem of arithmetic, Euler-Fermat formula, groups and morphisms. The course gives an understanding of algebraic terms and concepts used in mathematics and physics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises

Target group:

Major and minor students

Prerequisites and co-requisites:

802151P Introduction to mathematical deduction

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Kari Myllylä

Working life cooperation:

-

802357A: Euclidean Spaces, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Ville Suomala
Opintokohteen kielet: Finnish
Leikkaavuudet:

802352A Euclidean Topology 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

2nd year 4t period

Learning outcomes:

After passing the course the student
- will be able to define basic topological concepts
- will be able to handle sequences
- will be able to justify basic properties of continuous vector valued functions

Contents:

Sequences, continuity and limit of a vector valued function, basic topological concepts

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

28 hours of lectures, 14 hours of excercises, independent work

Target group:

Major and minor students

Prerequisites and co-requisites:

Functions and limits, Continuity and derivative, Introduction to Matrices

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

Fail, 1-5

Person responsible:

Ville Suomala

Working life cooperation:

No

Other information:

-

800331A: Proseminar, 10 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish
Leikkaavuudet:

801323A Seminar 6.0 op

ECTS Credits:

10 ECTS credits / 266 hours of work

Language of instruction:

Finnish

Timing:

2nd and 3rd year

Learning outcomes:

After completing the Bachelor's thesis:
1) student is able to form a clear and logical
2) student is able to concentrate to important and essential details in the subject of thesis
3) student gain experience presenting mathematical concept and research studies

Contents:

Proseminar (Bachelor's thesis) is a small mathematical study based on literature. Student is familiarized to write mathematical texts and obtain information using literature. Thesis includes a oral presentation from the subject of the thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Seminars and own work

Target group:

Major students

Prerequisites and co-requisites:

Compulsory basic and intermediate studies

Recommended optional programme components:

Maturity test is written from the topic of Bachelor's thesis

Assessment methods and criteria:

Bachelor's thesis

Grading:

Pass/Fail

Person responsible:

Kari Myllylä

800300A: Maturity test, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A325004: Mathematics Minor, 25 - 120 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ayA325004 Mathematics Minor (OPEN UNI) 25.0 op

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

General Studies in Mathematics (min 45 ECTS cr)

802151P: Introduction to mathematical deduction, 5 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay802151P Introduction to mathematical deduction (OPEN UNI) 5.0 op

ECTS Credits:

5 ECTS cr

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 techniquesis
- able to use basic set theoretic concepts and definitionsis
- able to define and apply basic definitions related to functions

Contents:

The course in an introduction to mathematical deduction and introduces different types of proof techniques. The course covers the concepts familiar from upper secondary school studies more profound way. Main concepts in this course are basic set theory and functions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h

Target group:

Major and minor students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/Fail

Person responsible:

Marko Leinonen

Working life cooperation:

-

800119P: Functions and limit, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Salmi

Opintokohteen kielet: Finnish

Leikkaavuudet:

802162P	Continuity and Limit	5.0 op
802155P	Continuity and limit	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year, 1st period

Learning outcomes:

Upon completing the course the student is
- able to apply the triangle inequality and make approximations
- able to manipulate elementary functions such as polynomials and trigonometric functions
- able to define the limit of a sequence and the limit of a function as well as apply these definitions
- able to apply different techniques to determine limits.

Contents:

The course concerns real-valued functions of one variable. In particular elementary functions are defined and the monotonicity of functions is studied. The notion of absolute value is reviewed and applied to approximation. Also the triangle inequality is used in approximation. The central concept is the limit of a function, which is introduced via the limit of a sequence. The aim of the course is to improve deductive skills as well as computational skills.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Introduction to mathematical deduction 802151P is recommended to be taken simultaneously (or earlier).

Recommended optional programme components:

-

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam, exercises

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Other information:

Replaces the course 802161P Introduction to real functions.

800317A: Continuity and derivative, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Salmi

Opintokohteen kielet: Finnish

Leikkaavuudet:

802163P	Derivative	5.0 op
802156P	Derivative	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year, 2nd period

Learning outcomes:

Upon completing the course the student is
- able to define the concept of continuous function and apply this definition in examples and deductions
- able to determine derivatives of functions
- able to apply derivative to study functions
- able to appy the concepts of continuity and derivative in various problems, including deductions

Contents:

The course concerns continuity and derivative of real-valued functions of one variable. The central topics are the intermediate value theorem, the chain rule, the derivative of inverse functions, the mean value theorem and its applications. Differential calculus is also applied to various problems. The aim of the course is to improve mathematical thinking as well as computational skills.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Functions and limit 800119P, Introduction to mathematical deduction 802151P

Recommended optional programme components:

-

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam, exercises

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

no

Other information:

Replaces the course 802163P Derivative.

800318A: Integral, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Ville Suomala

Opintokohteen kielet: Finnish

Leikkaavuudet:

802164P	Series and Integral	5.0 op
802353A	Series and Integrals	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year 3rd period

Learning outcomes:

After completing the course, the student
- understands the connection between derivative and extremal values
- manages the basics of integration theory
- understands the connection and differences between definite and indefinite integral
- is able to understand the connetcion between the integral and the derivative

Contents:

Higher order derivatives, extremal values, Taylor polynomials, Riemann integral, The fundamental theorem of Calculus, Eksponent function and logarithm, integration by parts, integration by substitution, imporper integral

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, independent work

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Functions and limit, Continuity and derivative

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Ville Suomala

Working life cooperation:

no

Other information:

Replaces the course 802164P Series and integral.

802120P: Introduction to Matrices, 5 op

Voimassaolo: 01.06.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

802118P Linear Algebra I 4.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

1. year, 4. periodi

Learning outcomes:

After completing the course the student is able to
- apply arithmetic operations of matrices
- solve system of linear equations by matrix methods
- study linear depence and linear indepence of vectors
- recognize the subspace of R^n and understands the concepts of basis and dimension of a vector space
- analyse matrices by the parameters and the vectors.

Contents:

Vectors and matrices, Systems of linear equations, determinant of a matrix, subspaces of R^n, linear depence and linear indepence of vectors, base, dimension, eigenvalues and eigenvectors of a matrix, diagonalization.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, Exercises 14 h

Target group:

Major and minor studies

Prerequisites and co-requisites:

802151P Introduction to Mathematical Deduction

Recommended or required reading:

Lecture notes
Grossman, S.I. : Elementary Linear Algebra, David C. Lay: Linear Algebra and Its Applications.

Assessment methods and criteria:

Final exam

Grading:

Fail, 1-5

Person responsible:

Marko Leinonen

Working life cooperation:

-

800328A: Calculus of several variables, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Salmi
Opintokohteen kielet: Finnish
Leikkaavuudet:

802351A	Vector Calculus	5.0 op
800322A	Multidimensional analysis	8.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd year, 1st period

Learning outcomes:

After completing the course the student is able to:
- operate functions of several variables
- apply derivates of functions of several variables
- calculate multiple integrals

Contents:

The course concerns calculus of severable variables. The central concepts of the course are partial derivative, gradient, divergence, curl and multiple integral. Integral theorems related to functions of several variables are also presented. In addition power series are introduced. The course offers basic tools for applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h study a part of which may be guided

Target group:

Mathematics and physics major and minor students

Prerequisites and co-requisites:

Continuity and derivative 800317A, Integral 800318A, Introduction to matrices 802120P

Assessment methods and criteria:

Final exam

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Other information:

Replaces the course 802351A Vector calculus

802320A: Linear Algebra, 5 op

Voimassaolo: 01.06.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

802119P Linear Algebra II 5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish and English

Timing:

2nd year, 2nd period

Learning outcomes:

On successful completion of this course, the student will be able to
- apply the definition of linear space and concepts associated with linear spaces such as basis
- work with linear mappings and their matrix representations
- apply the definition of inner product space and concepts associated with inner product spaces such as orthogonality
- prove results related to linear spaces

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 and concepts associated with linear mappings such as kernel, eigenvalues and eigenvectors.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

Mathematics majors and minors students

Prerequisites and co-requisites:

802120P Introduction to Matrices

Recommended optional programme components:

-

Recommended or required reading:

http://cc.oulu.fi/~tma/OPETUS.html

Assessment methods and criteria:

Final exam

Grading:

1-5, fail

Person responsible:

Tapani Matala-aho

Working life cooperation:

No

Other information:

-

806113P: Introduction to Statistics, 5 op

Voimassaolo: 01.01.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Hanna Heikkinen

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 ECTS cr

Language of instruction:

Finnish

Timing:

4th period. 1st or 2nd year of studies.

Learning outcomes:

Upon completion of the course, student will be
- able to identify and define the main principles of statistical research, collection of the data and analysis
- able to apply basic methods of descriptive statistics and statistical inference in simple quantitative research using a statistical software
- able to critically evaluate results of the statistical research presented in media
- prepared for teaching statistics in secondary school and high school
- prepared for participating in a group.

Contents:

- the nature and the meaning of statistics
- data and the acquisition of them: observations, variables, measuring and designs of a study
- the descriptive statistics of empirical distributions: tables, graphical presentations and descriptive measures of center, variation and dependence
- the most important probability distributions
- the principles and the basic methods of statistical inference: random sample, sample statistics, point estimation, confidence intervals and statistical testing of hypotheses.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 16 h (partly compulsory) / instructed group work (28 h) / independent work 80 h. Group works will be returned. Additional independently implemented learning diary tasks. Independent work contains also preparation for group work and peer assessment.

Target group:

Students of mathematics and physics and other interested students.

Prerequisites and co-requisites:

The recommended prerequisite prior to enrolling for the course is the completion of the courses: 802151P Introduction to mathematical deduction and 800119P Functions and limit.

Recommended optional programme components:

After the course, student is able to continue other statistics courses.

Recommended or required reading:

Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. Practical works and learning diaries are assessed weekly. In addition web tests. The assessment of the course is based on the learning outcomes of the course. The

more detailed assessment criteria is available in the beginning of the course. In addition one compulsory lecture and peer assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Hanna Heikkinen

Working life cooperation:

No

800320A: Differential equations, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Erkki Laitinen
Opintokohteen kielet: Finnish
Leikkaavuudet:

031076P	Differential Equations	5.0 op
031017P	Differential Equations	4.0 op
800345A	Differential Equations I	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

2nd year

Learning outcomes:

Upon completing the course the student
- is able to classify differential equations and is able to apply correct solution methods to them
- knows the conditions that guarantee the unique solvability of an equation
- understands the concept of implicitly defined solution

Contents:

The course is devoted to ordinary differential equations. Central part is formed by first order differential equations (separable, homogeneous, linear, exact equations and certain equations which can be transformed into these). The equations are solved using algebraic, iterative and numerical methods. The second part which is central to applications is formed by linear inhomogeneous differential equations with constant coefficients and linear second order equations with continuous coefficient functions. In addition, systems of differential equations are considered. Certain second order linear differential equatoins (e.g. Legendre's equation) is solved via power series.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, independent work

Target group:

Major and minor students

Prerequisites and co-requisites:

Continuity and derivative 800317A and Integral 800318A

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Erkki Laitinen

Working life cooperation:

no

Other information:

Homepage in Noppa portal.

These courses mandatory in Master studies if not included in Bachelor degree

802357A: Euclidean Spaces, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Ville Suomala
Opintokohteen kielet: Finnish
Leikkaavuudet:

802352A Euclidean Topology 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

2nd year 4t period

Learning outcomes:

After passing the course the student
- will be able to define basic topological concepts
- will be able to handle sequences
- will be able to justify basic properties of continuous vector valued functions

Contents:

Sequences, continuity and limit of a vector valued function, basic topological concepts

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

28 hours of lectures, 14 hours of excercises, independent work

Target group:

Major and minor students

Prerequisites and co-requisites:

Functions and limits, Continuity and derivative, Introduction to Matrices

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

Fail, 1-5

Person responsible:

Ville Suomala

Working life cooperation:

No

Other information:

-

802354A: Basics in Algebra, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

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 cr

Language of instruction:

Finnish

Timing:

1. year, 3. period

Learning outcomes:

After completing the course, student is able to

- derive and proof main results in the course
- use and apply different proof techniques
- recognize algebraic structures and the concepts
- see connections and differences between different algebraic structures

Contents:

The course includes basics in arithmetics and algebraic structures, such as, congruence, residue classes, prime numbres, Euclidean algorithm, the fundamental theorem of arithmetic, Euler-Fermat formula, groups and morphisms. The course gives an understanding of algebraic terms and concepts used in mathematics and physics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises

Target group:

Major and minor students

Prerequisites and co-requisites:

802151P Introduction to mathematical deduction

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Kari Myllylä

Working life cooperation:

-

801195P: Probability Theory, 5 op

Voimassaolo: 01.01.2011 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

2nd year, 2nd period.

Learning outcomes:

Upon completing the 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. In the beginning high school level probability is reviewed and after that axiomatic treatment of the theory starts. The central concepts discussed include probability space, conditional probability, independence, and random variable together with its distribution and expected value.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h of lectures, 14 h of exercises, 91 h of independent study

Target group:

Mathematics majors and minors

Prerequisites and co-requisites:

Integral 800318A

Recommended optional programme components:

-

Recommended or required reading:

Lectures.
Text book: Pekka Tuominen, "Todennäköisyyslaskenta I", Limes ry, Helsinki.

Assessment methods and criteria:

Final exam and small tests.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Hanna Heikkinen

Working life cooperation:

-

761316A: Being a teacher in mathematical subjects, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Saana-Maija Aho
Opintokohteen kielet: Finnish
Leikkaavuudet:

766339A	Physics for teachers	5.0 op
766338A	Physics for teachers	4.0 op

Ei opintojaksokuvauksia.

800146P: Introduction to teaching, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

801329A	Mathematics in Teaching	3.0 op
802157P	Mathematics in teaching	2.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
Finnish
Timing:
1st year, 3th period
Learning outcomes:
After the course, the student is able to reflect critically on the learning and teaching of mathematics. The student can discuss and explain the connection between mathematics at school and at university.
Contents:
Learning and teaching mathematics and physics are thought about and discussed.
The course consists of reflective exercises, reading articles and seminar meetings where the exercises are discussed. The student writes a learning journal.
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
28 h seminar meetings, 105 h independent work and group work
Target group:
1st year mathematics and physics teacher students
Assessment methods and criteria:
Participating in the meetings, writing a learning diary, group work tasks
Grading:
pass/fail
Person responsible:
Marko Leinonen
Working life cooperation:
No
Other information:
Replaces the course 801329A Mathematics in teaching.

A300091: Language and Communication Studies, 0 op

Opiskelumuoto: Language and Communication Studies

Laji: Study module

Vastuuyksikkö: Faculty of Science

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Compulsory Studies

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

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:

B2/C1 on the Common European Framework of Reference scale.

Status:

This course is mandatory for students who choose English as their foreign language in the following B.Sc. degree programmes:
Faculty of Natural Sciences
•Biology
•Mathematical and Physical Sciences
•Mathematical Sciences
Faculty of Information Technology and Electrical Engineering
•Department of Information Processing Science
Faculty of Technology
•Department of Chemistry
Oulu Mining School
•Geosciences degree programme
Notes:
In Autumn 2017, English 1 is offered separately to 2nd-year students of Mathematical Sciences.

Please consult your faculty's Study Guide to establish the language requirements for your own degree program.

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 / 54 hours of work

Language of instruction:

English

Timing:

Biology: 1st year spring term (periods 3 and 4)
Mathematical and Physical Sciences: 1st year autumn term (periods 1 and 2)
Mathematical Sciences (for students in the older programme): 2nd year autumn term (periods 1 and 2)
Chemistry: 1st year autumn term (periods 1 and 2)
Geosciences: 1st year spring term (periods 3 and 4)
Information Processing Science: 2nd year autumn term (period 1) for students who begin in 2017 or later
In Spring 2018, English 1 is offered to 2nd-year students of Information Processing Science.

Learning outcomes:

By the end of the course, you are expected to

- have acquired effective vocabulary-learning techniques
- be able to distinguish parts of words to infer meanings
- be able to utilise your knowledge of text structure and cohesion markers to understand academic texts
- to be able to extract information and learn content from English readings in scientific and professional contexts

Contents:

The course will focus on reading strategies; these include recognising how texts are organised, identifying key points in a text, and understanding words in context. Vocabulary work in the course will focus on: a) academic vocabulary, as used in formal scientific writing, and b) using your knowledge of the meanings of parts of words (affixes) to infer meaning.

Mode of delivery:

Contact teaching and independent study

Learning activities and teaching methods:

The English 1 course is adapted to accommodate many different fields of study, and thus the materials and implementation methods of the course vary. There will be 26 hours of guided teaching events and 28 hours of independent study, either individually or in a group. A more detailed course description and list of homework tasks will be provided by the teacher.

Target group:

Faculty of Natural Sciences: Biology, Mathematical & Physical Sciences
Faculty of Information Technology and Electrical Engineering: Information Processing Science
Faculty of Technology: Chemistry
Oulu Mining School: Geosciences

Prerequisites and co-requisites:

-

Recommended optional programme components:

Students are also required to take English 2 902004Y, or English 4 902005Y, AFTER completion of this course.

Recommended or required reading:

Course materials will be provided in electronic form or will be accessible from the university library.

Assessment methods and criteria:

Student work is monitored by continuous assessment, and students are required to participate regularly and actively in all contact teaching provided. During the course, there will be three monthly tests on material covered so far. The assessment of the course is based on the learning outcomes listed above. Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/Fail

Person responsible:

Karen Niskanen

Working life cooperation:

-

Other information:

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. Please contact your own faculty for information.

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

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

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 Common European Framework of Reference scale.

Status:

This course is mandatory for students who choose English as their foreign language in the following B.Sc. degree programmes:
Faculty of Natural Sciences:
Biology
Mathematical & Physical Sciences
Mathematical Science (for 2nd year students in spring 2018)
Physical Science (for 2nd year students in autumn 2017)
Faculty of Information Technology and Electrical Engineering:
Information Processing Science (for students who began their studies before autumn 2017)
Faculty of Technology:
Chemistry
Oulu Mining School:
Geoscience degree programme

Note: Information Processing Science students who began their studies in autumn 2017 or later will take English 4 instead.
Please consult your faculty's study guide to establish the language requirements of your own degree programme.

Required proficiency level:

Students taking this course must have had English as the A1 or A2 language at school or have equivalent skills. The course English 1 (902002Y) is a pre-requisite, unless exempted.

ECTS Credits:

2 ECTS credits / 54 hours work.

Language of instruction:

English

Timing:

Biology: 2nd year autumn term (periods 1 and 2)
Mathematic and Physical Sciences 1st year spring term (periods 3 and 4)
Mathematics: 2nd year spring term (for the last time in spring 2018) (periods 3 and 4)
Physics: 2nd year autumn term (for the last time in autumn 2017) (periods 1 and 2)
Information Processing Science: 2nd year autumn term (for the last time in autumn 2017) (periods 1 and 2)
Chemistry: 2nd year spring term (periods 3 and 4)
Geosciences: 2nd year spring term (periods 3 and 4)

Learning outcomes:

By the end of the course, you are expected to have demonstrated the ability to:

- **use appropriate strategies and techniques for communicating effectively** in English in an academic context
- **prepare and present scientific subjects** to your classmates, using appropriate field-related vocabulary.

Contents:

Skills in listening, speaking, and presenting academic topics are practised in the classroom, where there is an emphasis on working in pairs and small groups. Homework is given to support the classroom learning.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

The English 2 course is tailored to the needs of students in different fields of study, and thus the materials and implementation methods of the course vary between groups. The teacher will provide a more detailed schedule and list of homework tasks. There will be 26 hours of guided teaching events and 28 hours of independent work, including both individual and group work.
Individual learning methods: autonomous learning tasks, practice in lecture listening and written tasks in preparation for classroom lessons
Group work: Preparation of presentations in groups

Target group:

2nd year students of Biology, Chemistry, Geoscience, Information Processing Science (older programme)
1st year students of Mathematical and Physical Sciences (new programme)
2nd year students of Mathematical Science (older programme)
2nd year students of Physical Sciences (older programme)

Prerequisites and co-requisites:

Pre-requisite course: 902002Y Englannin kieli 1

Recommended optional programme components:

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Recommended or required reading:

-

Assessment methods and criteria:

Continuous assessment is based on regular attendance, active participation in all lessons and the successful completion of all homework tasks.
The assessment of the course is based on the learning outcomes of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass / fail.

Person responsible:

Karen Niskanen

Working life cooperation:

-

Other information:

-

901034Y: Second Official Language (Swedish), Written Skills, 1 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Opintokohteen kielet: Swedish

Leikkaavuudet:

901060Y	Second Official Language (Swedish), Written Skills	1.0 op

ay901034Y Second Official Language (Swedish), Written Skills (OPEN UNI) 1.0 op
901004Y Swedish 2.0 op

901035Y: Second Official Language (Swedish), Oral Skills, 1 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Opintokohteen kielet: Swedish
Leikkaavuudet:

901061Y Second Official Language (Swedish), Oral Skills 1.0 op
ay901035Y Second Official Language (Swedish), Oral Skills (OPEN UNI) 1.0 op
901004Y Swedish 2.0 op

Optinal language and communication studies

901018Y: Brush-up Course in Swedish, 2 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay901018Y Brush-up Course in Swedish (OPEN UNI) 2.0 op

Voidaan suorittaa useasti: Kyllä

Proficiency level:

-

Status:

For students whose proxiciency level in Swedish is not sufficient.

Required proficiency level:

See status

ECTS Credits:

2 ECTS credits

Language of instruction:

Swedish and Finnish

Timing:

before the obligatory Swedish course, see Status

Learning outcomes:

See Contents

Contents:

Throughout the course unit the student brushes up on his/her Swedish skills. Various oral and written exercises aim to improve his/her command of essential grammatical structures and vocabulary and his/her ability to understand spoken Swedish.

Mode of delivery:

contact teaching

Learning activities and teaching methods:

Contact teaching and independent study.

Target group:

See Status

Prerequisites and co-requisites:

See Status

Recommended optional programme components:

before the obligatory Swedish course, see Status

Recommended or required reading:

Will be agreed on in the class.

Assessment methods and criteria:

Active participation and a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass / fail

Person responsible:

See Contact teachers

Working life cooperation:

-

Other information:

Registration in WebOodi. Registration is binding and cancellation is subject to a charge unless done before the registration closes.
This course is also offered by the Summer University.

A300090: Other Studies, 0 op

Opiskelumuoto: Other Studies
Laji: Study module
Vastuuyksikkö: Faculty of Science
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Major subject in mathematics: select the code 800012Y. Major subject in physics: select the code 761010Y

761010Y: Orientation course for new students, 3 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761011Y	Orientation course for new students	2.0 op
761011Y-01	Orientation course, Small groups	0.0 op
761011Y-02	Orientation course, Research groups	0.0 op

ECTS Credits:

3 ECTS credits / 80 hours of work

Language of instruction:

Finnish

Timing:

1 st autumn

Learning outcomes:

After the course, the student is able to plan her/his studies and find answers to questions regarding teaching and studying.

Contents:

During the course, older students introduce the new students to the studying environment and the university organization, provide information on the subject matters, aims and prospects related to the field of study, and help with the practical issues connected to the beginning of the studies. The course includes an introduction to different profiles in the degree programme, teacher tutor meetings and guidance for making a personal study plan.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Group work 10-15 h, lectures 10 h, teacher tutor meetings

Target group:

Students in mathematical and physical sciences

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

Coincides with 800012Y

Recommended or required reading:

Handouts

Assessment methods and criteria:

Participation to meetings, producing a personal study plan.

Grading:

pass/fail

Person responsible:

Saana-Maija Huttula

Working life cooperation:

No work placement period

800012Y: Orientation for New Students, 3 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

3 ECTS cr

Language of instruction:

Finnish

Timing:

1st year, 1st and 2nd period

Learning outcomes:

After the course, the student is able to plan her/his studies and find answers to questions regarding teaching and studying.

Contents:

During the course, older students introduce the new students to the studying environment and the university organization, provide information on the subject matters, aims and prospects related to the field of study, and help with the practical issues connected to the beginning of the studies. The course includes an introduction to different profiles in the degree programme, teacher tutor meetings and guidance for making a personal study plan.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Group work 10-15 h, lectures 10 h, teacher tutor meetings

Target group:

Students in mathematical and physical sciences

Prerequisites and co-requisites:

No

Recommended optional programme components:

Coincides with 761010Y

Recommended or required reading:

Handouts

Assessment methods and criteria:

Participation to meetings, producing a personal study plan.

Grading:

Pass/fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Compulsory Studies

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opettajat: Ursula Heinikoski
Opintokohteen kielet: Finnish
Leikkaavuudet:

030004P	Introduction to Information Retrieval	0.0 op

ECTS Credits:

1 ECTS credits

Language of instruction:

Finnish

Timing:

Architecture 3. spring semester, period I; biochemistry 3. autumn semester; biology 3. autumn semester, period I; chemistry 3. autumn semester, period II; computer science and engineering 2. spring semester, period IV; electrical engineering 3. spring semester, period III; geosciences 2. spring semester, period IV;

geography 1. and 3. spring semester, *period III;* industrial engineering and management 3. year*;* information processing sciences 1. year; mathematics and physics 1. spring semester; mechanical engineering 3. year; mining engineering and mineral processing 3. year; process and environmental engineering 1. year, period I. Master's degree students in Industrial Engineering and Management 1st year.

Learning outcomes:

Upon completion of the course, the students:
- can search scientific information,
- can use the most important databases of their discipline,
- know how to evaluate search results and information sources,
- can use the reference management tool

Contents:

Scientific information retrieval process, the most important databases and publication channels of the discipline, evaluation of the reliability of information sources and RefWorks reference management tool.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises, a group assignment.

Learning activities and teaching methods:

Training sessions 8 h, group working 7 h, self-study 12 h

Target group:

Compulsory for all bachelor degree students of Faculty of information technology and electrical engineering, Faculty of Technology, Oulu mining school, Oulu School of architecture and Faculty of science. Optional for students of biochemistry. Compulsory also for the Master's degree students in Industrial Engineering and Management who have not earlier studies in information skills.

Prerequisites and co-requisites:

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Recommended optional programme components:

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Recommended or required reading:

Web learning material Tieteellisen tiedonhankinnan opas http://libguides.oulu.fi/tieteellinentiedonhankinta

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Ursula Heinikoski

Working life cooperation:

-

Other information:

-

521141P: Elementary Programming, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Oja, Mika Rautiainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521141P	Elementary Programming (OPEN UNI)	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS Cr

Language of instruction:

Lectures and learning material are in Finnish. The course can be completed in English by self-studying from a book, completing assignments and exercises on the course learning environment, and delivering a final project.

Timing:

Fall, period 1. There is an option to extend the course to the 2nd period in cases where completing in one period doesn't fit the student's schedule.

Learning outcomes:

1. Is capable of solving problems in the computer's terms

2. Understands the basic concepts of programming

3. Knows the basics of the Python programming language

4. Is able to implement programs independently

5. Is able to use the internet to find information about programming

Contents:

Problem solving with programming, basic concepts of programming, writing Python code.

Mode of delivery:

Web-based teaching + face-to-face teaching

Learning activities and teaching methods:

30h of exercise groups, 105h self-studying in the web.

Target group:

1 st year students of computer science and engineering, electrical engineering, medical and wellness technology and industrial and engineering management, 2nd year students of physics, and other students of the University of Oulu

Prerequisites and co-requisites:

None.

Recommended optional programme components:

The course provides a basis for subsequent programming courses.

Recommended or required reading:

Web material in an online learning environment. Address will be announced at the beginning of the course.

Assessment methods and criteria:

The course is completed by passing all learning assignments, programming exercises and a final exercise project. Read more about assessment criteria at the University of Oulu webpage
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass/fail.

Person responsible:

Mika Oja

Working life cooperation:

-

Other information:

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A325101: Physics, basic studies, 25 - 40 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Studies in Physics

761108P: Physical world view, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Laura Timonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

761112P Physical world view 3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Autumn

Learning outcomes:

After the course student can see the position of physics in the advancement of scientific world view and technology. The student has a comprehensive view of different learning and studying methods (s)he can use later on.

Contents:

The forming of key concepts in physics, using models and observations in advancing both classical and modern physics. The meaning of applying physics in modern society. Getting to know different areas of physics research.

Mode of delivery:

Multiform teaching

Learning activities and teaching methods:

48 h face-to-face teaching, 85 h independent work including course work and group work

Target group:

Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Feynman, R. The Character of Physical Law, Penguin Books 1992 (or equivalent, there are several prints). The original Massenger Lectures by Richard Fenyman in 1965 (7x55min) can be found online with search "Richard Feynman messenger lectures".

Assessment methods and criteria:

Passed course work or final exam

Grading:

Numerical grading scale 0-5, where 0 = fail

Person responsible:

Laura Timonen

Working life cooperation:

No

Other information:

https://wiki.oulu.fi/display/761112P/

761118P: Mechanics 1, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op
766323A	Mechanics	6.0 op
761323A	Mechanics	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work
- 761118P-01, Lectures and exam (4 cr)
- 761118P-02, Lab. exercises (1 cr)

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton’s laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Both parts (761118P-01 and 761118P-02) will be graded separately. The final grade of the course is the weighted average of the grades of part 1 (4 cr) and part 2 (1 cr).
761118P-01: Three midterm exams or final examination
761118P-02: Two laboratory exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761118P

Compulsory

761118P-01: Mechanics 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P-02	Basic mechanics, lab. exercises	0.0 op
761111P-01	Basic mechanics, lectures and exam	0.0 op
761111P	Basic mechanics	5.0 op
761121P	Physical Measurements I	3.0 op
761101P	Basic Mechanics	4.0 op
761323A	Mechanics	6.0 op
766323A	Mechanics	6.0 op

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course: Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Three small midterm exams or final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

Course website

761118P-02: Mechanics 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Basic Studies

Laji: Partial credit

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P-01	Basic mechanics, lectures and exam	0.0 op
761111P-02	Basic mechanics, lab. exercises	0.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op
761323A	Mechanics	6.0 op
766323A	Mechanics	6.0 op

Other information:

Course website

761115P: Laboratory Exercises in Physics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P Physical Measurements I 3.0 op
761121P-01 Physical measurements I, exam 0.0 op
761121P-02 Physical measurements I, lab. exercises 0.0 op
800149P Introduction to LateX 2.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Spring

Learning outcomes:

The student can safely make physical measurements, use different measurement tools, read different scales, handle the data, calculate the error estimations and make a sensible report of his laboratopy measurements.

Contents:

The skill to make laboratory measurements is important for physicists. This is an introductory course how to make physical measurements and how to treat the measured data. Laboratory works are made in groups. The laboratory security is an essential part also in physics. Measurements are made with different instruments. As a result the most probable value is determined as well as its error. The skills obtained during this course can be applied in the other laboratory courses Laboratory exercises in physics 2 and 3.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 10 h, exercises 20 h (5 x 4 h). Five different works will be made during the course in groups. Self-study 103 h.

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites.

Recommended optional programme components:

800149P Introduction to LaTex

Recommended or required reading:

Lecture material is in Finnish. Work instructions are available also in English.

Assessment methods and criteria:

Written reports of the experiments and one written examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:
No work placement period

Compulsory

761115P-01: Laboratory Exercises in Physics 1, lecture and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01	Physical measurements I, exam	0.0 op
761121P-02	Physical measurements I, lab. exercises	0.0 op
761121P	Physical Measurements I	3.0 op

Ei opintojaksokuvauksia.

761115P-02: Laboratory Exercises in Physics 1, laboratory exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01	Physical measurements I, exam	0.0 op
761121P-02	Physical measurements I, lab. exercises	0.0 op
761121P	Physical Measurements I	3.0 op

Ei opintojaksokuvauksia.

761115P-03: Laboratory Exercises in Physics 1, Introduction to LateX, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01	Physical measurements I, exam	0.0 op
761121P-02	Physical measurements I, lab. exercises	0.0 op
761121P	Physical Measurements I	3.0 op
800149P	Introduction to LateX	2.0 op

Ei opintojaksokuvauksia.

761120P: Laboratory Exercises in Physics 2, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Alanko

Opintokohteen kielet: Finnish

Leikkaavuudet:

766106P Laboratory exercises in physics 2 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1. spring - 3. autumn

Learning outcomes:

After completing the course, the student can rather independently work with the most important measuring instruments used in physics and has experience in planning and conducting different measurements. The student is also able to critically assess her/his own results and report them to a group of peers.

Contents:

The laboratory exercises (1/3 - 1/2 ECTS per exercise) train the student in applying measurements to research into different physical phenomena. The exercises include practising how to plan the measurements, learning how to use the measuring instruments, processing and assessing the results, and drawing up scientific reports. Some of the exercises can be chosen according to the student´s own interest.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Per one exercise, 4 h of measurements in the laboratory and 5-9 h of preparation and drawing up a report independently.

Target group:

No specific target qroup

Prerequisites and co-requisites:

Recommended: 761121P Laboratory exercises in physics 1.

Recommended optional programme components:

Each exercise is closely related to a basic or intermediate course in physics, because the phenomena connected to the measurements and their theory are discussed in the lectures for the courses.

Recommended or required reading:

The exercise work instructions and guidelines for the work report, which can be found on the website of the course.

Assessment methods and criteria:

Adequate familiarization with the phenomenon under scrutiny and the measurements before the exercise (oral or written questions), successfully completing the guided measurements, reporting on the exercise (the work report will be graded). Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/766106P/

761119P: Electromagnetism 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op
761113P	Electricity and magnetism	5.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

Ei opintojaksokuvauksia.

Compulsory

761119P-01: Electromagnetism 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P	Electricity and magnetism	5.0 op
761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

Ei opintojaksokuvauksia.

761119P-02: Electromagnetism 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P	Electricity and magnetism	5.0 op
761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op

766319A Electromagnetism 7.0 op
761103P Electricity and Magnetism 4.0 op

Ei opintojaksokuvauksia.

A325102: Physics, intermediate studies, 35 - 60 op

Opiskelumuoto: Intermediate Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory Studies

761312A: Electromagnetism 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Anita Aikio
Opintokohteen kielet: Finnish
Leikkaavuudet:

766319A Electromagnetism 7.0 op

Ei opintojaksokuvauksia.

761309A: Mechanics 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

761313A: Atomic physics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Saana-Maija Aho
Opintokohteen kielet: Finnish
Leikkaavuudet:

766326A Atomic physics 1 6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Second autumn term

Learning outcomes:

Student can explain the development of the atomic model. Student is able to describe some interaction mechanisms of electromagnetic radiation and matter. Student can resolve easy quantum mechanical problems. Student can describe the principles used when the wave functions and energies of some simple systems are determined. Student can take advantage of the periodic table of elements in finding the chemical and physical properties of atoms based on its electronic structure.

Contents:

In the beginning of the course, the historical events which led to the development of the quantum mechanics and the modern atomic model in the early 20th century are discussed. In this context, the interaction processes between matter and electromagnetic radiation, like black-body radiation, the photoelectric effect, and scattering, are examined. In quantum mechanics, particles are usually described with the aid of wave functions. De Broglie wavelength, the group and phase velocities of particles, and Heisenberg uncertainty principle serve as an introduction to the wave properties of particles. The Bohr's atomic model, electronic transitions of atoms, and emission spectra of atoms are also discussed. The first touch to the quantum mechanics is the solutions of wave functions and energies for some simple systems, like hydrogen atom, are described. Additionally, many-electron atoms are discussed briefly. Some modern research methods which are used to study the atomic and molecular physics are introduced. Applications which exploit the atom physical phenomena in everyday life are also discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 7, self-study 80 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Books: A. Beiser: Concepts of Modern Physics, McGraw-Hill Inc

Assessment methods and criteria:

Group excercises, lectures, webexcercises or one final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Saana-Maija Huttula

Working life cooperation:

No work placement period

Other information:

Lectured for the first time in autumn 2018, period 1. Replaces the course 766326A Atomic physics 1, 6 ECTS cr.

761310A: Wave motion and optics, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Alanko

Opintokohteen kielet: Finnish

Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish. The course material and exercises are available in English.

Timing:

First spring

Learning outcomes:

The student is able to treat different types of waves by methods of general theory of wave motion. The student is also able to solve problems related to basic optics and apply her/his knowledge to teaching and research in physics.

Contents:

General principles of wave motion, sound, electromagnetic waves, propagation of light, image formation in mirrors and lenses, optical instruments, interference, Fraunhofer diffraction, diffraction grating, laser principles.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, 2 laboratory exercises (3 hours/exercise), self-study 90 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

Basic skills in mathematics

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

H. D. Young and R. A. Freedman, University Physics, Addison-Wesley, 2000 ja 2004, F. L. Pedrotti ja L. S. Pedrotti, Introduction to optics, Prentice-Hall, 2. ed., 1993 ja E. Hecht, Optics, (3rd ed.), Addison Wesley Longman, 1998.

Assessment methods and criteria:

Two written intermediate examinations or one final examination

Grading:

Numerical grading scale 0 – 5, where 0 is fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Compulsory

761310A-01: Wave motion and optics, lectures and exam, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

Ei opintojaksokuvauksia.

761310A-02: Wave motion and optics, lab. exercises, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

Ei opintojaksokuvauksia.

766344A: Nuclear and particle physics, 5 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766330A-01	Structure of matter, part 1: Solid state physics	0.0 op
766330A-02	Structure of matter, part 2: Nuclear and particle physics	0.0 op
766334A	Structure of matter II	2.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

The student knows the structure and key properties of atomic nuclei, the most important ways in which the nuclei undergo radioactive decay, and is familiar with some technological applications based on nuclear properties and radioactivity. The student can explain fission and fusion reactions.
The student knows the key varieties of subatomic particles, their properties and interactions. The student can explain main principles of particle accelerators and detectors, and how they are used in research.

Contents:

This course deals with the structure and properties of nuclei, nuclear forces, nuclear models, radioactivity, nuclear reactions, properties and interactions of fundamental particles, and unified theories of fundamental interactions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 8 exercises (16 h), self-study 87 h

Target group:

Primarily for the students of the degree programme in physics.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics 1 (766326A), Electromagnetism (766319A). An important supporting course is Thermophysics (766328A/766348A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Textbooks: H. D. Young and R. A. Freedman: University Physics, 13th edition, Pearson Addison-Wesley, 2012, or earlier editions (in part), R. Eisberg and R. Resnick: Quantum physics of atoms, molecules, solids, nuclei, and particles, John Wiley & Sons (in part). Additional material available from the web pages of the course.
Course material availability can be checked here.

Assessment methods and criteria:

Final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Minna Patanen

Working life cooperation:

No work placement period

Other information:

Course website

763343A: Solid state physics, 5 op

Voimassaolo: 01.12.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766330A Structure of matter 6.0 op

766330A-02 Structure of matter, part 2: Nuclear and particle physics 0.0 op

766330A-01 Structure of matter, part 1: Solid state physics 0.0 op

763333A Structure of matter I 4.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

To learn to explain the basics of solid state physics such as lattice structure, binding interactions, lattice vibrations, band structure and its effect on conductivity, conductivity of semiconductors, the interaction between light and matter, magnetism and superconductivity, and to apply these to different materials.

Contents:

The rapid development of technology is largely based on understanding the properties of the solid state. There are many interesting phenomena in solid state physics, which are consequences of very large number of particles and their interactions. The course starts with symmetry of crystal lattices and their experimental determination. Different binding forces of solids are discussed. Lattice vibrations and their contribution to specific heat are studied. Especial emphasis is put on electronic structure, and it is used to explain the electric conduction in metals, insulators and semiconductors. Also experimental methods, magnetism and superconductivity are discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, exercises 16 h, self-study 87 h

Target group:

Primarily for the students of the degree programme in physics.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics 1 (766326A), Electromagnetism (766319A). An important supporting course is Thermophysics (766322A/766348A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

E. Thuneberg: Kiinteä aineen fysiikka (lecture notes), C. Kittel: Introduction to solid state physics.

Assessment methods and criteria:

Examination

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Erkki Thuneberg

Working life cooperation:

No work placement period

Other information:

https://noppa.oulu.fi/noppa/kurssi/763343a/

761314A: Thermophysics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Perttu Lantto
Opintokohteen kielet: Finnish
Leikkaavuudet:

766348A	Thermophysics	7.0 op
766328A	Thermophysics	6.0 op
761328A	Thermophysics	4.0 op

Ei opintojaksokuvauksia.

766384A: B.Sc. seminar, 4 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761385A-01	B.Sc. thesis	0.0 op
761385A-02	Seminar	0.0 op

ECTS Credits:

4 ECTS cr

Language of instruction:

Finnish

Timing:

3rd autumn

Learning outcomes:

The student is familiar with the special requirements of a scientific text and is aware of physics' common practices in scientific writing. The student has the basic knowledge of scientific writing enabling the student to write her/his B.Sc. thesis under a supervision. The student learns important scientific communication skills necessary in scientific research in physics.

Contents:

Both written and oral reporting is essential part of the scientific research. During the course, the students participate in the seminars, act as opponents and present a seminar talk. The course gives basic knowledge of scientific writing so that the student can start to write her/his B. Sc. thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 10 h, seminar talk, act as an opponent (ca 20 h), self-study 77 h

Target group:

Compulsory for Bachelor of Science in physics. In seminars 80 % obligatory attendance.

Prerequisites and co-requisites:

Introduction to information retrieval (030005P).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Material available from the web pages of the course.

Assessment methods and criteria:

Students have to attend the lectures (ca. 80 %) and be an opponent for two seminar talks. Students have to give a seminar talk, which is graded (0-5). Possible homework.

Grading:

Numerical grading scale 0 – 5, where 0 = fail.

Person responsible:

Marko Huttula

Working life cooperation:

No work placement period

Other information:

Course website

766385A: B.Sc. thesis, 6 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761385A-02	Seminar	0.0 op
761385A-01	B.Sc. thesis	0.0 op

ECTS Credits:

6 credits

Language of instruction:

Finnish or English

Timing:

3rd year

Learning outcomes:

The student can carry out research work, search information and write scientific reports about the subject.

Contents:

Both written and oral reporting is essential part of the scientific research. In the course, the students write a candidate thesis. The candidate thesis is about 20 pages. Thesis is written about subject given by and under supervision of a senior researcher.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Self-study 160 h.

Target group:

Compulsory for Bachelor of Science in physics.

Prerequisites and co-requisites:

Introduction to information retrieval (030005P).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Material available from the web pages of the course.

Assessment methods and criteria:

B.Sc. thesis

Grading:

Numerical grading scale 0 – 5, where 0 = fail.

Person responsible:

Marko Huttula

Working life cooperation:

No work placement period

Other information:

Course website ???

761386A: Maturity test, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A325104: Physics Minor, 15 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

General Studies in Physics

761108P: Physical world view, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Laura Timonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

761112P Physical world view 3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

Autumn

Learning outcomes:

After the course student can see the position of physics in the advancement of scientific world view and technology. The student has a comprehensive view of different learning and studying methods (s)he can use later on.

Contents:

The forming of key concepts in physics, using models and observations in advancing both classical and modern physics. The meaning of applying physics in modern society. Getting to know different areas of physics research.

Mode of delivery:

Multiform teaching

Learning activities and teaching methods:

48 h face-to-face teaching, 85 h independent work including course work and group work

Target group:

Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Feynman, R. The Character of Physical Law, Penguin Books 1992 (or equivalent, there are several prints). The original Massenger Lectures by Richard Fenyman in 1965 (7x55min) can be found online with search "Richard Feynman messenger lectures".

Assessment methods and criteria:

Passed course work or final exam

Grading:

Numerical grading scale 0-5, where 0 = fail

Person responsible:

Laura Timonen

Working life cooperation:

No

Other information:

https://wiki.oulu.fi/display/761112P/

761118P: Mechanics 1, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op
766323A	Mechanics	6.0 op

761323A Mechanics 6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work
- 761118P-01, Lectures and exam (4 cr)
- 761118P-02, Lab. exercises (1 cr)

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Both parts (761118P-01 and 761118P-02) will be graded separately. The final grade of the course is the weighted average of the grades of part 1 (4 cr) and part 2 (1 cr).
761118P-01: Three midterm exams or final examination
761118P-02: Two laboratory exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Juha Vaara

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761118P

Compulsory

761118P-01: Mechanics 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Basic Studies

Laji: Partial credit

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766343A Mechanics 7.0 op
761111P-02 Basic mechanics, lab. exercises 0.0 op
761111P-01 Basic mechanics, lectures and exam 0.0 op
761111P Basic mechanics 5.0 op
761121P Physical Measurements I 3.0 op
761101P Basic Mechanics 4.0 op
761323A Mechanics 6.0 op
766323A Mechanics 6.0 op

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics. Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton’s laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course: Lectures 30 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 h

Target group:

For the students of the University of Oulu

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used. Lecture material: Finnish lecture material will be available on the web page of the course.

Assessment methods and criteria:

Three small midterm exams or final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:
Juha Vaara
Working life cooperation:
No work placement period
Other information:
Course website

761118P-02: Mechanics 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766343A	Mechanics	7.0 op
761111P-01	Basic mechanics, lectures and exam	0.0 op
761111P-02	Basic mechanics, lab. exercises	0.0 op
761111P	Basic mechanics	5.0 op
761101P	Basic Mechanics	4.0 op
761323A	Mechanics	6.0 op
766323A	Mechanics	6.0 op

Other information:
Course website

761115P: Laboratory Exercises in Physics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P	Physical Measurements I	3.0 op
761121P-01	Physical measurements I, exam	0.0 op
761121P-02	Physical measurements I, lab. exercises	0.0 op
800149P	Introduction to LateX	2.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
Finnish
Timing:
Spring
Learning outcomes:

The student can safely make physical measurements, use different measurement tools, read different scales, handle the data, calculate the error estimations and make a sensible report of his laboratopy measurements.

Contents:

The skill to make laboratory measurements is important for physicists. This is an introductory course how to make physical measurements and how to treat the measured data. Laboratory works are made in groups. The laboratory security is an essential part also in physics. Measurements are made with different instruments. As a result the most probable value is determined as well as its error. The skills obtained during this course can be applied in the other laboratory courses Laboratory exercises in physics 2 and 3.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 10 h, exercises 20 h (5 x 4 h). Five different works will be made during the course in groups. Self-study 103 h.

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites.

Recommended optional programme components:

800149P Introduction to LaTex

Recommended or required reading:

Lecture material is in Finnish. Work instructions are available also in English.

Assessment methods and criteria:

Written reports of the experiments and one written examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Compulsory

761115P-01: Laboratory Exercises in Physics 1, lecture and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01 Physical measurements I, exam 0.0 op
761121P-02 Physical measurements I, lab. exercises 0.0 op
761121P Physical Measurements I 3.0 op

Ei opintojaksokuvauksia.

761115P-02: Laboratory Exercises in Physics 1, laboratory exercises, 0 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01	Physical measurements I, exam	0.0 op
761121P-02	Physical measurements I, lab. exercises	0.0 op
761121P	Physical Measurements I	3.0 op

Ei opintojaksokuvauksia.

761115P-03: Laboratory Exercises in Physics 1, Introduction to LateX, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761121P-01	Physical measurements I, exam	0.0 op
761121P-02	Physical measurements I, lab. exercises	0.0 op
761121P	Physical Measurements I	3.0 op
800149P	Introduction to LateX	2.0 op

Ei opintojaksokuvauksia.

Optional studies in Physics. When you complete 25 ECTS cr from the physics. Choose the 2 courses below. (60 ECTS cr of minor subject are all selected below)

761119P: Electromagnetism 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op
761113P	Electricity and magnetism	5.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

Ei opintojaksokuvauksia.

Compulsory

761119P-01: Electromagnetism 1, lectures and exam, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P	Electricity and magnetism	5.0 op
761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

Ei opintojaksokuvauksia.

761119P-02: Electromagnetism 1, lab. exercises, 0 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761113P	Electricity and magnetism	5.0 op
761113P-01	Electricity and magnetism, lectures and exam	0.0 op
761113P-02	Electricity and magnetism, lab. exercises	0.0 op
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

Ei opintojaksokuvauksia.

761313A: Atomic physics 1, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Saana-Maija Aho
Opintokohteen kielet: Finnish
Leikkaavuudet:

766326A	Atomic physics 1	6.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
Finnish
Timing:
Second autumn term
Learning outcomes:

Student can explain the development of the atomic model. Student is able to describe some interaction mechanisms of electromagnetic radiation and matter. Student can resolve easy quantum mechanical problems. Student can describe the principles used when the wave functions and energies of some simple systems are determined. Student can take advantage of the periodic table of elements in finding the chemical and physical properties of atoms based on its electronic structure.

Contents:

In the beginning of the course, the historical events which led to the development of the quantum mechanics and the modern atomic model in the early 20th century are discussed. In this context, the interaction processes between matter and electromagnetic radiation, like black-body radiation, the photoelectric effect, and scattering, are examined. In quantum mechanics, particles are usually described with the aid of wave functions. De Broglie wavelength, the group and phase velocities of particles, and Heisenberg uncertainty principle serve as an introduction to the wave properties of particles. The Bohr's atomic model, electronic transitions of atoms, and emission spectra of atoms are also discussed. The first touch to the quantum mechanics is the solutions of wave functions and energies for some simple systems, like hydrogen atom, are described. Additionally, many-electron atoms are discussed briefly. Some modern research methods which are used to study the atomic and molecular physics are introduced. Applications which exploit the atom physical phenomena in everyday life are also discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 7, self-study 80 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Books: A. Beiser: Concepts of Modern Physics, McGraw-Hill Inc

Assessment methods and criteria:

Group excercises, lectures, webexcercises or one final examination.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Saana-Maija Huttula

Working life cooperation:

No work placement period

Other information:

Lectured for the first time in autumn 2018, period 1. Replaces the course 766326A Atomic physics 1, 6 ECTS cr.

761314A: Thermophysics, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Perttu Lantto

Opintokohteen kielet: Finnish

Leikkaavuudet:

766348A	Thermophysics	7.0 op

766328A Thermophysics 6.0 op
761328A Thermophysics 4.0 op

Ei opintojaksokuvauksia.

761310A: Wave motion and optics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A Wave motion and optics 7.0 op
761114P Wave motion and optics 5.0 op
761114P-02 Wave motion and optics, lab. exercises 0.0 op
761114P-01 Wave motion and optics, lectures and exam 0.0 op
766329A Wave motion and optics 6.0 op
761104P Wave Motion 3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish. The course material and exercises are available in English.

Timing:

First spring

Learning outcomes:

The student is able to treat different types of waves by methods of general theory of wave motion. The student is also able to solve problems related to basic optics and apply her/his knowledge to teaching and research in physics.

Contents:

General principles of wave motion, sound, electromagnetic waves, propagation of light, image formation in mirrors and lenses, optical instruments, interference, Fraunhofer diffraction, diffraction grating, laser principles.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, 2 laboratory exercises (3 hours/exercise), self-study 90 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

Basic skills in mathematics

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

H. D. Young and R. A. Freedman, University Physics, Addison-Wesley, 2000 ja 2004, F. L. Pedrotti ja L. S. Pedrotti, Introduction to optics, Prentice-Hall, 2. ed., 1993 ja E. Hecht, Optics, (3rd ed.), Addison Wesley Longman, 1998.

Assessment methods and criteria:

Two written intermediate examinations or one final examination

Grading:

Numerical grading scale 0 – 5, where 0 is fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Compulsory

761310A-01: Wave motion and optics, lectures and exam, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

Ei opintojaksokuvauksia.

761310A-02: Wave motion and optics, lab. exercises, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

Ei opintojaksokuvauksia.

If you want to complete 60 ECTS cr in physics. Choose all the courses below

761309A: Mechanics 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

761120P: Laboratory Exercises in Physics 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

766106P Laboratory exercises in physics 2 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1. spring - 3. autumn

Learning outcomes:

After completing the course, the student can rather independently work with the most important measuring instruments used in physics and has experience in planning and conducting different measurements. The student is also able to critically assess her/his own results and report them to a group of peers.

Contents:

The laboratory exercises (1/3 - 1/2 ECTS per exercise) train the student in applying measurements to research into different physical phenomena. The exercises include practising how to plan the measurements, learning how to use the measuring instruments, processing and assessing the results, and drawing up scientific reports. Some of the exercises can be chosen according to the student´s own interest.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Per one exercise, 4 h of measurements in the laboratory and 5-9 h of preparation and drawing up a report independently.

Target group:

No specific target qroup

Prerequisites and co-requisites:

Recommended: 761121P Laboratory exercises in physics 1.

Recommended optional programme components:

Each exercise is closely related to a basic or intermediate course in physics, because the phenomena connected to the measurements and their theory are discussed in the lectures for the courses.

Recommended or required reading:

The exercise work instructions and guidelines for the work report, which can be found on the website of the course.

Assessment methods and criteria:

Adequate familiarization with the phenomenon under scrutiny and the measurements before the exercise (oral or written questions), successfully completing the guided measurements, reporting on the exercise (the work report will be graded). Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/766106P/

761312A: Electromagnetism 2, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Anita Aikio
Opintokohteen kielet: Finnish
Leikkaavuudet:

766319A Electromagnetism 7.0 op

Ei opintojaksokuvauksia.

766344A: Nuclear and particle physics, 5 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766330A-01 Structure of matter, part 1: Solid state physics 0.0 op
766330A-02 Structure of matter, part 2: Nuclear and particle physics 0.0 op
766334A Structure of matter II 2.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

The student knows the structure and key properties of atomic nuclei, the most important ways in which the nuclei undergo radioactive decay, and is familiar with some technological applications based on nuclear properties and radioactivity. The student can explain fission and fusion reactions.
The student knows the key varieties of subatomic particles, their properties and interactions. The student can explain main principles of particle accelerators and detectors, and how they are used in research.

Contents:

This course deals with the structure and properties of nuclei, nuclear forces, nuclear models, radioactivity, nuclear reactions, properties and interactions of fundamental particles, and unified theories of fundamental interactions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, 8 exercises (16 h), self-study 87 h

Target group:

Primarily for the students of the degree programme in physics.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics 1 (766326A), Electromagnetism (766319A). An important supporting course is Thermophysics (766328A/766348A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Textbooks: H. D. Young and R. A. Freedman: University Physics, 13th edition, Pearson Addison-Wesley, 2012, or earlier editions (in part), R. Eisberg and R. Resnick: Quantum physics of atoms, molecules, solids, nuclei, and particles, John Wiley & Sons (in part). Additional material available from the web pages of the course.
Course material availability can be checked here.

Assessment methods and criteria:

Final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Minna Patanen

Working life cooperation:

No work placement period

Other information:

Course website

763343A: Solid state physics, 5 op

Voimassaolo: 01.12.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

766330A	Structure of matter	6.0 op
766330A-02	Structure of matter, part 2: Nuclear and particle physics	0.0 op
766330A-01	Structure of matter, part 1: Solid state physics	0.0 op
763333A	Structure of matter I	4.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

To learn to explain the basics of solid state physics such as lattice structure, binding interactions, lattice vibrations, band structure and its effect on conductivity, conductivity of semiconductors, the interaction between light and matter, magnetism and superconductivity, and to apply these to different materials.

Contents:

The rapid development of technology is largely based on understanding the properties of the solid state. There are many interesting phenomena in solid state physics, which are consequences of very large number of particles and their interactions. The course starts with symmetry of crystal lattices and their experimental determination. Different binding forces of solids are discussed. Lattice vibrations and their contribution to specific heat are studied. Especial emphasis is put on electronic structure, and it is used to explain the electric conduction in metals, insulators and semiconductors. Also experimental methods, magnetism and superconductivity are discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h, exercises 16 h, self-study 87 h

Target group:

Primarily for the students of the degree programme in physics.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics 1 (766326A), Electromagnetism (766319A). An important supporting course is Thermophysics (766322A/766348A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

E. Thuneberg: Kiinteä aineen fysiikka (lecture notes), C. Kittel: Introduction to solid state physics.

Assessment methods and criteria:

Examination

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Erkki Thuneberg

Working life cooperation:

No work placement period

Other information:

https://noppa.oulu.fi/noppa/kurssi/763343a/

A325004: Mathematics Minor, 25 - 120 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ayA325004	Mathematics Minor (OPEN UNI)	25.0 op

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

General Studies in Mathematics (min 45 ECTS cr)

802151P: Introduction to mathematical deduction, 5 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay802151P	Introduction to mathematical deduction (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS cr

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 techniquesis
- able to use basic set theoretic concepts and definitionsis
- able to define and apply basic definitions related to functions

Contents:

The course in an introduction to mathematical deduction and introduces different types of proof techniques. The course covers the concepts familiar from upper secondary school studies more profound way. Main concepts in this course are basic set theory and functions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h

Target group:

Major and minor students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/Fail

Person responsible:

Marko Leinonen

Working life cooperation:

-

800119P: Functions and limit, 5 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Salmi
Opintokohteen kielet: Finnish
Leikkaavuudet:

802162P	Continuity and Limit	5.0 op
802155P	Continuity and limit	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year, 1st period

Learning outcomes:

Upon completing the course the student is
- able to apply the triangle inequality and make approximations
- able to manipulate elementary functions such as polynomials and trigonometric functions
- able to define the limit of a sequence and the limit of a function as well as apply these definitions
- able to apply different techniques to determine limits.

Contents:

The course concerns real-valued functions of one variable. In particular elementary functions are defined and the monotonicity of functions is studied. The notion of absolute value is reviewed and applied to approximation. Also the triangle inequality is used in approximation. The central concept is the limit of a function, which is introduced via the limit of a sequence. The aim of the course is to improve deductive skills as well as computational skills.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Introduction to mathematical deduction 802151P is recommended to be taken simultaneously (or earlier).

Recommended optional programme components:

-

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam, exercises

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Other information:

Replaces the course 802161P Introduction to real functions.

800317A: Continuity and derivative, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Salmi

Opintokohteen kielet: Finnish

Leikkaavuudet:

802163P	Derivative	5.0 op
802156P	Derivative	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year, 2nd period

Learning outcomes:

Upon completing the course the student is
- able to define the concept of continuous function and apply this definition in examples and deductions
- able to determine derivatives of functions
- able to apply derivative to study functions
- able to appy the concepts of continuity and derivative in various problems, including deductions

Contents:

The course concerns continuity and derivative of real-valued functions of one variable. The central topics are the intermediate value theorem, the chain rule, the derivative of inverse functions, the mean value theorem and its applications. Differential calculus is also applied to various problems. The aim of the course is to improve mathematical thinking as well as computational skills.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Functions and limit 800119P, Introduction to mathematical deduction 802151P

Recommended optional programme components:

-

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam, exercises

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

no

Other information:

Replaces the course 802163P Derivative.

800318A: Integral, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Ville Suomala

Opintokohteen kielet: Finnish

Leikkaavuudet:

802164P	Series and Integral	5.0 op
802353A	Series and Integrals	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year 3rd period

Learning outcomes:

After completing the course, the student
- understands the connection between derivative and extremal values
- manages the basics of integration theory
- understands the connection and differences between definite and indefinite integral
- is able to understand the connetcion between the integral and the derivative

Contents:

Higher order derivatives, extremal values, Taylor polynomials, Riemann integral, The fundamental theorem of Calculus, Eksponent function and logarithm, integration by parts, integration by substitution, imporper integral

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, independent work

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Functions and limit, Continuity and derivative

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Ville Suomala

Working life cooperation:

no

Other information:

Replaces the course 802164P Series and integral.

802120P: Introduction to Matrices, 5 op

Voimassaolo: 01.06.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

802118P Linear Algebra I 4.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

1. year, 4. periodi

Learning outcomes:

After completing the course the student is able to
- apply arithmetic operations of matrices
- solve system of linear equations by matrix methods
- study linear depence and linear indepence of vectors
- recognize the subspace of R^n and understands the concepts of basis and dimension of a vector space
- analyse matrices by the parameters and the vectors.

Contents:

Vectors and matrices, Systems of linear equations, determinant of a matrix, subspaces of R^n, linear depence and linear indepence of vectors, base, dimension, eigenvalues and eigenvectors of a matrix, diagonalization.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, Exercises 14 h

Target group:

Major and minor studies

Prerequisites and co-requisites:

802151P Introduction to Mathematical Deduction

Recommended or required reading:

Lecture notes
Grossman, S.I. : Elementary Linear Algebra, David C. Lay: Linear Algebra and Its Applications.

Assessment methods and criteria:

Final exam

Grading:

Fail, 1-5

Person responsible:

Marko Leinonen

Working life cooperation:

-

800328A: Calculus of several variables, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Salmi
Opintokohteen kielet: Finnish
Leikkaavuudet:

802351A	Vector Calculus	5.0 op
800322A	Multidimensional analysis	8.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd year, 1st period

Learning outcomes:

After completing the course the student is able to:
- operate functions of several variables
- apply derivates of functions of several variables
- calculate multiple integrals

Contents:

The course concerns calculus of severable variables. The central concepts of the course are partial derivative, gradient, divergence, curl and multiple integral. Integral theorems related to functions of several variables are also presented. In addition power series are introduced. The course offers basic tools for applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h study a part of which may be guided

Target group:

Mathematics and physics major and minor students

Prerequisites and co-requisites:

Continuity and derivative 800317A, Integral 800318A, Introduction to matrices 802120P

Assessment methods and criteria:

Final exam

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Other information:

Replaces the course 802351A Vector calculus

802320A: Linear Algebra, 5 op

Voimassaolo: 01.06.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

802119P Linear Algebra II 5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish and English

Timing:

2nd year, 2nd period

Learning outcomes:

On successful completion of this course, the student will be able to
- apply the definition of linear space and concepts associated with linear spaces such as basis
- work with linear mappings and their matrix representations
- apply the definition of inner product space and concepts associated with inner product spaces such as orthogonality
- prove results related to linear spaces

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 and concepts associated with linear mappings such as kernel, eigenvalues and eigenvectors.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

Mathematics majors and minors students

Prerequisites and co-requisites:

802120P Introduction to Matrices

Recommended optional programme components:

-

Recommended or required reading:

http://cc.oulu.fi/~tma/OPETUS.html

Assessment methods and criteria:

Final exam

Grading:

1-5, fail

Person responsible:

Tapani Matala-aho

Working life cooperation:

No

Other information:

-

806113P: Introduction to Statistics, 5 op

Voimassaolo: 01.01.2011 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Hanna Heikkinen
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 ECTS cr

Language of instruction:

Finnish

Timing:

4th period. 1st or 2nd year of studies.

Learning outcomes:

Upon completion of the course, student will be
- able to identify and define the main principles of statistical research, collection of the data and analysis
- able to apply basic methods of descriptive statistics and statistical inference in simple quantitative research using a statistical software
- able to critically evaluate results of the statistical research presented in media
- prepared for teaching statistics in secondary school and high school
- prepared for participating in a group.

Contents:

- the nature and the meaning of statistics
- data and the acquisition of them: observations, variables, measuring and designs of a study
- the descriptive statistics of empirical distributions: tables, graphical presentations and descriptive measures of center, variation and dependence
- the most important probability distributions
- the principles and the basic methods of statistical inference: random sample, sample statistics, point estimation, confidence intervals and statistical testing of hypotheses.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 16 h (partly compulsory) / instructed group work (28 h) / independent work 80 h. Group works will be returned. Additional independently implemented learning diary tasks. Independent work contains also preparation for group work and peer assessment.

Target group:

Students of mathematics and physics and other interested students.

Prerequisites and co-requisites:

The recommended prerequisite prior to enrolling for the course is the completion of the courses: 802151P Introduction to mathematical deduction and 800119P Functions and limit.

Recommended optional programme components:

After the course, student is able to continue other statistics courses.

Recommended or required reading:

Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. Practical works and learning diaries are assessed weekly. In addition web tests. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria is available in the beginning of the course. In addition one compulsory lecture and peer assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Hanna Heikkinen

Working life cooperation:

No

800320A: Differential equations, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Erkki Laitinen
Opintokohteen kielet: Finnish
Leikkaavuudet:

031076P	Differential Equations	5.0 op
031017P	Differential Equations	4.0 op
800345A	Differential Equations I	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

2nd year

Learning outcomes:

Upon completing the course the student
- is able to classify differential equations and is able to apply correct solution methods to them
- knows the conditions that guarantee the unique solvability of an equation
- understands the concept of implicitly defined solution

Contents:

The course is devoted to ordinary differential equations. Central part is formed by first order differential equations (separable, homogeneous, linear, exact equations and certain equations which can be transformed into these). The equations are solved using algebraic, iterative and numerical methods. The second part which is central to applications is formed by linear inhomogeneous differential equations with constant coefficients and linear second order equations with continuous coefficient functions. In addition, systems of differential equations are considered. Certain second order linear differential equatoins (e.g. Legendre's equation) is solved via power series.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, independent work

Target group:

Major and minor students

Prerequisites and co-requisites:

Continuity and derivative 800317A and Integral 800318A

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Erkki Laitinen

Working life cooperation:

no

Other information:

Homepage in Noppa portal.

These courses mandatory in Master studies if not included in Bachelor degree

802357A: Euclidean Spaces, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Ville Suomala
Opintokohteen kielet: Finnish
Leikkaavuudet:

802352A Euclidean Topology 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

2nd year 4t period

Learning outcomes:

After passing the course the student
- will be able to define basic topological concepts
- will be able to handle sequences
- will be able to justify basic properties of continuous vector valued functions

Contents:

Sequences, continuity and limit of a vector valued function, basic topological concepts

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

28 hours of lectures, 14 hours of excercises, independent work

Target group:

Major and minor students

Prerequisites and co-requisites:

Functions and limits, Continuity and derivative, Introduction to Matrices

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

Fail, 1-5

Person responsible:

Ville Suomala

Working life cooperation:

No

Other information:

-

802354A: Basics in Algebra, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
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 cr

Language of instruction:

Finnish

Timing:

1. year, 3. period

Learning outcomes:

After completing the course, student is able to

- derive and proof main results in the course
- use and apply different proof techniques
- recognize algebraic structures and the concepts
- see connections and differences between different algebraic structures

Contents:

The course includes basics in arithmetics and algebraic structures, such as, congruence, residue classes, prime numbres, Euclidean algorithm, the fundamental theorem of arithmetic, Euler-Fermat formula, groups and morphisms. The course gives an understanding of algebraic terms and concepts used in mathematics and physics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises

Target group:

Major and minor students

Prerequisites and co-requisites:

802151P Introduction to mathematical deduction

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Kari Myllylä

Working life cooperation:

-

801195P: Probability Theory, 5 op

Voimassaolo: 01.01.2011 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

2nd year, 2nd period.

Learning outcomes:

Upon completing the 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. In the beginning high school level probability is reviewed and after that axiomatic treatment of the theory starts. The central concepts discussed include probability space, conditional probability, independence, and random variable together with its distribution and expected value.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h of lectures, 14 h of exercises, 91 h of independent study

Target group:

Mathematics majors and minors

Prerequisites and co-requisites:

Integral 800318A

Recommended optional programme components:

-

Recommended or required reading:

Lectures.
Text book: Pekka Tuominen, "Todennäköisyyslaskenta I", Limes ry, Helsinki.

Assessment methods and criteria:

Final exam and small tests.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Hanna Heikkinen

Working life cooperation:

-

A325001: Mathematics, basic studies, 25 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory Studies

802151P: Introduction to mathematical deduction, 5 op

Voimassaolo: 01.08.2009 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay802151P	Introduction to mathematical deduction (OPEN UNI)	5.0 op

ECTS Credits:

5 ECTS cr

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 techniquesis
- able to use basic set theoretic concepts and definitionsis
- able to define and apply basic definitions related to functions

Contents:

The course in an introduction to mathematical deduction and introduces different types of proof techniques. The course covers the concepts familiar from upper secondary school studies more profound way. Main concepts in this course are basic set theory and functions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h

Target group:

Major and minor students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/Fail

Person responsible:

Marko Leinonen

Working life cooperation:

-

800119P: Functions and limit, 5 op

Voimassaolo: 01.01.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Salmi
Opintokohteen kielet: Finnish
Leikkaavuudet:

802162P	Continuity and Limit	5.0 op
802155P	Continuity and limit	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year, 1st period

Learning outcomes:

Upon completing the course the student is
- able to apply the triangle inequality and make approximations

- able to manipulate elementary functions such as polynomials and trigonometric functions
- able to define the limit of a sequence and the limit of a function as well as apply these definitions
- able to apply different techniques to determine limits.

Contents:

The course concerns real-valued functions of one variable. In particular elementary functions are defined and the monotonicity of functions is studied. The notion of absolute value is reviewed and applied to approximation. Also the triangle inequality is used in approximation. The central concept is the limit of a function, which is introduced via the limit of a sequence. The aim of the course is to improve deductive skills as well as computational skills.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Introduction to mathematical deduction 802151P is recommended to be taken simultaneously (or earlier).

Recommended optional programme components:

-

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam, exercises

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Other information:

Replaces the course 802161P Introduction to real functions.

802120P: Introduction to Matrices, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

802118P	Linear Algebra I	4.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

1. year, 4. periodi

Learning outcomes:

After completing the course the student is able to
- apply arithmetic operations of matrices
- solve system of linear equations by matrix methods
- study linear depence and linear indepence of vectors
- recognize the subspace of R^n and understands the concepts of basis and dimension of a vector space
- analyse matrices by the parameters and the vectors.

Contents:

Vectors and matrices, Systems of linear equations, determinant of a matrix, subspaces of R^n, linear depence and linear indepence of vectors, base, dimension, eigenvalues and eigenvectors of a matrix, diagonalization.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, Exercises 14 h

Target group:

Major and minor studies

Prerequisites and co-requisites:

802151P Introduction to Mathematical Deduction

Recommended or required reading:

Lecture notes
Grossman, S.I. : Elementary Linear Algebra, David C. Lay: Linear Algebra and Its Applications.

Assessment methods and criteria:

Final exam

Grading:

Fail, 1-5

Person responsible:

Marko Leinonen

Working life cooperation:

-

806113P: Introduction to Statistics, 5 op

Voimassaolo: 01.01.2011 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Hanna Heikkinen
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 ECTS cr

Language of instruction:

Finnish

Timing:

4th period. 1st or 2nd year of studies.

Learning outcomes:

Upon completion of the course, student will be
- able to identify and define the main principles of statistical research, collection of the data and analysis
- able to apply basic methods of descriptive statistics and statistical inference in simple quantitative research using a statistical software
- able to critically evaluate results of the statistical research presented in media
- prepared for teaching statistics in secondary school and high school
- prepared for participating in a group.

Contents:

- the nature and the meaning of statistics
- data and the acquisition of them: observations, variables, measuring and designs of a study
- the descriptive statistics of empirical distributions: tables, graphical presentations and descriptive measures of center, variation and dependence
- the most important probability distributions
- the principles and the basic methods of statistical inference: random sample, sample statistics, point estimation, confidence intervals and statistical testing of hypotheses.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 16 h (partly compulsory) / instructed group work (28 h) / independent work 80 h. Group works will be returned. Additional independently implemented learning diary tasks. Independent work contains also preparation for group work and peer assessment.

Target group:

Students of mathematics and physics and other interested students.

Prerequisites and co-requisites:

The recommended prerequisite prior to enrolling for the course is the completion of the courses: 802151P Introduction to mathematical deduction and 800119P Functions and limit.

Recommended optional programme components:

After the course, student is able to continue other statistics courses.

Recommended or required reading:

Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. Practical works and learning diaries are assessed weekly. In addition web tests. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria is available in the beginning of the course. In addition one compulsory lecture and peer assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Hanna Heikkinen

Working life cooperation:

No

801195P: Probability Theory, 5 op

Voimassaolo: 01.01.2011 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

2nd year, 2nd period.

Learning outcomes:

Upon completing the 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. In the beginning high school level probability is reviewed and after that axiomatic treatment of the theory starts. The central concepts discussed include probability space, conditional probability, independence, and random variable together with its distribution and expected value.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h of lectures, 14 h of exercises, 91 h of independent study

Target group:

Mathematics majors and minors

Prerequisites and co-requisites:

Integral 800318A

Recommended optional programme components:

-

Recommended or required reading:

Lectures.
Text book: Pekka Tuominen, "Todennäköisyyslaskenta I", Limes ry, Helsinki.

Assessment methods and criteria:

Final exam and small tests.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Hanna Heikkinen

Working life cooperation:

-

A325002: Mathematics, intermediate studies, 35 op

Opiskelumuoto: Intermediate Studies
Laji: Study module
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Myllylä
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory Studies

800317A: Continuity and derivative, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Salmi

Opintokohteen kielet: Finnish

Leikkaavuudet:

802163P	Derivative	5.0 op
802156P	Derivative	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year, 2nd period

Learning outcomes:

Upon completing the course the student is
- able to define the concept of continuous function and apply this definition in examples and deductions
- able to determine derivatives of functions
- able to apply derivative to study functions
- able to appy the concepts of continuity and derivative in various problems, including deductions

Contents:

The course concerns continuity and derivative of real-valued functions of one variable. The central topics are the intermediate value theorem, the chain rule, the derivative of inverse functions, the mean value theorem and its applications. Differential calculus is also applied to various problems. The aim of the course is to improve mathematical thinking as well as computational skills.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Functions and limit 800119P, Introduction to mathematical deduction 802151P

Recommended optional programme components:

-

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam, exercises

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

no

Other information:

Replaces the course 802163P Derivative.

800318A: Integral, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Ville Suomala

Opintokohteen kielet: Finnish

Leikkaavuudet:

802164P	Series and Integral	5.0 op
802353A	Series and Integrals	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

1st year 3rd period

Learning outcomes:

After completing the course, the student
- understands the connection between derivative and extremal values
- manages the basics of integration theory
- understands the connection and differences between definite and indefinite integral
- is able to understand the connetcion between the integral and the derivative

Contents:

Higher order derivatives, extremal values, Taylor polynomials, Riemann integral, The fundamental theorem of Calculus, Eksponent function and logarithm, integration by parts, integration by substitution, imporper integral

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, independent work

Target group:

1st year mathematics and physics students as well as students taking mathematics as a minor subject

Prerequisites and co-requisites:

Functions and limit, Continuity and derivative

Recommended or required reading:

In addition to the material hand out in the course, for example the book P. Harjulehto, R. Klén, M. Koskenoja, Analyysiä reaaliluvuilla.

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Ville Suomala

Working life cooperation:

no

Other information:

Replaces the course 802164P Series and integral.

800328A: Calculus of several variables, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Salmi

Opintokohteen kielet: Finnish

Leikkaavuudet:

802351A	Vector Calculus	5.0 op
800322A	Multidimensional analysis	8.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd year, 1st period

Learning outcomes:

After completing the course the student is able to:
- operate functions of several variables
- apply derivates of functions of several variables
- calculate multiple integrals

Contents:

The course concerns calculus of severable variables. The central concepts of the course are partial derivative, gradient, divergence, curl and multiple integral. Integral theorems related to functions of several variables are also presented. In addition power series are introduced. The course offers basic tools for applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h study a part of which may be guided

Target group:

Mathematics and physics major and minor students

Prerequisites and co-requisites:

Continuity and derivative 800317A, Integral 800318A, Introduction to matrices 802120P

Assessment methods and criteria:

Final exam

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

No

Other information:

Replaces the course 802351A Vector calculus

802320A: Linear Algebra, 5 op

Voimassaolo: 01.06.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

802119P Linear Algebra II 5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish and English

Timing:

2nd year, 2nd period

Learning outcomes:

On successful completion of this course, the student will be able to
- apply the definition of linear space and concepts associated with linear spaces such as basis
- work with linear mappings and their matrix representations
- apply the definition of inner product space and concepts associated with inner product spaces such as orthogonality
- prove results related to linear spaces

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 and concepts associated with linear mappings such as kernel, eigenvalues and eigenvectors.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises, 91 h independent study

Target group:

Mathematics majors and minors students

Prerequisites and co-requisites:

802120P Introduction to Matrices

Recommended optional programme components:

-

Recommended or required reading:

http://cc.oulu.fi/~tma/OPETUS.html

Assessment methods and criteria:

Final exam

Grading:

1-5, fail

Person responsible:

Tapani Matala-aho

Working life cooperation:

No

Other information:

-

802354A: Basics in Algebra, 5 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
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 cr

Language of instruction:

Finnish

Timing:

1. year, 3. period

Learning outcomes:

After completing the course, student is able to

- derive and proof main results in the course
- use and apply different proof techniques
- recognize algebraic structures and the concepts
- see connections and differences between different algebraic structures

Contents:

The course includes basics in arithmetics and algebraic structures, such as, congruence, residue classes, prime numbres, Euclidean algorithm, the fundamental theorem of arithmetic, Euler-Fermat formula, groups and morphisms. The course gives an understanding of algebraic terms and concepts used in mathematics and physics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h lectures, 14 h exercises

Target group:

Major and minor students

Prerequisites and co-requisites:

802151P Introduction to mathematical deduction

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

1-5

Person responsible:

Kari Myllylä

Working life cooperation:

-

802357A: Euclidean Spaces, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Ville Suomala
Opintokohteen kielet: Finnish
Leikkaavuudet:

802352A Euclidean Topology 4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

2nd year 4t period

Learning outcomes:

After passing the course the student
- will be able to define basic topological concepts
- will be able to handle sequences
- will be able to justify basic properties of continuous vector valued functions

Contents:

Sequences, continuity and limit of a vector valued function, basic topological concepts

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

28 hours of lectures, 14 hours of excercises, independent work

Target group:

Major and minor students

Prerequisites and co-requisites:

Functions and limits, Continuity and derivative, Introduction to Matrices

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Final exam

Grading:

Fail, 1-5

Person responsible:

Ville Suomala

Working life cooperation:

No

Other information:

-

800331A: Proseminar, 10 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Kari Myllylä

Opintokohteen kielet: Finnish

Leikkaavuudet:

801323A Seminar 6.0 op

ECTS Credits:

10 ECTS credits / 266 hours of work

Language of instruction:

Finnish

Timing:

2nd and 3rd year

Learning outcomes:

After completing the Bachelor's thesis:
1) student is able to form a clear and logical
2) student is able to concentrate to important and essential details in the subject of thesis
3) student gain experience presenting mathematical concept and research studies

Contents:

Proseminar (Bachelor's thesis) is a small mathematical study based on literature. Student is familiarized to write mathematical texts and obtain information using literature. Thesis includes a oral presentation from the subject of the thesis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Seminars and own work

Target group:

Major students

Prerequisites and co-requisites:

Compulsory basic and intermediate studies

Recommended optional programme components:

Maturity test is written from the topic of Bachelor's thesis

Assessment methods and criteria:

Bachelor's thesis

Grading:

Pass/Fail

Person responsible:

Kari Myllylä

800300A: Maturity test, 0 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

802355A: Algebraic Structures, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

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
Learning outcomes:
After completing the course, student is able to

- derive and proof main results in the course
- use and apply different proof techniques
- recognize algebraic structures and the concepts
- see connections and differences between different algebraic structures

Contents:
The course introduces algebraic structures, such as rings, subrings, ideals, integral domains, fields and finite fields. The course gives an understanding of algebraic terms and concepts used in mathematics and physics.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
28 h lectures, 14 h exercises
Target group:
Major students
Prerequisites and co-requisites:
802354A Basics in Algebra
Recommended optional programme components:
-
Recommended or required reading:
Lecture notes
Assessment methods and criteria:
Final exam
Grading:
1-5
Person responsible:
Kari Myllylä
Working life cooperation:
-

800321A: Series and Approximation, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Salmi

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
Finnish
Timing:
2nd year
Learning outcomes:
Upon completing the course the student is
- able to manipulate series and investigate their convergence
- able to explain the difference between uniform and pointwise convergence
- able to study the uniform and pointwise convergence of function sequences and series
- able to use power series in approximation
Contents:
The course concerns both number series and function series. The central topics are convergence tests, pointwise and uniform convergence, power series and the Taylor series. The course gives also an introduction to approximation of functions by polynomials for example.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
28 h lectures, 14 h exercises, 91 h independent study
Target group:
Mathematics majors
Prerequisites and co-requisites:
Continuity and derivative 800317A and Integral 800318A
Recommended optional programme components:
-
Assessment methods and criteria:
Final exam
Grading:
1-5, fail
Person responsible:
Pekka Salmi
Working life cooperation:
no

A326602: Statistics, intermediate studies, 35 op

Opiskelumuoto: Intermediate Studies

Laji: Study module

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory Studies

805305A: Introduction to Regression and Analysis of Variance, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Päkkilä

Opintokohteen kielet: Finnish

Leikkaavuudet:

806112P Basic Methods of Data Analysis 10.0 op

Ei opintojaksokuvauksia.

805306A: Introduction to Multivariate methods, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari Päkkilä
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Choose from the following 15 ECTS cr

805350A: Estimation and Test Theory, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Läärä Esa
Opintokohteen kielet: Finnish
Leikkaavuudet:

805310A Statistical Inference I 10.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year during B.Sc. studies

Learning outcomes:

After successful completion of the course the student can describe the basic principles of frequentist and bayesian statistical inference, compute point and interval estimates, test statistics and P-values based on likelihood function of models with few parameters, and interpret results thus obtained.

Contents:

Statistical model and observational data; construction and properties of point estimators and confidence intervals; likelihood ratio, score and Wald test statistics and their asymptotic sampling distribution; jackknife and bootstrap methods; elements of bayesian inference; use of R environment in inferential problems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (28 h), practicals and computer classes (14 h), and independent work

Target group:

Students having statistics as the major or a minor subject

Prerequisites and co-requisites:

Likelihood inference, Introduction to probability theory I, Basic Methods of Data Analysis

Recommended optional programme components:

Needed in nearly all intermediate and advanced courses of statistics

Recommended or required reading:

Migon, H.S., Gamerman, D., Louzada, F. Statistical Inference: An Integrated Approach, Second Edition. Chapman & Hall/CRC, 2014; Pawitan, Y: In All Likelihood: Statistical Modelling and Inference Using Likelihood, Oxford, 2001; Sprott, D. A.: Statistical Inference in Science, Springer, 2000; Kalbfleisch, J.G.: Probability and Statistical Inference, volume 2: Statistical Inference, Second Edition, Springer, 1985.

Assessment methods and criteria:

Final Exam. Read more about assessment criteria at the University of Oulu webpage

Grading:

Fail, 1-5

Person responsible:

Esa Läärä

Working life cooperation:

No

Other information:

-

805351A: Linear Regression, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Läärä Esa
Opintokohteen kielet: Finnish
Leikkaavuudet:

806359A	Regression modelling	10.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

2nd or 3rd year during B.Sc. studies

Learning outcomes:

After successful completion of the course the student can describe basic concepts and assumptions in linear models for continuous outcome variables as well as main principles of regression modelling, and can also apply these methods in analysis of experimental and non-experimental observation data.

Contents:

Linear regression models for a continuous outcome variable; formulation of the model, selection of variables and interpretation of parameters; fitting the models, estimation of parameters and prediction using method of least squares; model criticism and diagnostics; use of R environment and SAS software in modelling.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (28 h), practicals and computer classes (14 h) and independent work.

Target group:

Students having statistics as the major or a minor subject.

Prerequisites and co-requisites:

Basic Methods of Data Analysis; Core courses in the B.Sc curriculum of mathematical sciences.

Recommended optional programme components:

Prerequisite to the course Generalized Linear Models

Recommended or required reading:

Weisberg, S. (2014). Applied Linear Regression, fourth edition, Hoboken NJ: John Wiley.

Assessment methods and criteria:

Active participation in practicals and final exam. Read more about assessment criteria at the University of Oulu webpage

Grading:

Fail, 1-5

Person responsible:

Esa Läärä

Working life cooperation:

No

Other information:

-

805353A: Statistical Software, 5 op

Voimassaolo: 01.06.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mathematics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

805340A	Statistical Software	4.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

3. year studies. Fall semester. Timing varies.

Learning outcomes:

After successful completion of the course the student can use independently major statistical software needed in data analysis.

Contents:

The course covers R, SAS and IBM SPSS, and their most important tools for data management, statistical computation, graphics and programming will be introduced and proficiency for their fluent use is acquired.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

42 h lectures, exercises and tutoring. 88 h learning tasks and self-study.

Target group:

Major and minor students

Prerequisites and co-requisites:

806112P Basic methods of data-analysis

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Home works and/or exam

Grading:

Numerical grading 1-5 (or fail)

Person responsible:

Hanna Heikkinen

Working life cooperation:

No

801396A: Introduction to Probability Theory II, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd or 3rd year

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 central topics are the moments of a distribution, the probability generating function, the Law of Large Numbers, the Central Limit Theorem, two-dimensional distibutions as well as conditional distributions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

28 h of lectures, 14 h of exercises, 91 h of independent study

Target group:

Mathematics major and minor students. Recommended for students aiming for the profile of computational mathematics and data science.

Prerequisites and co-requisites:

801195P Introduction to probability I, 800328A Calculus of several variables (or Vector Calculus)

Recommended or required reading:

P. Tuominen: Todennäköisyyslaskenta I, Limes 2002 and other books on probability.

Assessment methods and criteria:

Final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5, fail

Person responsible:

Pekka Salmi

Working life cooperation:

-

805349A: Likelihood and Bayesian Inference, 5 op

Voimassaolo: 01.06.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Läärä Esa
Opintokohteen kielet: Finnish
Leikkaavuudet:

805310A Statistical Inference I 10.0 op

Ei opintojaksokuvauksia.

H325104: General Physics, 25 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Basic and intermediate studies in general physics

766116P: Radiation physics, biology and safety, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761116P Radiation physics, biology and safety 3.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

Spring

Learning outcomes:

The student knows the origin of ionising radiation and the principles of its interaction with matter. He/she can explain the essential effects of ionising radiation on human tissue and remembers the principles of radiation safety and laws and regulations (in Finland) concerning this.

Contents:

The topics of the course include the origin of ionizing radiation e.g. as a result of radioactive decay and in nuclear reactions, the interaction between radiation and matter, the detection and measurements of radiation, physical quantities and measuring units related to radiation, radiation in the environment, and examples of utilizing radiation. The biologic effects of radiation and the legislation on radiation safety are also discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, problem solving exercises 8 h and laboratory exercises 8 h. Self-study 90 h.

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

740368A Radiation and safety

Recommended or required reading:

Lecture material (in Finnish), Laws and regulations concerning radiation safety

Assessment methods and criteria:

Final examination

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

761315A: Laboratory Exercises in Physics 3, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761615S	Laboratory exercises in physics 3	5.0 op
766308A	Laboratory exercises in physics 3	2.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

2. spring - 3. spring

Learning outcomes:

After the course students are capable for planning, performing, data handling and results reporting on physical measurements. Students are able to evaluate the validity of observations and to estimate the errorlimits and the possible sources of errors.

Contents:

The course is a follow up for the Laboratory exercises in physics 1 and 2 courses where the methods learned will be used to familiarize oneself with the wide range of physics phenomena in laboratory circumstances. The laboratory exercises may be chosen from a variety of works from at the physics exercise laboratory or from the works given at the research group laboratories (1/2 op / exercise). Exercises already included in the course "Laboratory exercises in physics 2" may not be selected. Possibility is also to choose special research related exercises (1 op / exercise, max. 1 exercise/research group) where students are included in the daily topics of research supervised by the researchers at research groups of the department. Research related exercises are to be agreed with a supervising researcher and the correspondent of the course.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Laboratory exercises in small groups

Target group:

No specific target qroup

Prerequisites and co-requisites:

Courses 761121P Laboratory exercises in physics 1 and 766106P Laboratory exercises in physics 2

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Laboratory exercise instructions

Assessment methods and criteria:

Written reports of exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/766308A/

763312A: Quantum mechanics I, 10 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

763612S	Quantum mechanics I	10.0 op

ECTS Credits:

10 credits

Language of instruction:

Finnish / English depending on the audience

Timing:

3rd autumn

Learning outcomes:

The most important goal of the course is the development of a quantum mechanical frame-of-mind. After the course, the student knows the postulates of quantum mechanics and can solve the Schrödinger equation in such one- and three-dimensional problems that have important applications in condensed matter physics and in atomic, nuclear and molecular physics. The student will also learn to derive the uncertainty principle and use it to interpret what happens in a quantum mechanical measurement.

Contents:

Quantum mechanics, together with the general theory of relativity, lays the foundation for the modern scientific understanding of the nature. Recent developments in nanotechnology has also brought quantum-based applications into our everyday lives. However, the greatest influence quantum mechanics brings is on how we understand and interpret the behavior of the basic building blocks of nature. One of the interesting results of quantum mechanics is the uncertainty principle which means, for example, that a particle does not possess well defined position and velocity at a given time. This has far-reaching consequences in our understanding of the structure of matter, and even of the present amount and distribution of galaxies in the known universe. The inherent indeterminacy in the classical state of the particles implies that the microscopic particles have to be described with the so-called wave function, which determines the probability density of finding the particle at an arbitrary location. The course begins with the introduction of the basic principles and postulates of quantum mechanics. As an example, several one-dimensional problems for the time-evolution of the wave function are solved. The uncertainty principle is derived in its general form, and applied to the simultaneous measurement of position and velocity. In three-dimensional problems, spherical symmetry is connected with the angular momentum. The corresponding operators and quantum numbers are derived. As an example, the quantized energy states of hydrogen atom are solved. The general formulation of quantum mechanics in terms of abstract Hilbert space and its linear transformations is presented, and shown to be equivalent with the wave function formalism. The properties of the general theory are illustrated in terms of the two quantum paradigms: the two-level system and the harmonic oscillator.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 50 h, 12 exercises (á 3 h), self-study and examination 184 h

Target group:

Compulsory for theoretical physicists and physicists. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics (766326A) and knowledge of linear algebra and differential equations.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

J. Tuorila: Kvanttimekaniikka I (2013, in Finnish). D. Griffiths: Introduction to Quantum Mechanics (2005). Course material availability can be checked here.

Assessment methods and criteria:

Two written intermediate examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Matti Alatalo

Working life cooperation:

No work placement period

Other information:

Course website

At least one of the courses listed below must be chosen

766355A: Basics of space physics, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766345A	Basics of space physics	6.0 op

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

In most years

Learning outcomes:

The student identifies and is capable of naming the basic concepts and processes of solar activity, solar wind, magnetosphere and ionosphere. He can explain the reasons for different phenomena in space physics and apply the theory to simple problems.

Contents:

This lecture course gives the basic view on the near space around the Earth. The solar wind is a continuous plasma flow emerging from the Sun. It compresses the magnetic field of the Earth into a region with a cometary shape, called the magnetosphere. The solar radiation and charged particles precipitating from the magnetosphere ionise the upper part of the atmosphere thus creating the ionosphere. The lecture course contains the physics of the Sun, the solar wind, the magnetosphere and the ionosphere, as well as the effects of the the Sun and the solar wind on the magnetosphere and the ionosphere. There are plasma bursts in the Sun causing disturbances in the surrounding space. These phenomena create the varying space weather. The space weather may affect e.g. telecommunication links, electrical power networks and operation of satellites. It may also cause health hazards for astronauts. Since the near space contains ionised gas in magnetic field, plasma physics is used in explaining the phenomena.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h, exercises 20 h, self-study 73 h

Target group:

Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

K. Mursula: Avaruusfysiikan perusteet (Basics of Space physics; in Finnish; distributed in the web page of the Department). Supporting material for instance: H. Koskinen: Johdatus plasmafysiikkaan ja sen avaruussovellutuksiin (Limes ry); A. Brekke: Physics of the upper polar atmosphere (Wiley & Sons). Course material availability can be checked here.

Assessment methods and criteria:

Two written intermediate examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Kalevi Mursula

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/766355A
Passing the course helps in getting drafted in various project works of the space physics group.

761359A: Spectroscopic methods, 5 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766359A	Spectroscopic methods	7.0 op

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

Every second year (odd year), spring term

Learning outcomes:

After completion, student knows the principles of various spectroscopic methods and what kind of physical /biophysical phenomena can be studied and what kind of information can be obtained with these methods.

Contents:

Basic principles of infrared, mass and NMR spectroscopy and X-ray analytics are introduced

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 46 h, exercises 24 h, self-study 63 h

Target group:

Compulsory for students in biophysics. Recommended for students directing at some of the lines in atomic, molecular and materials physics. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Partly distributed through net, and partly as paper copies during the course.

Assessment methods and criteria:

Two written examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Ville-Veikko Telkki

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761359A/

A325704: Astronomy Minor, 25 - 40 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Compulsory

765114P: Fundamentals of astronomy I, 5 op

Voimassaolo: 01.03.2014 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pertti Rautiainen
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

1st Spring, Period 3

Learning outcomes:

Student can describe the basic physical processes behind astronomical phenomena and can solve mathematical problems related to the course.

Contents:

A more detailed basic astronomy course (part one), that contains e.g. the fundamentals of electromagnetic radiation, astronomical instruments, celestial mechanics and the physical environment of the planets.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 26 h, exercises 12 h, self-study 95 h

Target group:

First or second year students in e.g. astronomy, physics, geophysics or geology. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

H. Karttunen, K.-J. Donner, P. Kröger, H. Oja and M. Poutanen (eds.): Fundamental astronomy, Springer, 2007, chapters 1-7, Carroll, B.W., Ostlie, D.A., An Introduction to Modern Astrophysics, Pearson 2007. (4. edition or newer.)
Course material availability can be checked here.

Assessment methods and criteria:

One written examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Pertti Rautiainen

Working life cooperation:

No work placement period

Other information:

https://noppa.oulu.fi/noppa/kurssi/765114p/etusivu

765115P: Fundamentals of astronomy II, 5 op

Voimassaolo: 01.03.2014 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

5 credits

Timing:

1st Spring, Period 4

Learning outcomes:

Student can describe the basic physical processes behind astronomical phenomena and can solve mathematical problems related to the course.

Contents:

A more detailed basic astronomy course (part two), that contains e.g. stellar structure and evolution, the structure of the Milky Way and principles of cosmology.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 24 h, exercises 12 h, self-study 97 h

Target group:

First or second year students in e.g. astronomy, physics, geophysics or geology. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

H. Karttunen, K.-J. Donner, P. Kröger, H. Oja and M. Poutanen (eds.): Fundamental astronomy, Springer, 2007, chapters 8-20, Carroll, B.W., Ostlie, D.A., An Introduction to Modern Astrophysics, Pearson 2007.

Course material availability can be checked here.

Assessment methods and criteria:

One written examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Pertti Rautiainen

Working life cooperation:

No work placement period

Other information:

https://noppa.oulu.fi/noppa/kurssi/765115p/etusivu

765309A: Galaxies, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Sébastien Comerón Limbourg
Opintokohteen kielet: English
Leikkaavuudet:

765630S	Galaxies	6.0 op
765330A	Galaxies and cosmology	6.0 op

Ei opintojaksokuvauksia.

765384A: Physics of the solar system I, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jürgen Schmidt
Opintokohteen kielet: English
Leikkaavuudet:

767304A	Solar System Physics	5.0 op
767604S	Solar System Physics	5.0 op
765684S	Physics of the Solar System I	5.0 op
765359A	Physics of the Solar System I	7.0 op
765659S	Physics of the Solar System I	7.0 op

Ei opintojaksokuvauksia.

Choose another: Major Students of Astronomy take 765307A Research project of astronomy and Minor Students of Astronomy take 765308A History of astronomy.

765307A: Research Project of Astronomy I, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Heikki Salo
Opintokohteen kielet: Finnish
Leikkaavuudet:

765332A Study project in astronomy 1 5.0 op
765332A-01 Data processing in astronomy 0.0 op
765332A-02 Study project 0.0 op
765135P Data processing in astronomy 2.0 op

Ei opintojaksokuvauksia.

Compulsory

765307A-01: Research Project of Astronomy I: Data processing in astronomy, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

765332A-02 Study project 0.0 op
765332A Study project in astronomy 1 5.0 op
765332A-01 Data processing in astronomy 0.0 op
765135P Data processing in astronomy 2.0 op

Ei opintojaksokuvauksia.

765307A-02: Research Project of Astronomy I: Study project, 0 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

765332A-01 Data processing in astronomy 0.0 op
765332A-02 Study project 0.0 op
765332A Study project in astronomy 1 5.0 op

Ei opintojaksokuvauksia.

765308A: History of astronomy, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course

Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pertti Rautiainen
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay765308A History of astronomy (OPEN UNI) 5.0 op
765107P Astronomical world view 5.0 op
765107P-02 Astronomical world view (part 2): History of astronomy 0.0 op
765106P History of astronomy 3.0 op

Ei opintojaksokuvauksia.

It is strongly recommended to take at least 15 ECTS cr optional study in Astronomy.

765304A: Celestial mechanics I, 5 - 8 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

765386A: Interstellar Matter, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Sébastien Comerón Limbourg
Opintokohteen kielet: English, Finnish

Ei opintojaksokuvauksia.

765358A: Cosmology, 5 op

Voimassaolo: 29.10.2013 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

765658S Cosmology 5.0 op

Ei opintojaksokuvauksia.

765301A: Introduction to Nonlinear Dynamics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies

Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jürgen Schmidt
Opintokohteen kielet: English, Finnish
Leikkaavuudet:

765601S Introduction to Nonlinear Dynamics 5.0 op

Ei opintojaksokuvauksia.

767303A: Observational Astronomy I, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Vitaly Neustroev
Opintokohteen kielet: English

Ei opintojaksokuvauksia.

767302A: Physics of the solar system II, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Jürgen Schmidt
Opintokohteen kielet: English, Finnish
Leikkaavuudet:

767602S Physics of the solar system II 5.0 op

Ei opintojaksokuvauksia.

767301A: Time Series Analysis in Astronomy, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Vitaly Neustroev
Opintokohteen kielet: Finnish, English
Leikkaavuudet:

767601S Time Series Analysis in Astronomy 5.0 op
765368A Time Series Analysis in Astronomy 6.0 op
765668S Time Series Analysis in Astronomy 6.0 op

Ei opintojaksokuvauksia.

A325304: Theoretical Physics Minor, 25 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Intermediate studies in theoretical physics

763312A: Quantum mechanics I, 10 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

763612S Quantum mechanics I 10.0 op

ECTS Credits:

10 credits

Language of instruction:

Finnish / English depending on the audience

Timing:

3rd autumn

Learning outcomes:

The most important goal of the course is the development of a quantum mechanical frame-of-mind. After the course, the student knows the postulates of quantum mechanics and can solve the Schrödinger equation in such one- and three-dimensional problems that have important applications in condensed matter physics and in atomic, nuclear and molecular physics. The student will also learn to derive the uncertainty principle and use it to interpret what happens in a quantum mechanical measurement.

Contents:

Quantum mechanics, together with the general theory of relativity, lays the foundation for the modern scientific understanding of the nature. Recent developments in nanotechnology has also brought quantum-based applications into our everyday lives. However, the greatest influence quantum mechanics brings is on how we understand and interpret the behavior of the basic building blocks of nature. One of the interesting results of quantum mechanics is the uncertainty principle which means, for example, that a particle does not possess well defined position and velocity at a given time. This has far-reaching consequences in our understanding of the structure of matter, and even of the present amount and distribution of galaxies in the known universe. The inherent indeterminacy in the classical state of the particles implies that the microscopic particles have to be described with the so-called wave function, which determines the probability density of finding the particle at an arbitrary location. The course begins with the introduction of the basic principles and postulates of quantum mechanics. As an example, several one-dimensional problems for the time-evolution of the wave function are solved. The uncertainty principle is derived in its general form, and applied to the simultaneous measurement of position and velocity. In three-dimensional problems, spherical symmetry is connected with the angular momentum. The corresponding operators and quantum numbers are derived. As an example, the quantized energy states of hydrogen atom are solved. The general formulation of quantum mechanics in terms of abstract Hilbert space and its linear transformations is presented, and shown to be equivalent with the wave function formalism. The properties of the general theory are illustrated in terms of the two quantum paradigms: the two-level system and the harmonic oscillator.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 50 h, 12 exercises (á 3 h), self-study and examination 184 h

Target group:

Compulsory for theoretical physicists and physicists. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Atomic physics (766326A) and knowledge of linear algebra and differential equations.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

J. Tuorila: Kvanttimekaniikka I (2013, in Finnish). D. Griffiths: Introduction to Quantum Mechanics (2005). Course material availability can be checked here.

Assessment methods and criteria:

Two written intermediate examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Matti Alatalo

Working life cooperation:

No work placement period

Other information:

Course website

763313A: Quantum mechanics II, 10 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

763613S	Quantum mechanics II	10.0 op

ECTS Credits:

10 ECTS cr

Language of instruction:

English (or Finnish, depending on the participants)

Timing:

3rd spring

Learning outcomes:

Course continues the development of the quantum mechanical frame-of-mind. After the course, the student can solve different physical eigenvalue problems by using matrices, can calculate the quantum numbers of the system, and can estimate the effect of a perturbation. The student can also solve problems that arise in low-energy scattering.

Contents:

Quantum mechanics of two and many particle systems is discussed in the context of, e.g.the periodic table of elements and the band structure of solids. For atomic, molecular and nuclear physics, the essential quantity in classifying states is the angular momentum, which we study in detail including the particle spin. Effects of weak perturbations are studied in terms of time-independent and time-dependent perturbation theory. As an example, we calculate fine-structure corrections to hydrogen atom, Zeeman effect, and the

bound states of ionic Hydrogen molecule and He-atom. We derive the Fermi golden rule to calculate radiation induced transition rates between eigenstates. Finally we study interactions between particles using scattering theory. Concepts such as cross section, phase shift, scattering amplitude and Green's function are introduced.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 50 h, 12 exercises, self-study and examination 184 h

Target group:

For all interested in modern, quantum phenomena, compulsory for theoretical physicists. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Quantum Mechanics I (763312A).

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

J. Tuorila: Kvanttimekaniikka II (2014, in Finnish). D. Griffiths: Introduction to Quantum Mechanics (2005). Course material availability can be checked here.

Assessment methods and criteria:

Two written intermediate examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Matti Alatalo

Working life cooperation:

No work placement period

Other information:

Course website

761317A: Numerical Programming, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Jänkälä
Opintokohteen kielet: Finnish, English

Ei opintojaksokuvauksia.

763314A: Analytical mechanics, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Erkki Thuneberg

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A326010: Biomedical Physics Minor, 25 op

Opiskelumuoto: Basic Studies
Laji: Study module
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory Studies (25 ECTS cr)

764163P: Introduction to Biomedical Physics, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kyösti Heimonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

764163P-01	Basic biophysics (part 1): Introduction to biophysics	0.0 op
764163P-02	Introduction to Biomedical Physics (part 2)	0.0 op
764103P	Introduction to biophysics	2.0 op
764162P	Introduction to biophysics	3.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

1st spring

Learning outcomes:

Student can describe and explain some basics and concepts of certain areas of biomedical physics and knows central research targets and methods of biomedical physics.

Contents:

The course provides an introdution to biomedical physics from the point of views of biosciences and medical physics, and introduces basics of research and recording methods of the field, biophysical models, biosystems analysis, cellular and biomolecular physics, physics of fluids and their flow, and some other special issues. The course includes also a short introduction to some fields of physics that are of particular and occupational interest to medical physicists.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 36 h, self-study 96 h, final exam

Target group:

Mainly students in Physics B.Sc. program.
Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Lectures and lecture notes

Assessment methods and criteria:

Exam

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Kyösti Heimonen

Working life cooperation:

No work placement period

Other information:

Course website

764125P: Foundations of cellular biophysics, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kyösti Heimonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

764115P	Foundations of cellular biophysics	4.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish

Timing:

2nd spring

Learning outcomes:

After finishing the course the student is able to describe the foundations or basics of cellular structure and function, to present the biophysical background for some of these, and to solve simple problems and calculations concerning cellular biophysics and -chemistry. In addition, the student can specify and categorize some of the central fields of cell biology and cellular biophysics.

Contents:

In this course cellular function is considered from the point of views of biophysics and medical physics. The course concentrates on the subjects of energy metabolism, information transfer, and the cellular structures and features that are of interest in biophysics or medical physics. The course contains, for instance, introduction to physical chemistry of cells, structure and evolution of cells and cell membranes, cellular homeostasis, kinetics of enzyme reactions, basics of cell membrane function and transportation phenomena, introduction to electrical phenomena of cell membranes, cellular energy sources and metabolism, and the basics of cellular signalling and information processing.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 9 h, self-study 96 h, home exam and final exam

Target group:

Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Introduction to biomedical physics (764163P) is recommended to be done before this course.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously.

Recommended or required reading:

Lectures, lecture notes, P.J. Antikainen, Biotieteiden fysikaalista kemiaa, WSOY, Helsinki 1981 (partly); J. Heino and M. Vuento, Solubiologia, WSOY, Porvoo 2002 or newer edition (partly). Course material availability can be checked here.

Assessment methods and criteria:

Home exam, final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Kyösti Heimonen

Working life cooperation:

No work placement period

Other information:

Course website

766116P: Radiation physics, biology and safety, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761116P	Radiation physics, biology and safety	3.0 op

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish

Timing:

Spring

Learning outcomes:

The student knows the origin of ionising radiation and the principles of its interaction with matter. He/she can explain the essential effects of ionising radiation on human tissue and remembers the principles of radiation safety and laws and regulations (in Finland) concerning this.

Contents:

The topics of the course include the origin of ionizing radiation e.g. as a result of radioactive decay and in nuclear reactions, the interaction between radiation and matter, the detection and measurements of radiation, physical quantities and measuring units related to radiation, radiation in the environment, and examples of utilizing radiation. The biologic effects of radiation and the legislation on radiation safety are also discussed.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, problem solving exercises 8 h and laboratory exercises 8 h. Self-study 90 h.

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

740368A Radiation and safety

Recommended or required reading:

Lecture material (in Finnish), Laws and regulations concerning radiation safety

Assessment methods and criteria:

Final examination

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

761359A: Spectroscopic methods, 5 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766359A	Spectroscopic methods	7.0 op

ECTS Credits:

5 credits

Language of instruction:

Finnish

Timing:

Every second year (odd year), spring term

Learning outcomes:

After completion, student knows the principles of various spectroscopic methods and what kind of physical /biophysical phenomena can be studied and what kind of information can be obtained with these methods.

Contents:

Basic principles of infrared, mass and NMR spectroscopy and X-ray analytics are introduced

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 46 h, exercises 24 h, self-study 63 h

Target group:

Compulsory for students in biophysics. Recommended for students directing at some of the lines in atomic, molecular and materials physics. Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Partly distributed through net, and partly as paper copies during the course.

Assessment methods and criteria:

Two written examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Ville-Veikko Telkki

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761359A/

764338A: Basic Neuroscience, 5 op

Voimassaolo: 01.01.2009 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

764638S	Basic Neuroscience	5.0 op

ECTS Credits:

5 ECTS cr

Language of instruction:

Finnish (Exam can be done in English on the basis of the course book)

Timing:

3th - 5th spring (depending on whether included in BSc or MSc degree)

Learning outcomes:

Student will be able to explain basic oganization and functions of the nervous system.

Contents:

General organization and function of the peripheral and central nervous system are introduced based on a course book. Objective of the course is to provide students with a broad view of the basic principles of nervous system function based on recent knowledge.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, self-study 105 h

Target group:

Primarily the students of the degree programme in physics, especially the biomedical physics students. Also the other students of the University of Oulu.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Lectures and the course book Dale Purves et al.: Neuroscience, 4th edition or newer, Sinauer Associates Inc., MA, USA, 2008.

Assessment methods and criteria:

Final exam

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Esa-Ville Immonen, Kyösti Heimonen

Working life cooperation:

No work placement period

Other information:

Course website

Recommended Optional Studies

080925A: Anatomy and Physiology for Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Miika Nieminen, Kyösti Heimonen
Opintokohteen kielet: English

ECTS Credits:

5 ECTS credit points / 135 hours of work

Language of instruction:

English

Timing:

Master studies, Spring 2018, 4th period

Learning outcomes:

The student is able to define human anatomy and describe the physiological functions, and can explain how these can be investigated using different imaging methods and measurement systems

Contents:

The course acquaites the student to human physiology and anatomy. Areas covered include
Cells and tissues,
Skin, blood, blood circulation and the fluids of the body
Musculoskeletal organs
Defence reactions of the body
Respiration
Digestion,
Urine sectretion
Metabolic regulation, heat regulation
Reproduction
Sensory functions
Nervous system

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28h, demonstrations 12h. Independent studying and preparing reports 95h. Final examination

Target group:

Biomedical engineering and physics students

Recommended optional programme components:

The coure is an independent entity and does not require additional studies carried out at the same time. Imaging methods are more closely studied in the course Diagnostic Imaging.

Recommended or required reading:

Supplementary reading will be given in the beginning of the course.

Assessment methods and criteria:

Taking part in the lectures and demonstrations. Written reports on demonstrations. Final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Miika Nieminen

Working life cooperation:

Course demonstrations will be held in hospital environment and are related to diagnostics.

Other information:

max. 40 students

764322A: Cell membrane biophysics, 10 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kyösti Heimonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

764622S	Cell membrane biophysics	10.0 op

ECTS Credits:

10 ECTS cr

Language of instruction:

English

Timing:

3rd or 5th autumn (depending on whether included in BSc or MSc degree). Lectured every second year (during odd years). Recommended timing is during master studies.

Learning outcomes:

After finishing the course the student is able to describe the basics of cell membrane structure and function, to present the basic biophysical models describing the electrical function of the cell membrane, and to solve problems and calculations concerning these models. In addition, the student will be able make and present a short review and a talk on the basis of scientific literature or articles of this field.

Contents:

During the course the students will become acquainted with the central biophysical phenomena of the cell membrane, for example: the physical structure and properties of the cell membrane, lipids and proteins in the membrane, permeation and selectivity, ion channels and their kinetics. In addition they will learn to

know the basics about the theory of the different cell membrane recording methods, the models describing the electrical function of the cell membrane and the analysis of cell membrane signals.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 34 h, calculation exercises 20 h, seminar 4 h, seminar presentation, weekly assignments, self-study 206 h

Target group:

Students of Biomedical physics (voluntary in BSc minor, mandatory in MSc). Also for the other students of the University of Oulu.

Prerequisites and co-requisites:

Introduction to biomedical physics (764163P) and Foundations of cellular biophysics (764115P) are recommended to be done before this course.

Recommended optional programme components:

764680 Neural information processing is recommended to be done after this course.

Recommended or required reading:

Lectures, lecture handouts; D. Johnston, S. Wu: Foundations of Cellular Neurophysiology, MIT Press, Cambridge MA, 1995 (partly); B. Hille: Ion channels of excitable membranes, Sinauer Associates Inc., Sunderland, Massachusetts USA, 3rd edition, 2001 (partly).
Course material availability can be checked here.

Assessment methods and criteria:

Home exam, final exam, seminar presentation

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Kyösti Heimonen

Working life cooperation:

No work placement period

Other information:

Course website

761317A: Numerical Programming, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Jänkälä
Opintokohteen kielet: Finnish, English

Ei opintojaksokuvauksia.