# Opasraportti

# LTK - Medical and Wellness Technology (2010 - 2011)

**UNIVERSITY OF OULU**

**FACULTY OF MEDICINE**

**DEPARTMENT OF MEDICAL TECHNOLOGY**

**DEGREE PROGRAMME IN MEDICAL AND WELLNESS TECHNOLOGY**

**INFORMATION ON THE DEPARTMENT, DEGREE PROGRAMMES AND COURSE DESCRIPTIONS 2010 - 2011**

## 1. DEPARTMENT OF MEDICAL TECHNOLOGY

### 1.1 ECTS Departmental Coordinator

Mrs Riikka Ahola, e-mail riikka.ahola@oulu.fi, tel. +358 (0)8 537 6008.

### 1.2 General description of the Department of Medical Technology

The department is responsible for the Degree Program in Medical and Wellness Technology. The website of the department can be found at http://www.medicine.oulu.fi/ltek. The department is a part of Oulu School of Biomedical Engineering (http://www.bme.oulu.fi) and therefore arranges courses also for biomedical engineering students from other faculties and degree programs.

### Head of the Department

PhD, Professor in Medical Technology, Timo Jämsä

e-mail timo.jamsa@oulu.fi, tel. +358 (0)8 537 6001. Education Program in Medical and Wellness Technology, post graduate education and supplementary education.

### Staff

Secretary, Irja Käsmä

Assistant, Maarit Kangas

Assistant, study advisor, Päivi Tahvanainen

Assistant, Pasi Pulkkinen

Researcher, Riikka Ahola

Researcher, Mikko Finnilä

Researcher, Janne Koivumäki

Researcher, Mikko Määttä

Researcher, Jérôme Thevenot

**Research areas:**

Bone biomechanics and hard tissue imaging
Quantification and qualification of physical activity

Smart environment and activity measurements for the elderly
Orthopaedic shape memory implants

Characterization of biomaterials

## 2. INFORMATION ON DEGREE PROGRAMMES:

### 2.1 General description:

The Degree Program in Medical & Wellness Technology leads to Bachelor's Degree in Health Sciences, which is a lower academic degree (180 ECTS credits). Bachelor's degree can be completed in three years. Thereafter student proceeds to Master's degree in Health Sciences, which is a higher academic degree. The Master's degree includes 120 credits and can be completed in two years. It is also possible to extend studies to licentiate and doctoral degrees.

The study plan for Bachelor's Degree includes mandatory and elective courses. The study plan for Master's Degree includes mandatory and specialization courses, which include compulsory and elective courses according to the specialization.

Master's degree has two specialization options:

- Medical Engineering

- Biomedical Technology

### 2.2 Qualification awarded:

Bachelor in Health Science (Terveystieteiden kandidaatti)

Master in Health Science (Terveystieteiden maisteri)

Doctor of Philosophy (Filosofian tohtori)

### 2.3 Admission requirements:

General admission requirement is completed Finnish Matriculation Examination ( *ylioppilastutkinto*) or equivalent proof of completing upper secondary school. Applicants with IB, EB, or Reifprüfung degree will be considered the same as the applicants with Finnish Matriculation Examination.

A student who has not completed the matriculation examination can be accepted, if he or she has graduated from a polytechnic, college or higher level vocational education institution or has at least three years of vocational education, or if he or she has received such an education abroad that makes him or her eligible for university studies in the country in question.

Application deadline for international degree student applicants is January 31st. The application period for other applicants is February-May. More information can be found in http://www.oulu.fi/intl/degreestudents.htm.

All applicants are invited to Entrance Examination, which includes Chemistry and Physics. Applicants are expected to have sufficient knowledge in mathematics, chemistry and physics. A comparative index is calculated for each applicant based on their Matriculation Examination. Selection is done in two parts. Students can be selected by using either the comparative index and the result of Entrance Examination or only the result of Entrance Examination. The language of entrance examination is Finnish.

**2.4 Educational and professional goals:**

The program offers multidisciplinary education. The studies consist of mathematics, natural sciences, medicine and biomedical and medical engineering studies. The aim of the program is to offer the basic knowledge demanded by the field by both theoretical and practical exercises. Students learn to use or develop adequate technical tools to different applications of health and wellbeing. The graduated can operate as an expert in different fields including education, research and with tasks involved with industry and health care.

**2.5 Access to further studies:**

To get an admission for postgraduate studies at the Department of Medical Technology, an applicant needs to have good knowledge in the field of the postgraduate studies, and a Master's level degree with good grades. Further, the applicant should have good skills in English language.

The Faculty of Medicine offers a postgraduate degree (Doctor of Philosophy). Postgraduate studies comprise of studies in major subject, minor subject and general scientific studies. Dissertation is a part of major subject studies. The Faculty of Medicine confirms a study plan for each postgraduate student.

**2.6 Course structure diagram with credits:**

**Bachelor of Health Science Degree (Terveystieteiden kandidaatti)**

| | Year 1, ECTS cr | Year 2, ECTS cr | Year 3, ECTS cr |
|---|---|---|---|
| General Studies | 7.5 | 7 | - |
| Basic Studies in Medical Technology | 47.5 | 15 | 10 |
| Intermediate Studies in Medical Technology | 5 | 33 | 30 |

| | | | |
|---|---|---|---|
| Elective Studies | - | 5 | 10 |
| Bachelor's Thesis | - | - | 10 |
| | 60 ECTS cr | 60 ECTS cr | 60 ECTS cr |

The letters at the end of each course code refer to the level of the study; Y and P are for General studies, A is for Subject studies and S is for Advanced studies.

Year 1, courses:

580101Y Introduction to University Studies, 1.5 ECTS

902006Y English (Scientific Communication), 1.5 ECTS

040011Y Medical Informatics I, 0.5 ECTS

580102Y Introduction to Medical & Wellness Technology, 2 ECTS

761101P Basic Mechanics, 4 ECTS

031010P Calculus I, 5 ECTS

031019P Matrix Algebra, 3.5 ECTS

811122P Introduction to Programming, 5 ECTS

811175P Programming Study I, 2 ECTS

764163P Introduction to Biophysics, 3 ECTS

761104P Wave Motion, 3 ECTS

761103P Electricity and Magnetism, 4 ECTS

761121P Physical Measurements, 3 ECTS

031011P Calculus II, 6 ECTS

031017P Differential Equations, 4 ECTS

521302A Circuit Theory I, 5 ECTS

040901Y Basic Anatomy, 2 ECTS

Elective studies

Year 2, courses:

040002Y Cell and Developmental Biology, 5 ECTS

040004Y Chemistry, 6 ECTS

040005Y Biostatistics, 3 ECTS

040007Y Introduction to Scientific Research, 1.5 ECTS

040011Y Medical Informatics II, 1 ECTS

040105Y Basic Epidemiology, 1.5 ECTS

040902Y Biochemistry I, 2.5 ECTS

040904A Basic Pharmacology, 1.5 ECTS

080901A Introduction to Technology in Clinical Medicine, 6 ECTS

521109A Electronics Measurement Principles 5 ECTS

521431A Principles of Electronics Design, 5 ECTS

580103A Basic Biomechanics, 2 ECTS

764317A Radiation Physics, Biology and Safety, 3 ECTS

764624A Laboratory Exercises in Biophysics I, 4 ECTS

811338A Internet and the Information Networks, 5 ECTS

902007Y English (Reading for Academic Purposes), 1.5 ECTS

901020Y Swedish, 3 ECTS

Elective studies

Year 3, courses:

031021P Statistical Analysis, 5 ECTS

031049A Signals and Systems, 5 ECTS

040102A Physiology, 15 ECTS

040201Y Basics in eHealth, 5 ECTS

764627A Virtual Measurement Principles, 5 ECTS

580201A Biomedical Engineering Programming Study, 5 ECTS

580209A Bachelor's Thesis, 10 ECTS

580211S Maturity test, 0 ECTS

Elective studies

Suggested elective studies in bachelor's degree:

031018P Complex Analysis 4 ECTS

031022P Numerical Analysis, 5 ECTS

031024A Random Signals, 5 ECTS

031044A Mathematical Methods, 3 ECTS

040903Y Biochemistry II, 4 ECTS

465075A Research Techniques for Materials, 3.5 ECTS

521337A Digital Filters, 5 ECTS

521430A Electronic Measurement Techniques, 6 ECTS

521432A Electronics Design I, 5 ECTS

740318A Molecular Biology, 4 ECTS

750340A Basics of Bioinformatics, 3 ECTS

764115P Basics in Cell Biophysics, 2 ECTS

040408S Applied Physiology, 1.5 ECTS

**Master of Health Science Degree (Terveystieteiden maisteri)**

| | Year 1, ECTS cr | Year 2, ECTS cr |
|---|---|---|
| Intermediate Studies in Medical Technology | 9 | - |
| Advanced Studies in Medical Technology | 23 | 7 |
| Specialization studies (A or B)<br>(minimum 20 ECTS) | 10 | 10 |
| Elective Studies | 18 | 8 |
| Master's Thesis | - | 35 |
| | 60 ECTS cr | 60 ECTS cr |

Specialization studies A or B, minimum **20 ECTS**

Choice A: Medical Engineering

Choice B: Biomedical Technology

Year 1, courses:

040108A General Pathology, 3 ECTS

080913A Technology in Clinical Chemistry, 3 ECTS

521124S Sensors and Measuring Techniques, 5 ECTS

521126S Biomedical Measurements, 5 ECTS

521467S Digital Image Processing, 5 ECTS

764364A Analysis of Biosystems, 4 ECTS

764633S Medical Physics, 4 ECTS

764660S Bioelectronics, 4 ECTS

Choice A: Medical Engineering:

040408S Applied Physiology, 1.5 ECTS

080910A Applied Diagnostic Radiology, 4 ECTS

521053S Medical Device Product Liability, 2 ECTS

555364S Ergonomics for Design, 5 ECTS

764369A Medical Equipment Techniques, 3 ECTS

Choice B: Biomedical Technology:

040903Y Biochemistry II, 4 ECTS

580401A Basic Biomaterials, 2 ECTS

580402A Biomedical Imaging Methods, 2 ECTS

764115P Basics in Cell Biophysics, 2 ECTS

764323A Biophysics of Membranes, 6 ECTS

Elective studies

Year 2, courses:

521273S Biosignal Processing, 4 ECTS

080914S Biomedical Engineering and Medical Physics Seminar, 3 ECTS

580211S Maturity Test, 0 ECTS

Specialization studies:

Choice A: Medical Engineering:

080912S Applied Biomechanics, 4 ECTS

521114S Wireless Measurements, 4 ECTS

521116S Information Systems in Health Care, 4 ECTS

Choice B: Biomedical Technology:

040910S Experimental Animal Course, 6 ECTS

764359A Spectroscopic Methods, 5 ECTS

764680S Processes of the Nervous System, 5 ECTS

Elective courses

Suggested elective studies for all:

031022P Numerical Analysis, 5 ECTS

031044A Mathematical Methods, 3 ECTS

040627A Technology and Rehabilitation, 4 ECTS

521116S Information Systems in Health Care, 4 ECTS

521238S Optoelectronical Measurements, 4 ECTS

521430A Electronic Measurement Techniques, 6 ECTS

521497S Pattern Recognition and Neural Networks, 5 ECTS

580202S Biomedical Engineering Project Study, 5-10 ECTS

764325A Biophysical Laboratory Exercises, 5 ECTS

764620S Hemodynamics, 4 ECTS

764668S Simulation of Biosystems, 4 ECTS

Suggested elective studies in choice A (Medical Engineering):

031024A Random Signals, 5 ECTS

031028S Mathematical Signal Processing, 6 ECTS

521337A Digital Filters, 5 ECTS

521361A Basics of Digital Communications 3 ECTS

521432A Electronics Design I, 5 ECTS

815624S Virtual Reality, 4 ECTS

Suggested elective studies in choice B (Biomedical Technology):

080912S Applied Biomechanics, 4 ECTS

090503A Dental Materials, 1 ECTS

461028S Experimental Methods in Engineering Mechanics, 6 ECTS

465075A Research Techniques for Materials, 3.5 ECTS

740318A Molecular Biology, 4 ECTS

744604S Introduction to Biocomputing 3 ECTS

750340A Basics of Bioinformatics, 3 ECTS

764619S Molecular Biophysics 4 ECTS

764631S Dynamics of Bioprocesses, 3 ECTS

**2.7 Final examination:**

580209A Bachelor's Thesis, 10 ECTS

580210S Master's Thesis, 35 ECTS

**2.8 Examination and Assessment Regulations:**

Assessment is based on examinations, exercises, papers, field work, reports or any other method determined by the instructor of the particular course. Most of the courses are completed with written examinations. All the exams can be retaken. Additional information is given from the organizing department.

Grading scale is 1-5 or fail as follows: sufficient (1), satisfactory (2), good (3), very good (4), and excellent (5). Some courses are graded as pass or fail. Bachelor's Thesis is graded as pass. Master's Thesis is graded as Latin grades: *approbatur, lubenter approbatur, non sine laude approbatur, cum laude approbatur, magna cum laude approbatur, eximia cum laude approbatur, laudatur*.

After all the study modules for the degree (Bachelor of Health Science or Master of Health Science) are done and thesis has been accepted, the student can apply for the Degree Certificate.

# Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

764364A: Analysis of biosystems, 6 op
080912S: Applied Biomechanics, 4 op
*Compulsory*
080912S-01: Applied Biomechanics, Written assignment nr 1, 0 op
080912S-02: Applied Biomechanics, Written assignment nr 2, 0 op
080910A: Applied Diagnostic Radiology, 4 op
*Compulsory*
080910A-01: Applied Diagnostic Radiology, Seminar, 0 op
080910A-02: Applied Diagnostic Radiology, Home exam, 0 op
580209A: Bachelor's Thesis, 10 op
040901Y: Basic Anatomy, 1,5 - 2 op
580401A: Basic Biomaterials, 2 op
580103A: Basic Biomechanics, 3 op

*Compulsory*
580103A-01: Basics Biomechanics, exercise work, 0 op
580103A-02: Basics Biomechanics, exam, 0 op
040105Y: Basic Epidemiology, 1,5 op
761101P: Basic Mechanics, 4 op
040904A: Basic Pharmacology, 1,5 op
040201Y: Basics in eHealth, 5 op
040903A: Biochemistry II, 4 op
*Compulsory*
040903A-01: Biochemistry II-exam, 0 op
040903A-02: Biochemistry II, 0 op
764660S: Bioelectronics, 5 op
580201A: Biomedical Engineering Programming Study, 5 op
580202S: Biomedical Engineering Project, 5 op
080914S: Biomedical Engineering and Medical Physics Seminar, 3 op
580402S: Biomedical Imaging Methods, 1 - 5 op
521126S: Biomedical Measurements, 5 op
764324A: Biophysical laboratory exercises I, 5 op
521273S: Biosignal Processing, 5 op
040005Y: Biostatistics, 3 op
031010P: Calculus I, 5 op
031011P: Calculus II, 6 op
764323A: Cell membrane biophysics, 7 op
040004Y: Chemistry, 6 op
*Electives*
040004Y-04: Chemistry Math practice, 0 op
*Compulsory*
040004Y-03: Chemistry Laboratory works, 0 op
040004Y-02: Chemistry, organic chemistry, 0 op
040004Y-01: Chemistry, general and inorganic chemistry, 0 op
521302A: Circuit Theory 1, 5 op
031017P: Differential Equations, 4 op
521467S: Digital Image Processing, 5 op
521109A: Electrical Measurement Principles, 5 op
761103P: Electricity and Magnetism, 4 op
555364S: Ergonomics, 5 op
040408S: Exercise and Work Physiology, 1 op
764115P: Foundations of cellular biophysics, 4 op
040108A: General Pathology, 3,5 - 5 op
521116S: Healthcare Information Systems, 4 op
811338A: Internet and Computer Networks, 5 op
580102P: Introduction to Medical and Wellbeing Technology, 5 op
*Compulsory*
580102P-01: Introduction to Medical and Wellbeing Technology, lectures, attendance, 0 op
580102P-02: Introduction to Medical and Wellbeing Technology, exam, 0 op
811122P: Introduction to Programming, 5 op
080901A: Introduction to Technology in Clinical Medicine, 5 op
*Compulsory*
080901A-01: Introduction to Technology in Clinical Medicine, Initial exam, 0 op
080901A-02: Introduction to Technology in Clinical Medicine, Lectures and demonstrations, 0 op
080901A-03: Introduction to Technology in Clinical Medicine, Written assignment, 0 op
080901A-04: Introduction to Technology in Clinical Medicine, Exam, 0 op
580101Y: Introduction to University Studies, 2 op
*Compulsory*
580101Y-01: Introduction to University Studies, tutorial, 0 op
580101Y-02: Introduction to University Studies, conversation, 0 op
764103P: Introduction to biophysics, 2 op
040007Y: Introduction to scientific research, 1,5 op
040910S: Laboratory Animal Course For Scientists, 6 op
761121P: Laboratory Exercises in Physics 1, 3 op
031019P: Matrix Algebra, 3,5 op
580211S: Maturity Test, 0 op
580211A: Maturity Test, 0 op
040902Y: Medical Biochemistry and molecular biology, 8 - 9 op

*Compulsory*
040902Y-01: Medical Biochemistry and molecular biology, 3 op
040902Y-02: Medical Biochemistry and molecular biology, 3 op
040902Y-03: Medical Biochemistry and molecular biology, 3 op
764369A: Medical Equipments, 3 op
764633S: Medical Physics, 4 op
040002Y: Medical cell and developmental biology, 7 op
040011Y: Medical informatics, 2 op
040011Y-01: Medical informatics, module 1, information and Communication Technology, 0,5 op
040011Y-02: Medical informatics, module 2, literature retrieval, 1 op
764680S: Neural information processing, 5 op
040112A: Physiology, 15 op
580121A: Practical training, 1 - 5 op
580120A: Practical training 1, 1 - 5 op
521431A: Principles of Electronics Design, 5 op
580210S: Pro Gradu, 35 op
031021P: Probability and Mathematical Statistics, 5 op
521053S: Product Responsibility to Medical Devices, 2 op
811175P: Programming Assignment I, 2 op
764317A: Radiation physics, biology and safety, 3 op
902006Y: Reading for Academic Purposes, 1,5 op
902007Y: Scientific Communication, 1,5 op
901020Y: Second Official Language (Swedish), 3 op
521124S: Sensors and Measuring Techniques, 5 op
764359A: Spectroscopic methods, 5 op
080913A: Technology in Clinical Chemistry, 3 op
*Compulsory*
080913A-04: Technology in Clinical Chemistry, Exam, 0 op
080913A-03: Technology in Clinical Chemistry, Written assignment, 0 op
080913A-02: Technology in Clinical Chemistry,Contact teaching, 0 op
080913A-01: Technology in Clinical Chemistry, Pre-assignment, 0 op
764327A: Virtual measurement environments, 5 op
761104P: Wave Motion, 3 op
521114S: Wireless Measurements, 4 op

# Opintojaksojen kuvaukset

## Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

### 764364A: Analysis of biosystems, 6 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

764664S Analysis and simulation of biosystems 6.0 op

**ECTS Credits:**
5 credits
**Timing:**
2nd spring

**Learning outcomes:**
The student is able to use modelling in the analysis of simple biosystems, with the utilization of the concept of analogies between different types of systems.
**Contents:**
Models and analogies are studied as tools to analyse biological systems. Also the foundations of system identification and feedback are considered, and especially the utilization of transfer function and impedance in identification and analysis.
**Learning activities and teaching methods:**
Lectures 30 h, calculation exercises 16 h, final exam.
**Target group:**
Compulsory in biophysics major (BSc) and 25 cu (approbatur) minor.
**Recommended optional programme components:**
Introduction to biophysics (764162P) is recommended before this course. Knowing Laplace transform is useful.
**Recommended or required reading:**
Lecture handouts; W.B. Blesser, A Systems Approach to Biomedicine, McGraw-Hill, New York 1969 (partly) or some corresponding literature.
**Person responsible:**
Matti Weckström
**Other information:**
https://wiki.oulu.fi/display/764364A/

## 080912S: Applied Biomechanics, 4 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Jämsä, Timo Jaakko

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 credits
**Language of instruction:**
Finnish or English
**Timing:**
Master studies, spring semester
**Learning outcomes:**
After this course student has deeper knowledge in biomechanics in theory and in practice. The student will familiarize with the research methods and data analysis in experimental and clinical biomechanics by practical exercises.
**Contents:**
Musculoskeletal biomechanics, biomechanical measurements
**Learning activities and teaching methods:**
Lectures 8 hrs, participation. Practical exercise 8 hrs, independent work. Written reports
**Recommended optional programme components:**
761101P Basic Mechanics, 580103A Basic Biomechanics, physiology.
**Recommended or required reading:**
Material given in the lectures. Literature.
**Assessment methods and criteria:**
Written reports based on the labs.
**Grading:**
1-5 or fail.
**Person responsible:**
Professori Timo Jämsä
**Other information:**
This course is a part of specialization Medical Engineering.

*Compulsory*

**080912S-01: Applied Biomechanics, Written assignment nr 1, 0 op**

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

4 credits

**Language of instruction:**

Finnish or English

**Timing:**

Master studies, spring semester

**Learning outcomes:**

After this course student has deeper knowledge in biomechanics in theory and in practice. The student will familiarize with the research methods and data analysis in experimental and clinical biomechanics by practical exercises.

**Contents:**

Musculoskeletal biomechanics, biomechanical measurements

**Learning activities and teaching methods:**

Lectures 8 hrs, participation. Practical exercise 8 hrs, independent work. Written reports

**Recommended optional programme components:**

761101P Basic Mechanics, 580103A Basic Biomechanics, physiology.

**Recommended or required reading:**

Material given in the lectures. Literature.

**Assessment methods and criteria:**

Written reports based on the labs.

**Grading:**

1-5 or fail.

**Person responsible:**

Professori Timo Jämsä

**Other information:**

This course is a part of specialization Medical Engineering.

### 080912S-02: Applied Biomechanics, Written assignment nr 2, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

4 credits

**Language of instruction:**

Finnish or English

**Timing:**

Master studies, spring semester

**Learning outcomes:**

After this course student has deeper knowledge in biomechanics in theory and in practice. The student will familiarize with the research methods and data analysis in experimental and clinical biomechanics by practical exercises.

**Contents:**

Musculoskeletal biomechanics, biomechanical measurements

**Learning activities and teaching methods:**

Lectures 8 hrs, participation. Practical exercise 8 hrs, independent work. Written reports

**Recommended optional programme components:**

761101P Basic Mechanics, 580103A Basic Biomechanics, physiology.

**Recommended or required reading:**

Material given in the lectures. Literature.

**Assessment methods and criteria:**

Written reports based on the labs.

**Grading:**

1-5 or fail.

**Person responsible:**

Professori Timo Jämsä

**Other information:**

This course is a part of specialization Medical Engineering.

## 080910A: Applied Diagnostic Radiology, 4 op

**Voimassaolo:** - 31.07.2016
**Opiskelumuoto:** Intermediate Studies
**Laji:** Course
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Koivula, Kalle Antero
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4 credits
**Language of instruction:**
Finnish
**Timing:**
Master studies, autumn-spring
**Learning outcomes:**
After this course student knows the theoretical basics, usability and restrictions of different medical imaging techniques. The student knows how an image of good quality is obtained and what is essential when interpreting the images.
**Contents:**
Course gives insight to radiological work (conventional X-rays, computed tomography, ultrasound examinations, magnetic resonance imaging and radiological operations). Seminars include radiological examinations from the technical point of view combining technical and medical knowledge.
**Learning activities and teaching methods:**
Lectures 20 hrs. Seminars and demonstrations 20 hrs. Selected lectures from the course 080602A (see the ECTS guide for the Faculty of Medicine). Final exam.
**Recommended or required reading:**
S Soimakallio (ed), L Kivisaari, H Manninen, E Svedström, O Tervonen. Radiologia, WSOY, 2005.
**Assessment methods and criteria:**
Seminar presentation and final exam are graded 1–5 or fail. Seminar grade is weighted as 2/3 and final exam grade as 1/3 in the final grade.
**Grading:**

1-5 or fail.
**Person responsible:**
Doc Antero Koivula
**Other information:**
This course is a part of specialization Medical Engineering. For more information, please contact Dr Pasi Pulkkinen.

*Compulsory*

**080910A-01: Applied Diagnostic Radiology, Seminar, 0 op**

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Koivula, Kalle Antero
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

4 credits

**Language of instruction:**

Finnish

**Timing:**

Master studies, autumn-spring

**Learning outcomes:**

After this course student knows the theoretical basics, usability and restrictions of different medical imaging techniques. The student knows how an image of good quality is obtained and what is essential when interpreting the images.

**Contents:**

Course gives insight to radiological work (conventional X-rays, computed tomography, ultrasound examinations, magnetic resonance imaging and radiological operations). Seminars include radiological examinations from the technical point of view combining technical and medical knowledge.

**Learning activities and teaching methods:**

Lectures 20 hrs. Seminars and demonstrations 20 hrs. Selected lectures from the course 080602A (see the ECTS guide for the Faculty of Medicine). Final exam.

**Recommended or required reading:**

S Soimakallio (ed), L Kivisaari, H Manninen, E Svedström, O Tervonen. Radiologia, WSOY, 2005.

**Assessment methods and criteria:**

Seminar presentation and final exam are graded 1–5 or fail. Seminar grade is weighted as 2/3 and final exam grade as 1/3 in the final grade.

**Grading:**

1-5 or fail.

**Person responsible:**

Doc Antero Koivula

**Other information:**

This course is a part of specialization Medical Engineering. For more information, please contact Dr Pasi Pulkkinen.

**080910A-02: Applied Diagnostic Radiology, Home exam, 0 op**

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Koivula, Kalle Antero

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

4 credits

**Language of instruction:**

Finnish

**Timing:**

Master studies, autumn-spring

**Learning outcomes:**

After this course student knows the theoretical basics, usability and restrictions of different medical imaging techniques. The student knows how an image of good quality is obtained and what is essential when interpreting the images.

**Contents:**

Course gives insight to radiological work (conventional X-rays, computed tomography, ultrasound examinations, magnetic resonance imaging and radiological operations). Seminars include radiological examinations from the technical point of view combining technical and medical knowledge.

**Learning activities and teaching methods:**

Lectures 20 hrs. Seminars and demonstrations 20 hrs. Selected lectures from the course 080602A (see the ECTS guide for the Faculty of Medicine). Final exam.

**Recommended or required reading:**

S Soimakallio (ed), L Kivisaari, H Manninen, E Svedström, O Tervonen. Radiologia, WSOY, 2005.

**Assessment methods and criteria:**

Seminar presentation and final exam are graded 1–5 or fail. Seminar grade is weighted as 2/3 and final exam grade as 1/3 in the final grade.

**Grading:**

1-5 or fail.

**Person responsible:**

Doc Antero Koivula

**Other information:**

This course is a part of specialization Medical Engineering. For more information, please contact Dr Pasi Pulkkinen.

## 580209A: Bachelor's Thesis, 10 op

**Voimassaolo:** 01.08.2005 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
10 credits
**Language of instruction:**
Finnish or English
**Timing:**
3rd year
**Learning outcomes:**
The main objective is to apply theoretical knowledge and problem solving and reporting skills in practical problems.
**Contents:**

Guided research or development work in the field of medical & wellness technology and writing of the thesis.
**Learning activities and teaching methods:**
Independent work with the help of a supervisor. The topic and contents should be discussed with the professor in the beginning. Thesis can be made at different research groups of the university or in industry or health care system.
**Assessment methods and criteria:**
Writing the thesis and an oral presentation.
**Grading:**
Pass or fail
**Person responsible:**
Professor Timo Jämsä

## 040901Y: Basic Anatomy, 1,5 - 2 op

**Opiskelumuoto:** General Studies
**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Tuukkanen, Kaarlo Juha Kullervo
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 580401A: Basic Biomaterials, 2 op

**Opiskelumuoto:** Intermediate Studies
**Laji:** Course
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
2 credits
**Timing:**
Master studies. The course is not organized every year.
**Learning outcomes:**
After this course student knows biological materials and different tissue compensative materials and their interactions with the tissue.
**Contents:**
Biocompatibility, metallic and ceramic implantation materials, polymers, biodegradable materials, bioglass, multifunctional biomaterials, tissue engineering, examples of applications.
**Learning activities and teaching methods:**
Lectures and written exam
**Recommended or required reading:**
Lecture material. Literature: Park JP, Bronzino JD, Biomaterials; Principles and Applications. CRC Press 2002.
**Assessment methods and criteria:**
Written exam.
**Grading:**
1-5 or fail.
**Person responsible:**
Professor Timo Jämsä, professor Juha Tuukkanen
**Other information:**
This course is a part of specialization Biomedical Technology.

## 580103A: Basic Biomechanics, 3 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Jämsä, Timo Jaakko

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
2 credits
**Language of instruction:**
Lectures are given in Finnish, but the practical exercises and the exam can be taken in English (English material provided).
**Timing:**
2nd year, autumn
**Learning outcomes:**
After this course student is familiar with the concepts and phenomena of biomechanics and their modeling principles.
**Contents:**
Physical basics. Characteristics of biological materials. Fatigue resistance and fraction mechanics. Tissue mechanics. Biomechanical modelling of the human body. Motion analysis.
**Learning activities and teaching methods:**
Lectures 10 hours, mathematical exercises 6 hours, practical exercises 4 hours. Independent work. Final exam
**Recommended optional programme components:**
761101P Basic Mechanics
**Recommended or required reading:**
Lecture material.
Literature:
Hall: Basic biomechanics, 3rd ed. McGraw-Hill,1999, parts.
Lucas, Cooke andFriis: A primer of biomechanics. Springer, 1998.
**Assessment methods and criteria:**
Practical exercises are marked as pass or fail, final exam is graded 1–5 or fail.
**Grading:**
1-5 or fail
**Person responsible:**
Professor Timo Jämsä

*Compulsory*

**580103A-01: Basics Biomechanics, exercise work, 0 op**

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Jämsä, Timo Jaakko

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

2 credits

**Language of instruction:**

Lectures are given in Finnish, but the practical exercises and the exam can be taken in English (English material provided).

**Timing:**

2nd year, autumn

**Learning outcomes:**

After this course student is familiar with the concepts and phenomena of biomechanics and their modeling principles.

**Contents:**

Physical basics. Characteristics of biological materials. Fatigue resistance and fraction mechanics. Tissue mechanics. Biomechanical modelling of the human body. Motion analysis.

**Learning activities and teaching methods:**

Lectures 10 hours, mathematical exercises 6 hours, practical exercises 4 hours. Independent work. Final exam

**Recommended optional programme components:**

761101P Basic Mechanics

**Recommended or required reading:**

Lecture material.
Literature:
Hall: Basic biomechanics, 3rd ed. McGraw-Hill,1999, parts.
Lucas, Cooke andFriis: A primer of biomechanics. Springer, 1998.

**Assessment methods and criteria:**

Practical exercises are marked as pass or fail, final exam is graded 1–5 or fail.

**Grading:**

1-5 or fail

**Person responsible:**

Professor Timo Jämsä

### 580103A-02: Basics Biomechanics, exam, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

2 credits

**Language of instruction:**

Lectures are given in Finnish, but the practical exercises and the exam can be taken in English (English material provided).

**Timing:**

2nd year, autumn

**Learning outcomes:**

After this course student is familiar with the concepts and phenomena of biomechanics and their modeling principles.

**Contents:**

Physical basics. Characteristics of biological materials. Fatigue resistance and fraction mechanics. Tissue mechanics. Biomechanical modelling of the human body. Motion analysis.

**Learning activities and teaching methods:**

Lectures 10 hours, mathematical exercises 6 hours, practical exercises 4 hours. Independent work. Final exam

**Recommended optional programme components:**

761101P Basic Mechanics

**Recommended or required reading:**

Lecture material.
Literature:

Hall: Basic biomechanics, 3rd ed. McGraw-Hill,1999, parts.
Lucas, Cooke andFriis: A primer of biomechanics. Springer, 1998.

**Assessment methods and criteria:**

Practical exercises are marked as pass or fail, final exam is graded 1–5 or fail.

**Grading:**

1-5 or fail

**Person responsible:**

Professor Timo Jämsä

## 040105Y: Basic Epidemiology, 1,5 op

**Opiskelumuoto:** General Studies
**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jouni Jaakkola
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
1,5 op
**Language of instruction:**
Finnish. Can be offered in English if several English speaking student registered.

**Timing:**
Lectures on 2. Year spring term.
**Learning outcomes:**
Students are expected to learn the basic concepts of epidemiology and basics of epidemiologic methods used in medicine and in general in health sciences.
**Contents:**
The course includes a lecture on the following topics: 1) introduction to basic concepts and causality, 2) principles of study design, 3) precision and validity, 4) exposure assessment, 5) assessment of health effects and measures of disease occurrence, association and effect , 6) principles of cohort studies, 7) data analysis in cohort studies, 8) principles of case-control studies, 9) data analysis in case-controls studies and 10) cross-sectional studies. In addition, the course includes two exercise sessions conducted in small groups on: 1) epidemiologic methods based on critical reviews of articles and 2) calculation. Students will also review individually and critically an scientific article.

**Learning activities and teaching methods:**
10 one-hour lectures, two 3-hour exercise sessions and critical review of an articles.
**Target group:**
Basic course for medical students, but suitable for students planning research in health sciences.
**Recommended optional programme components:**
Closely linked to the course in biostatiistics taught in the same term.
**Recommended or required reading:**
Lecture notes. Recommended books: Hernberg S. Introduction to occupational epidemiology (1992) ja Rothman K. Epidemiology. An Introduction (2002).
**Assessment methods and criteria:**
Lectures highly recommended and exercise sessions compulsory. Written exam.
**Grading:**
5 - 1 / fail.

**Person responsible:**
Jouni J.K. Jaakkola, professor of public health.

## 761101P: Basic Mechanics, 4 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

761118P Mechanics 1 5.0 op
761118P-01 Mechanics 1, lectures and exam 0.0 op
761118P-02 Mechanics 1, lab. exercises 0.0 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
761101P2 Basic Mechanics 4.0 op

**ECTS Credits:**
4 credits
**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 masters the basic concepts of mechanics and is able 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, also the 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.
**Learning activities and teaching methods:**
Lectures 32 h, 8 exercises (16 h), four mini examinations and end examination or final examination.
**Target group:**
Secondary subject students.
**Recommended optional programme components:**
Knowledge of vector calculus and basics of differential and integral calculus would be desirable.
**Recommended or required reading:**
Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 12th edition, 2008, chapters 1-14. Also 11th and 10th editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.
**Person responsible:**
Anita Aikio
**Other information:**
https://wiki.oulu.fi/display/761101P/

## 040904A: Basic Pharmacology, 1,5 op

**Voimassaolo:** - 31.07.2012

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Medicine

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Hakkola, Jukka Antti Tapio

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 040201Y: Basics in eHealth, 5 op

**Voimassaolo:** 01.08.2008 -
**Opiskelumuoto:** General Studies
**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Winblad, Ilkka Urmas
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
Web course: 5 ECTS credit points.
**Learning outcomes:**
The target of the course is to give to the students basic knowledge of the use of health care information and communication technology (eHealth).
**Contents:**
- terms and concepts
- societal dimensions
- delivery of health services
- human interaction
- electronic patient records and data transfer
- remote consultations, radiology, surgery (in Finnish), psychiatry,
- economic assessment
- functional assessment
- education
- technical requirements (in Finnish)
- data security and legislation (in Finnish).

**Learning activities and teaching methods:**
The course consists of video-taped lectures, power point-dias and links to other material available in the web. Interactivity takes place in virtual learning environment Optima.
Performance of duties include an essay (homework), exam (homework), participating in discussions, and making at least two questions on the grounds of the lectures.
**Person responsible:**
Ilkka Winblad and jarmo Reponen
**Other information:**
Recommended literature:
Graig J Wootton R, Patterson V (Eds): An introduction to Telemedicine,RSM Press 2006
Saranto K, Korpela M (toim) Tietotekniikka ja tiedonhallinta sosiaali- ja terveydenhuollossa, WSOY, Porvoo-Helsinki-Juva 1999
Hämäläinen P, Reponen J, Winblad I: eHealth of Finland,, Check point 2008, Report 1/2009 Gummerus. Jyväskylä 2009
( http://www.thl.fi/thl-client/pdfs/f5ca5a36-f2c6-4e94-ae95-a7b439b1169b
Winblad I, Reponen J, Hämäläinen P, Kangas M: Informaatio- ja ommunikaatioteknologian käyttö Suomen terveydenhuollossa vuonna 2007. Tilanne ja kehityksen suunta (English summary incl). Stakesin raportteja 37/2008, Stakes, Helsinki 2008
http://www.stakes.fi/verkkojulkaisut/raportit/R37-2008-VERKKO.pdf
Journal of Telemedicine and Telecare
In addition: eLibrary in the Optima comprising updating of the topics of the lectures and some selected essays (by permission of the author).

## 040903A: Biochemistry II, 4 op

**Opiskelumuoto:** Intermediate Studies
**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

*Compulsory*

**040903A-01: Biochemistry II-exam, 0 op**

**Voimassaolo:** 01.01.2011 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

**040903A-02: Biochemistry II, 0 op**

**Voimassaolo:** 01.01.2011 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 764660S: Bioelectronics, 5 op

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

**ECTS Credits:**
4 credits
**Timing:**
4th spring
**Learning outcomes:**
Students have basic skills for understanding and analyzing of electronics and its applications to measurements of living organisms.
**Contents:**
The course introduces bioelectric recording techniques, electrodes, most commenly used amplifier types, basic signal processing of biosignals, but also concepts related to the origin of bio-potentials and currents and how they are distributed in biological volume conductors.
**Learning activities and teaching methods:**
Lectures 20 h, MatLab-based project work 10 h, calculation exercises 15 h, exam.
**Target group:**
Optional for biophysics M.Sc. students.
**Recommended optional programme components:**
Physics courses, programming skills.
**Recommended or required reading:**
Lectures and lecture notes. Books e.g. Semmlov J, Circuits signals and systems for bioenergetics, Elsevier Academic Press, 2005; Electronic Signal Processing, parts I-IV, The Open University Press, Milton Keynes 1984.
**Person responsible:**
Matti Weckström

**Other information:**
https://wiki.oulu.fi/display/764660S/

## 580201A: Biomedical Engineering Programming Study, 5 op

**Voimassaolo:** 01.08.2008 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
5 credits
**Language of instruction:**
Finnish or English
**Timing:**
3rd autumn or spring
**Learning outcomes:**
After this course student is able to realize a program that is related to a practical application of biomedical engineering.
**Contents:**
Independent computer programming using modern programming tools.
**Learning activities and teaching methods:**
Students carry out an assigned programming project individually or in pairs and write out a report.
**Recommended optional programme components:**
811122P Introduction to Programming, 764627S Virtual Measurement Environments
**Assessment methods and criteria:**
The program and the report are assessed by the supervisor.
**Grading:**
Pass or fail.
**Person responsible:**
Professori Timo Jämsä
**Other information:**
More information on the available topics can be inquired on the assistants of the department.

## 580202S: Biomedical Engineering Project, 5 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Jämsä, Timo Jaakko

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
8 credits
**Language of instruction:**
Finnish or English
**Timing:**
Master studies, elective course
**Learning outcomes:**
Student is introduced to research and developmental work done in a research group. Student can make a report of the work and present it orally.
**Contents:**
Working with a project
**Learning activities and teaching methods:**

Student takes part in a research or a developmental project carried out either in the University or outside. Student writes out a report and presents it orally. The project can be linked to a summer job or practical training.
**Assessment methods and criteria:**
Written report and oral presentation
**Grading:**
Pass or fail.
**Person responsible:**
Professor Timo Jämsä

## 080914S: Biomedical Engineering and Medical Physics Seminar, 3 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Jämsä, Timo Jaakko

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 credits
**Language of instruction:**
Finnish or English
**Timing:**
Master studies, autumn or spring. The course is not organized every year.
**Learning outcomes:**
After this course student is familiar with the scientific text on the field of biomedical engineering and medical physics, and the structure of scientific articles. Student can find the essential parts of the articles and learnes critical assessment of scientific research.
**Contents:**
Assigned topics are reviewed in seminar meetings.
**Learning activities and teaching methods:**
Seminar presentations and conversations based on the presentations.
**Assessment methods and criteria:**
Attending seminars, making presentations and acting as an opponent.
**Grading:**
Pass or fail
**Person responsible:**
Professor Timo Jämsä
**Other information:**
Also for doctoral studies

## 580402S: Biomedical Imaging Methods, 1 - 5 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** English

**ECTS Credits:**
2 credits
**Language of instruction:**
Finnish
**Timing:**
Master studies. The course is not organized every year.
**Learning outcomes:**
After this course student knows the basic imaging methods used in biomedical research and understands how the samples are prepared.

**Contents:**
Basics in morphology, light and fluorescence microscopy, confocal microscopy, electron microscopy, atomic force microscopy
**Learning activities and teaching methods:**
Lectures, demonstrations. Final exam.
**Recommended or required reading:**
Literature is given in the lectures.
**Assessment methods and criteria:**
Exercises. Written exam.
**Grading:**
1-5 or fail
**Person responsible:**
Professo Timo Jämsä, Professor Juha Tuukkanen
**Other information:**
This course is a part of specialization area Biomedical Technology

## 521126S: Biomedical Measurements, 5 op

**Voimassaolo:** - 31.07.2012

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Electrical Engineering

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Myllylä, Risto Antero

**Opintokohteen kielet:** Finnish

**Language of instruction:**
Lectures are in Finnish. Calculation exercises are in Finnish but same material is available in English.

**Timing:**
Period 4-5.
**Learning outcomes:**
The objective of the course is to give an overall presentation of modern medical equipment and their special requirements. The emphasis is on technical and functional presentation. The goal is to provide the student sufficient knowledge to study hospital engineering.
Learning outcomes: After the course the student is capable to explain principles, applications and design of medical instruments most commonly used in hospitals. He/she can describe the electrical safety aspects of medical instruments and can present the physiological effects of electric current on humans. In addition the student is able to explain medical instrumentation development process and the factors affecting it. He/she also recognizes typical measurands and measuring spans and is able to plan and design a biosignal amplifier.
**Contents:**
Diagnostic instruments (common theories for medical devices, measurement quantities, sensors, amplifiers and registering instruments). Bioelectrical measurements (EKG, EEG, EMG, EOG, ERG), blood pressure and flow meters, respiration studies, measurements in a clinical laboratory, medical imaging methods and instruments, ear measurements, heart pacing and defibrillators, physical therapy devices, intensive care and operating room devices and electrical safety aspects.
**Learning activities and teaching methods:**
Lectures and exercises. The course is passed by a final exam.
**Recommended or required reading:**
J. G. Webster: Medical Instrumentation, Application And Design. John Wiley & Sons, 1998; lecture notes (in Finnish); exercise notes (also in English)

## 764324A: Biophysical laboratory exercises I, 5 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physics

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

Ei opintojaksokuvauksia.

## 521273S: Biosignal Processing, 5 op

**Voimassaolo:** 01.08.2005 -
**Opiskelumuoto:** Advanced Studies
**Laji:** Course
**Vastuuyksikkö:** Department of Computer Science and Engineering
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Tapio Seppänen
**Opintokohteen kielet:** Finnish

**Language of instruction:**
In Finnish.
**Timing:**
Period 2-3.
**Learning outcomes:**
The course provides knowledge of most common biomedical signals and signal processing methods that can be used for computerized biomedical signal analysis.

Learning outcomes: After passing the course, the student can explain the importance of artifact filtering, time- and frequency-domains, and nonstationarity for biomedical signal analysis and select a proper solution for most common application situations. In addition, (s)he can explain the central feature detection methods to analyze the contents of biosignals.

**Contents:**
Biomedical signals. Digital filtering. Time- and frequency-domain analysis, Nonstationarity of biomedical signals. Feature detection and classification. Diagnostic decision.
**Learning activities and teaching methods:**
Lectures 10 hours + Laboratory exercises 20-30 hours + Written exam

**Recommended optional programme components:**
The basic engineering math courses, digital filtering, programming skills
**Recommended or required reading:**
The course is based on the book "Biomedical Signal Analysis, A Case-Study Approach", R.M Rangayyan. 516 pages. +Lecture transparencies
+ Task assignment specific material.

## 040005Y: Biostatistics, 3 op

**Opiskelumuoto:** General Studies
**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Pentti Nieminen
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 credits
**Timing:**

C4

**Learning outcomes:**

By the end of the course the student should be able to:
- plan study designs and statistical computing in medical and dental research,
- obtain and analyze data with basic statistical methods,
- use basic statistical significance tests and inference methods,
- evaluate critically medical research reports

**Contents:**

Aims and phases of statistical research, planning statistical research, obtaining data, variable distributions (frequencies, graphs and statistics), basics in statistical inference and methods (estimates, significance tests and confidence limits), basic methods in comparing groups and estimating associations between variables, specific methods applied in medical research.

**Learning activities and teaching methods:**

Lessons 18 h, study-group sessions 12 h, practical projects and home-works 30 h.

**Recommended or required reading:**

Uhari M ja Nieminen P: Epidemiologia ja biostatistiikka. Duodecim, 2001.

**Assessment methods and criteria:**

Regular and active participation in the small group lessons and completion of a practical project. Written examination.

**Grading:**

0-5

**Person responsible:**

Docent Pentti Nieminen

**Other information:**

This course is a part of the studies in research skills.

## 031010P: Calculus I, 5 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Mathematics Division

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Ilkka Lusikka

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

ay031010P Calculus I (OPEN UNI) 5.0 op

**Language of instruction:**

Finnish

**Timing:**

Period 1-3

**Learning outcomes:**

The course gives the basics of vector algebra, analytic geometry, elementary functions and differential and integral calculus of real valued functions of one variable.

Learning outcomes **:** After completing the course the student identifies concepts of vector algebra and can use vector algebra for solving problems of analytic geometry. The student can also explain basic characteristics of elementary functions and is able to analyse the limit and the continuity of real valued functions of one variable. Furthermore, the student can solve problems associated with differential and integral calculus of real valued functions of one variable.

**Contents:**

Vector algebra and analytic geometry. Limit, continuity, differential and integral calculus and applications of real valued functions of one variable. Complex numbers.

**Learning activities and teaching methods:**

Term course. Lectures 5 h/week. Two examinations or a final examination.

**Recommended or required reading:**

Grossmann, S.I.: Calculus of One Variable; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations (partly); Adams, R.A.: A Complete Course Calculus (partly).

## 031011P: Calculus II, 6 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Mathematics Division

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Ilkka Lusikka

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

031075P Calculus II 5.0 op

ay031011P Calculus II (OPEN UNI) 6.0 op

**Language of instruction:**
Finnish
**Timing:**
Period 4-6
**Learning outcomes:**
The course gives the basics of theory of series and differential and integral calculus of real and vector valued functions of several variables.
Learning outcomes **:** After completing the course the student is able to examine the convergence of series and power series of real terms and estimate the truncation error. Furthermore, the student can explain the use of power series e.g. in calculating limits and approximations for definite integrals and is able to solve problems related to differential and integral calculus of real and vector valued functions of several variables.
**Contents:**
Sequences, series and power series of real terms. Differential and integral calculus of real and vector valued functions of several variables.
**Learning activities and teaching methods:**
Term course. Lectures 5 h/week. Two examinations or a final examination.
**Recommended optional programme components:**
Calculus I.
**Recommended or required reading:**
Kreyszig, E.: Advanced Engineering Mathematics; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations.

## 764323A: Cell membrane biophysics, 7 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

764623S Cell membrane biophysics 7.0 op

**ECTS Credits:**
7 credits
**Language of instruction:**
Can be taught partly or completely in English.
**Timing:**
3rd or 4th autumn
**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 to familiarize with the English literature of the field and present a short review of a given article.
**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 get to know the basics about the theory of the intracellular or cell membrane recordings, the models describing the electrical function of the cell membrane and the analysis of these signals.

**Learning activities and teaching methods:**
Lectures 30 h, calculation exercises 22 h, seminars 4-8 h, seminar presentation, weekly assignments, home exam, final exam.

**Target group:**
Biophysics students: recommended in minor (LuK), compulsory in major (FM). Other students: recommended in biophysics minor (25 cu).

**Recommended optional programme components:**
Introduction to biophysics (764103P) and Foundations of cellular biophysics (764115P) are recommended to be done before this course. This course itself forms theoretical to Information processing in the nervous system (764680S).

**Recommended or required reading:**
Lecture handouts; J. Keener, J. Sneyd: Mathematical Physiology, Springer, Berlin, 1998 (partly).; D. Johnston, S. Wu: Foundations of Cellular Neurophysiology, MIT Press, Cambridge MA, 1995 (partly).

**Person responsible:**
Kyösti Heimonen, Marja Hyvönen

**Other information:**
https://wiki.oulu.fi/display/764323A/

## 040004Y: Chemistry, 6 op

**Opiskelumuoto:** General Studies

**Laji:** Course

**Vastuuyksikkö:** Medicine

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Johanna Myllyharju

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
6op

**Timing:**
C2

**Learning outcomes:**
After finishing the module student should have a basic knowledge concerning chemistry and laboratory work

**Contents:**

General and inorganic chemistry: Basic concepts of chemistry; structure of atom; chemical bond; chemical formula, reaction and equations, stoichiometry; thermodynamics; phase equilibrium; reaction kinetics; chemical equilibrium; acid/base equilibrium; electrochemistry. Organic chemistry: nomenclature of organic compounds; carbon bonds; stereochemistry; properties and reactions of organic compounds; carbohydrates.
Laboratory work: Gravimetry; titration; photometry; chromatography; reaction rate; methodology of organic chemistry; chemical buffers.

**Learning activities and teaching methods:**
Lectures 56 h, practice of calculations 4 h, laboratory work 15 h. Optional tutoring.

**Recommended or required reading:**
R. Laitinen ja J. Toivonen: Yleinen ja epäorgaaninen kemia, soveltuvin osin. Otakustantamo. Harold Hart: Organic Chemistry. A short Course, Houghton Mifflin Company, 6. (1983) or updated edition. Lectures and laboratory work. Kemian opintojakson työt -moniste (LTK/lääketieteellisen biokemian ja molekyylibiologian laitos).

**Assessment methods and criteria:**
Separate exams for common and inorganic chemistry, and organic chemistry. Optional possibility to practice calculations.

**Grading:**
Common and inorganic chemistry will be graded in scale 0-28 where the lowest qualified limit is 14/28. Organic chemistry will be graded in scale 0-20 where the lowest qualified limit is 10/20. Total maximum score is 48 p from the chemistry module where 24-27.75 (1), 28-31.75 (2), 32-35.75 (3), 36-39.75 (4) and 40-48 (5).

**Person responsible:**
Professor Taina Pihlajaniemi

**Other information:**
It is possibly to take final exam before chemistry module that will (if passed) liberate student from the actual final exams, but not from the laboratory works.

*Electives*

**040004Y-04: Chemistry Math practice, 0 op**

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 0,0 - 99,9
**Opettajat:** Johanna Myllyharju
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6op

**Timing:**

C2

**Learning outcomes:**

After finishing the module student should have a basic knowledge concerning chemistry and laboratory work

**Contents:**

General and inorganic chemistry: Basic concepts of chemistry; structure of atom; chemical bond; chemical formula, reaction and equations, stoichiometry; thermodynamics; phase equilibrium; reaction kinetics; chemical equilibrium; acid/base equilibrium; electrochemistry. Organic chemistry: nomenclature of organic compounds; carbon bonds; stereochemistry; properties and reactions of organic compounds; carbohydrates.
Laboratory work: Gravimetry; titration; photometry; chromatography; reaction rate; methodology of organic chemistry; chemical buffers.

**Learning activities and teaching methods:**

Lectures 56 h, practice of calculations 4 h, laboratory work 15 h. Optional tutoring.

**Recommended or required reading:**

R. Laitinen ja J. Toivonen: Yleinen ja epäorgaaninen kemia, soveltuvin osin. Otakustantamo. Harold Hart: Organic Chemistry. A short Course, Houghton Mifflin Company, 6. (1983) or updated edition. Lectures and laboratory work. Kemian opintojakson työt -moniste (LTK/lääketieteellisen biokemian ja molekyylibiologian laitos).

**Assessment methods and criteria:**

Separate exams for common and inorganic chemistry, and organic chemistry. Optional possibility to practice calculations.

**Grading:**

Common and inorganic chemistry will be graded in scale 0-28 where the lowest qualified limit is 14/28. Organic chemistry will be graded in scale 0-20 where the lowest qualified limit is 10/20. Total maximum score is 48 p from the chemistry module where 24-27.75 (1), 28-31.75 (2), 32-35.75 (3), 36-39.75 (4) and 40-48 (5).

**Person responsible:**

Professor Taina Pihlajaniemi

**Other information:**

It is possibly to take final exam before chemistry module that will (if passed) liberate student from the actual final exams, but not from the laboratory works.

*Compulsory*

**040004Y-03: Chemistry Laboratory works, 0 op**

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** General Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Medicine

**Arvostelu:** 0,0 - 99,9

**Opettajat:** Johanna Myllyharju

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6op

**Timing:**

C2

**Learning outcomes:**

After finishing the module student should have a basic knowledge concerning chemistry and laboratory work

**Contents:**

General and inorganic chemistry: Basic concepts of chemistry; structure of atom; chemical bond; chemical formula, reaction and equations, stoichiometry; thermodynamics; phase equilibrium; reaction kinetics; chemical equilibrium; acid/base equilibrium; electrochemistry. Organic chemistry: nomenclature of organic compounds; carbon bonds; stereochemistry; properties and reactions of organic compounds; carbohydrates.
Laboratory work: Gravimetry; titration; photometry; chromatography; reaction rate; methodology of organic chemistry; chemical buffers.

**Learning activities and teaching methods:**

Lectures 56 h, practice of calculations 4 h, laboratory work 15 h. Optional tutoring.

**Recommended or required reading:**

R. Laitinen ja J. Toivonen: Yleinen ja epäorgaaninen kemia, soveltuvin osin. Otakustantamo. Harold Hart: Organic Chemistry. A short Course, Houghton Mifflin Company, 6. (1983) or updated edition. Lectures and laboratory work. Kemian opintojakson työt -moniste (LTK/lääketieteellisen biokemian ja molekyylibiologian laitos).

**Assessment methods and criteria:**

Separate exams for common and inorganic chemistry, and organic chemistry. Optional possibility to practice calculations.

**Grading:**

Common and inorganic chemistry will be graded in scale 0-28 where the lowest qualified limit is 14/28. Organic chemistry will be graded in scale 0-20 where the lowest qualified limit is 10/20. Total maximum score is 48 p from the chemistry module where 24-27.75 (1), 28-31.75 (2), 32-35.75 (3), 36-39.75 (4) and 40-48 (5).

**Person responsible:**

Professor Taina Pihlajaniemi

**Other information:**

It is possibly to take final exam before chemistry module that will (if passed) liberate student from the actual final exams, but not from the laboratory works.

**040004Y-02: Chemistry, organic chemistry, 0 op**

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** General Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Medicine

**Arvostelu:** 0,0 - 99,9

**Opettajat:** Johanna Myllyharju

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6op

**Timing:**

C2

**Learning outcomes:**

After finishing the module student should have a basic knowledge concerning chemistry and laboratory work

**Contents:**

General and inorganic chemistry: Basic concepts of chemistry; structure of atom; chemical bond; chemical formula, reaction and equations, stoichiometry; thermodynamics; phase equilibrium; reaction kinetics; chemical equilibrium; acid/base equilibrium; electrochemistry. Organic chemistry: nomenclature of organic compounds; carbon bonds; stereochemistry; properties and reactions of organic compounds; carbohydrates.
Laboratory work: Gravimetry; titration; photometry; chromatography; reaction rate; methodology of organic chemistry; chemical buffers.

**Learning activities and teaching methods:**

Lectures 56 h, practice of calculations 4 h, laboratory work 15 h. Optional tutoring.

**Recommended or required reading:**

R. Laitinen ja J. Toivonen: Yleinen ja epäorgaaninen kemia, soveltuvin osin. Otakustantamo. Harold Hart: Organic Chemistry. A short Course, Houghton Mifflin Company, 6. (1983) or updated edition. Lectures and laboratory work. Kemian opintojakson työt -moniste (LTK/lääketieteellisen biokemian ja molekyylibiologian laitos).

**Assessment methods and criteria:**

Separate exams for common and inorganic chemistry, and organic chemistry. Optional possibility to practice calculations.

**Grading:**

Common and inorganic chemistry will be graded in scale 0-28 where the lowest qualified limit is 14/28. Organic chemistry will be graded in scale 0-20 where the lowest qualified limit is 10/20. Total maximum score is 48 p from the chemistry module where 24-27.75 (1), 28-31.75 (2), 32-35.75 (3), 36-39.75 (4) and 40-48 (5).

**Person responsible:**

Professor Taina Pihlajaniemi

**Other information:**

It is possibly to take final exam before chemistry module that will (if passed) liberate student from the actual final exams, but not from the laboratory works.

### 040004Y-01: Chemistry, general and inorganic chemistry, 0 op

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** General Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Medicine

**Arvostelu:** 0,0 - 99,9

**Opettajat:** Johanna Myllyharju

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6op

**Timing:**

C2

**Learning outcomes:**

After finishing the module student should have a basic knowledge concerning chemistry and laboratory work

**Contents:**

General and inorganic chemistry: Basic concepts of chemistry; structure of atom; chemical bond; chemical formula, reaction and equations, stoichiometry; thermodynamics; phase equilibrium; reaction kinetics; chemical equilibrium; acid/base equilibrium; electrochemistry. Organic chemistry: nomenclature of organic compounds; carbon bonds; stereochemistry; properties and reactions of organic compounds; carbohydrates.
Laboratory work: Gravimetry; titration; photometry; chromatography; reaction rate; methodology of organic chemistry; chemical buffers.

**Learning activities and teaching methods:**

Lectures 56 h, practice of calculations 4 h, laboratory work 15 h. Optional tutoring.

**Recommended or required reading:**

R. Laitinen ja J. Toivonen: Yleinen ja epäorgaaninen kemia, soveltuvin osin. Otakustantamo. Harold Hart: Organic Chemistry. A short Course, Houghton Mifflin Company, 6. (1983) or updated edition. Lectures and laboratory work. Kemian opintojakson työt -moniste (LTK/lääketieteellisen biokemian ja molekyylibiologian laitos).

**Assessment methods and criteria:**

Separate exams for common and inorganic chemistry, and organic chemistry. Optional possibility to practice calculations.

**Grading:**

Common and inorganic chemistry will be graded in scale 0-28 where the lowest qualified limit is 14/28. Organic chemistry will be graded in scale 0-20 where the lowest qualified limit is 10/20. Total maximum score is 48 p from the chemistry module where 24-27.75 (1), 28-31.75 (2), 32-35.75 (3), 36-39.75 (4) and 40-48 (5).

**Person responsible:**

Professor Taina Pihlajaniemi

**Other information:**

It is possibly to take final exam before chemistry module that will (if passed) liberate student from the actual final exams, but not from the laboratory works.

## 521302A: Circuit Theory 1, 5 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Electrical Engineering

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Rahkonen, Timo Erkki

**Opintokohteen kielet:** Finnish

**Language of instruction:**
The course and exercises are held in Finnish.
**Timing:**
Period 5-6.
**Learning outcomes:**
In this course the student learns to analyse simple DC, AC, and transient circuits. The course gives necessary basic knowledge for all analogue electronics courses (Basics of Electronic Design, Electronics Design I - III, Analog Filters).
Learning Outcomes: After completing the course the student can write and solve a system of equations describing the behaviour of electric circuits, use complex phasor arithmetics to solve the response of

circuits driven by sinusoidal signals, solve time responses of circuits, simplify circuit by employing equivalent circuits and series and parallel combinations, and run simple circuit simulations and understands the differences and limitations of different types of analyses.
**Contents:**
Electric quantities, circuit laws, systematic writing and solving of circuit equations using nodal and mesh analysis, time and frequency response, phasor calculation. Basics of circuit simulation.
**Learning activities and teaching methods:**
6 hours lectures and exercises per week. Basic circuit simulation exercises. The course is passed by a final exam and the simulation exercises (contact the lecturer for exam in English).
**Recommended optional programme components:**
Matrix Algebra, Differential Equations.
**Recommended or required reading:**
Handouts. The same topics are covered in Nilsson, Riedel: Electric Circuits (6th ed., Prentice-Hall 1996), chapters 1-11.

## 031017P: Differential Equations, 4 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Mathematics Division

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Hamina, Martti Aulis

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

| | | |
|---|---|---|
| 800320A | Differential equations | 5.0 op |
| 031076P | Differential Equations | 5.0 op |

**Language of instruction:**
Finnish
**Timing:**
Period 4-6
**Learning outcomes:**
The students learn the concepts concerning differential equations and get the ability to read associated literature. The students will achieve adequate mathematical skills for treating differential equations. They can identify simple analytically solvable differential equations and they can solve these by using various methods.
Learning outcomes: The students can apply differential equations as a mathematical model. They can identify and solve various differential equations and they have knowledge on basic solvability of differential equations. The student can use the Laplace transform as a solution method.
**Contents:**
Principles of mathematical modelling. Ordinary differential equations of first and higher order. Laplace transform with applications to differential equations.
**Learning activities and teaching methods:**
Lectures 3h/week. Two intermediate exams or one final exam.
**Recommended optional programme components:**
Calculus I.
**Recommended or required reading:**
Lecture notes in Finnish. Kreyszig. E., Advanced Engineering Mathematics

## 521467S: Digital Image Processing, 5 op

**Voimassaolo:** - 31.07.2012

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Computer Science and Engineering

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Pietikäinen, Matti

**Opintokohteen kielet:** English

**Learning outcomes:**
To make an introduction to digital image processing and image analysis.
Learning outcomes: After passing the course the student knows the theoretical foundations and most important application areas of digital image processing and image analysis. The student is able to apply spatial domain, frequency domain and wavelet-based image processing methods introduced in the course to solve practical problems in image enhancement, restoration, compression, segmentation and recognition.

**Contents:**
1. Digital image fundamentals, 2. Image enhancement, 3. Image restoration, 4. Color image processing, 5. Wavelets, 6. Image compression, 7. Morphological image processing, 8. Image segmentation, 9. Representation and description, 10. Basic principles of pattern recognition.
**Learning activities and teaching methods:**
Lectures, exercises, examination. Interactive image processing in Matlab environment is introduced in the programming exercise.
**Recommended optional programme components:**
Basic studies of mathematics
**Recommended or required reading:**
Gonzalez R.C., Woods R.E.: Digital image processing, Second edition, Addison-Wesley, 2002. Lecture notes (in Finnish), exercise material.

## 521109A: Electrical Measurement Principles, 5 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Electrical Engineering

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Juha Saarela

**Opintokohteen kielet:** Finnish

**Language of instruction:**
Lectures are in Finnish. Laboratory exercises can be done in English.
**Timing:**
Periods 4-6.
**Learning outcomes:**
The goal of this course is to give the theoretical and practical basis on electrical measuring techniques and to give basic knowledge to later studies. The course will also provide knowledge to use of general electrical measurement equipment.
Learning outcomes: Upon completion of the course, students are be able to measure basic measurements with a ammeter, voltmeter and oscilloscope. They can estimate the validity of their measurements.
**Contents:**
Units of measures, standards of measures, analysis of errors, most commonly used analog and digital measuring methods, equipment and safety regulations.
**Learning activities and teaching methods:**
Lectures and laboratory exercises. One or two exams and passed lab exercises.
**Recommended optional programme components:**
Calculus I and II, Physics S.
**Recommended or required reading:**
A.D. Helfrich, W.D. Cooper: Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall, 1990., material from Optima.

## 761103P: Electricity and Magnetism, 4 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

761119P Electromagnetism 1 5.0 op
761119P-01 Electromagnetism 1, lectures and exam 0.0 op
761119P-02 Electromagnetism 1, lab. exercises 0.0 op
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

**ECTS Credits:**
4 credits
**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:**
Spring
**Learning outcomes:**
The student masters the basic concepts of electricity and magnetism and is able to apply those when solving the problems related to electromagnetism.
**Contents:**
Electromagnetic interaction is one of the four fundamental interactions in physics and many phenomena like light, radio waves, electric current, magnetism and formation of solid matter are based on electromagnetism. The current technological development is largely based on applications of electromagnetism in energy production and transfer, telecommunications and information technology.
Contents in brief: Coulomb's law. Electric field and potential. Gauss's law. Capacitors and dielectrics. Electric current, resistors, electromotive force and DC circuits. Magnetic field, motion of a charged particle in electric and magnetic fields, and applications. Ampère's law and Biot-Savart law. Electromagnetic induction and Faraday's law. Inductance and inductors. R-L-C circuits, alternating current and AC circuits.
**Learning activities and teaching methods:**
Lectures 32 h, 6 exercises (12 h), four mini examinations and end examination or final examination.
**Target group:**
Secondary subject students.
**Recommended optional programme components:**
Knowledge of vector calculus and basics of differential and integral calculus are needed.
**Recommended or required reading:**
Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 12th edition, 2008, chapters 21-31. Also 11th and 10th editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.
**Person responsible:**
Anita Aikio
**Other information:**
https://wiki.oulu.fi/display/761103P/

## 555364S: Ergonomics, 5 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Industrial Engineering and Management

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Seppo Väyrynen

**Opintokohteen kielet:** Finnish

**Voidaan suorittaa useasti:** Kyllä

**Language of instruction:**
Finnish.
**Learning outcomes:**
The course familiarises the student with the fundamental principles of ergonomics.
Learning outcomes: After the completion of the course students are able to present and justify human artefacts and the interaction of the essential principles for the production and use of products. He can choose the methods which will enhance the employees safety, health, well-being to achieve work satisfaction. Still, he can develop and design products in the production according to physical, cognitive and organizational ergonomics.

**Contents:**
The anthropometrics, biomechanics, gerontechnology, work physiology, cognitive psychology and organisational and participative approaches. The principles of design and measurement (CAD, simulation, participative design). Usability.
**Recommended or required reading:**
Väyrynen, S, Nevala, N & Päivinen, M (2004), ***Ergonomia ja käytettävyys suunnittelussa*** . Teknologiateollisuus. 336 s . **Additional literature:** Bridger, R. (2009). ***Introduction to ergonomics*** . 3rd edition. CRC Press ; SFS-ergonomiastandardit (EN-ISO, www.sfs.fi), Copies from lectures.

## 040408S: Exercise and Work Physiology, 1 op

**Opiskelumuoto:** Advanced Studies
**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Vuolteenaho, Olli Jaakko Tuomas
**Opintokohteen kielet:** Finnish

**Language of instruction:**
Finnish
**Timing:**
C 3
**Learning outcomes:**
After completion of the course the student is expected to know the principles and main methods of exercise physiology

**Contents:**
1. Physical work capacity
2. Assessment of physical strain
3. The effect of temperature on physiological functions
**Learning activities and teaching methods:**
Lectures (8 h), a practical (5 h), independent study (17 t)
**Recommended or required reading:**
Material is provided during the course
**Assessment methods and criteria:**
Attending the lectures and completing the practical
**Grading:**
No examination. Attending the lectures and practical is compulsory.
**Person responsible:**
Olli Vuolteenaho (olli.vuolteenaho@oulu.fi) ja Hannu Rintamäki (hannu.rintamaki@ttl.fi)

**Other information:**
Optional course complementing Physiology for Medical and Dental curricula

## 764115P: Foundations of cellular biophysics, 4 op

**Opiskelumuoto:** Basic Studies
**Laji:** Course
**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

764125P Foundations of cellular biophysics 5.0 op

**ECTS Credits:**
2 credits
**Timing:**
2nd autumn
**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 view of biophysics. The course concentrates on the subjects of energy metabolism, information transfer, and the cellular structures and features that are biophysically interesting. The course contains, for instance, the introduction to the physical chemistry of the cells, the structure of cell and cell membrane (some basic cell biology), cellular energy sources and metabolism, cellular trafficking, kinetics of enzyme reactions, basics of cell membrane function and transportation phenomena, some introduction into the electrical phenomena of the cell membrane and the basics of cellular information processing.
**Learning activities and teaching methods:**
Lectures 14 h, calculation exercises 6 h, weekly assignments, home exam, final exam.
**Target group:**
Compulsory in biophysics major (LuK) and 25 cu (approbatur) minor.
**Recommended optional programme components:**
Introduction to biophysics (764162P) is recommended to be done before this course. This course forms an introduction for the course Biophysics of cell membranes (764323A).
**Recommended or required reading:**
Lecture handouts; P.J. Antikainen, Biotieteiden fysikaalista kemiaa, WSOY, Helsinki 1981 (partly); J. Heino and M. Vuento, Solubiologia, WSOY, Porvoo 2002 (partly). Since the books are in Finnish, some corresponding literature can be discussed upon with the lecturer.
**Person responsible:**
Marja Hyvönen, Kyösti Heimonen
**Other information:**
https://wiki.oulu.fi/display/764115P/

## 040108A: General Pathology, 3,5 - 5 op

**Voimassaolo:** 01.08.2014 -

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Medicine

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
4,5 op
**Timing:**
C3 (DC3)
**Learning outcomes:**
Upon completion the student should know the basic mechanisms of diseases (etiology and pathogenesis), their basic morphological, functional and clinical characteristics, and terminology related with diseases. The student should be able to recognize the most common macroscopical and microscopical features of diseases and be able to reason the relationship between these features of the diseases and their symptoms and other clinical manifestations.
**Contents:**

Cellular adaptation; cell and tissue injury; genetic and environmental causes of diseases; infections and immunological mechanisms in disease; inflammation; healing; disorders of fluid balance and circulation; basic pathology of neoplastic diseases; basics of medical post-mortem investigation.
**Learning activities and teaching methods:**
Lectures 23 hours, practicals 33 hours. Self study. Written examination 3 hours.
**Target group:**
Medical and dental students.
**Recommended or required reading:**
Books:Underwood JCE: General and systematic pathology, 4 th ed. (2004; sections: Basic pathology and General disease mechanisms); or Kumar V. et al.: Robbins Basic Pathology, 8 th ed. (2007, or 7 th ed. 2003). Alternatives: Kumar et al.: Robbins and Cotran, Pathologic basis of disease, 7 th ed. (2005); Rubin & Strayer; Rubin's Pathology (2005). In Finnish: lecture handouts; Guidebook for microscopy practicals; Guidebook for autopsy practicals. Web-based material (in Finnish): http://www.medicine.oulu.fi/pato/opetus/YP_ATK_JOHDANTO.htm
**Assessment methods and criteria:**
The course requirements include participation in the compulsory practicals and passing in the end-of-course examination.
**Grading:**
The evaluation scale is 1-5/fail.
**Person responsible:**
Professor Ari Ristimäki

## 521116S: Healthcare Information Systems, 4 op

**Voimassaolo:** 01.08.2005 - 31.07.2012
**Opiskelumuoto:** Advanced Studies
**Laji:** Course
**Vastuuyksikkö:** Department of Electrical Engineering
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Esko Alasaarela
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 811338A: Internet and Computer Networks, 5 op

**Opiskelumuoto:** Intermediate Studies
**Laji:** Course
**Vastuuyksikkö:** Department of Information Processing Science
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
5 ECTS
**Timing:**
1st year, period 3

**Learning outcomes:**
Objective: To present the general functioning principles of a modern packet switching computer networks, to get to know (also in a computer class) the char-acteristics of different network protocols, to get acquainted with the principles of both connectionless and connection-oriented data transmission, addressing and routing in Internet as well as with security in computer network environment.
Learning outcomes: The student is able to describe the functioning of a com-puter network and how data is transmitted in a network, to list the distinct layers of a network (in two reference models), to estimate the significance and opera-tion of distinct layers arvioida and to compare connectionless and connection-oriented transport. She/he identifies the most important network protocols and is able to estimate their functions. The student is able to explain the structure of the Internet addressing system and those general principles along which

routing in IP-networks is carried out. She/he is capable to calculate values to parameters describing the capacity of the network (transmission rate, traffic intensity, delay, etc.) and to apply the theory in a computer class for instance when analyzing the network traffic.

**Contents:**

1. The history and development of Internet and WWW 2. The basic concepts of computer networks: network devices, physical media, circuit switching, packet switching, delay, loss and throughput, protocols layers and reference models 3. The functioning of the application layer, network application architectures, communicting processes, transport services 4. Classical network applications: electronic mail, file transfer, remote login, newsgroups 5. New applications in Internet: DNS, World Wide Web and HTTP, content distribution 6. Data transmission in Internet. UDP protocol: connectionless and simple. TCP protocol: connection-oriented and reliable data transfer 7. Addressing and routing in Inter-net, IP protocol 8. Multimedia: real-time applications, streaming stored audio and video, Internet radio, Internet telephone (VoIP), QoS 9. Local area neworks, multiple access protocols, link-layer addressing, network devices, wireless con-nections 10. The principles of network security, security in different layers of the network

**Learning activities and teaching methods:**

lectures 40 h, exercises 30 h, autonomous work about 60 h

**Target group:**

1st year

**Recommended optional programme components:**

preceding course Discrete Structures

**Recommended or required reading:**

lecture slides (about 250 slides), lecture notes (about 100 pages), text book: J. F. Kurose and K. W. Ross, Computer Networking. A Top-Down Approach, Fifth Edition, Pearson Education Inc., 2010. ISBN: 978-0-136548-3.

**Assessment methods and criteria:**

passing by either partial exams (3 exams) or by a final exam

**Grading:**

on the scale 1 - 5

**Person responsible:**

Juha Kortelainen

## 580102P: Introduction to Medical and Wellbeing Technology, 5 op

**Opiskelumuoto:** General Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Jämsä, Timo Jaakko

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

2 credits

**Timing:**

1st year, autumn

**Learning outcomes:**

Introductive course to medical and wellness technology studies. After this course the student is introduced to the major subject and orientated to his or her studies. Student has a general overview of the different areas of medical and wellness technology and engineering.

**Contents:**

Practical examples of medical and wellness technology, introducing terms. Group work based on the material given and presenting the results.

**Learning activities and teaching methods:**

Lectures, demonstrations and excursions. Group work. Final exam.

**Recommended or required reading:**

Given material

**Assessment methods and criteria:**

Participating in the contact teaching and group work. Written exam.

**Grading:**

Pass or fail

**Person responsible:**

Professor Timo Jämsä

*Compulsory*

**580102P-01: Introduction to Medical and Wellbeing Technology, lectures, attendance, 0 op**

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

2 credits

**Timing:**

1st year, autumn

**Learning outcomes:**

Introductive course to medical and wellness technology studies. After this course the student is introduced to the major subject and orientated to his or her studies. Student has a general overview of the different areas of medical and wellness technology and engineering.

**Contents:**

Practical examples of medical and wellness technology, introducing terms. Group work based on the material given and presenting the results.

**Learning activities and teaching methods:**

Lectures, demonstrations and excursions. Group work. Final exam.

**Recommended or required reading:**

Given material

**Assessment methods and criteria:**

Participating in the contact teaching and group work. Written exam.

**Grading:**

Pass or fail

**Person responsible:**

Professor Timo Jämsä

**580102P-02: Introduction to Medical and Wellbeing Technology, exam, 0 op**

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

2 credits

**Timing:**

1st year, autumn

**Learning outcomes:**

Introductive course to medical and wellness technology studies. After this course the student is introduced to the major subject and orientated to his or her studies. Student has a general overview of the different areas of medical and wellness technology and engineering.

**Contents:**

Practical examples of medical and wellness technology, introducing terms. Group work based on the material given and presenting the results.

**Learning activities and teaching methods:**

Lectures, demonstrations and excursions. Group work. Final exam.

**Recommended or required reading:**

Given material

**Assessment methods and criteria:**

Participating in the contact teaching and group work. Written exam.

**Grading:**

Pass or fail

**Person responsible:**

Professor Timo Jämsä

## 811122P: Introduction to Programming, 5 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Information Processing Science

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Ilkka Räsänen

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

ay811122P Introduction to Programming (OPEN UNI) 5.0 op

**ECTS Credits:**
5 ECTS
**Timing:**
1st year, periods 1+2
**Learning outcomes:**
Objective: Student can systematically design, accomplish and test simple pro-grams using C-language as a target language.
Learning outcomes: After the course student
- understands the importance of design in programming
- can design and implement modular programs
- understands the principles of control structures and can exploit them
- understands the meaning on array construction and can exploit them
- understands the meaning of pointers and can exploit them
- understands the meaning of data structures and can exploit them
- can manipulate txt files programmatically

**Contents:**
- software design method, (waterfall)
- problem solving,
- stepwise refinement
- control structures
- modular programming, calling modules, communication between modules
- datatypes
- arrays
- pointers
- character strings
- data structures
- file processing

**Learning activities and teaching methods:**

lectures and exercises
**Target group:**
1st year, periods 1+2

**Recommended optional programme components:**
-
**Recommended or required reading:**
http://www.tol.oulu.fi/users/ilkka.rasanen/johdanto.html
Course book: Datel, Datel: C HOW TO PROGRAM; Pearson Education Inc. 2007
**Assessment methods and criteria:**
two ways:
1. final exam + exercise points
2. weekly exams + exercise points
**Grading:**
1-5
**Person responsible:**
Ilkka Räsänen

## 080901A: Introduction to Technology in Clinical Medicine, 5 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
6 credits
**Language of instruction:**
Finnish
**Timing:**
2nd year, autumn-spring
**Learning outcomes:**
After this course student is familiar with the different applications of medical technology and engineering that are used in different clinical areas.
**Contents:**
Course introduction lectures. Specialists from different clinical areas give lectures and demonstrations, in which main themes and terms of the field are introduced and technical equipment and methods are presented.
**Learning activities and teaching methods:**
Initial exam. Lectures 35 hrs, demonstrations 30 hrs, written work. Final exam.
**Assessment methods and criteria:**
Initial exam and written work. Taking part in the lectures and demos. Written final exam.
**Grading:**
1-5 or fail
**Person responsible:**
Professor Timo Jämsä

*Compulsory*

### 080901A-01: Introduction to Technology in Clinical Medicine, Initial exam, 0 op

**Voimassaolo:** 01.08.2010 -

**Opiskelumuoto:** Intermediate Studies

**Laji:** Partial credit

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6 credits

**Language of instruction:**

Finnish

**Timing:**

2nd year, autumn-spring

**Learning outcomes:**

After this course student is familiar with the different applications of medical technology and engineering that are used in different clinical areas.

**Contents:**

Course introduction lectures. Specialists from different clinical areas give lectures and demonstrations, in which main themes and terms of the field are introduced and technical equipment and methods are presented.

**Learning activities and teaching methods:**

Initial exam. Lectures 35 hrs, demonstrations 30 hrs, written work. Final exam.

**Assessment methods and criteria:**

Initial exam and written work. Taking part in the lectures and demos. Written final exam.

**Grading:**

1-5 or fail

**Person responsible:**

Professor Timo Jämsä

### 080901A-02: Introduction to Technology in Clinical Medicine, Lectures and demonstrations, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6 credits

**Language of instruction:**

Finnish

**Timing:**

2nd year, autumn-spring

**Learning outcomes:**

After this course student is familiar with the different applications of medical technology and engineering that are used in different clinical areas.

**Contents:**

Course introduction lectures. Specialists from different clinical areas give lectures and demonstrations, in which main themes and terms of the field are introduced and technical equipment and methods are presented.

**Learning activities and teaching methods:**

Initial exam. Lectures 35 hrs, demonstrations 30 hrs, written work. Final exam.

**Assessment methods and criteria:**

Initial exam and written work. Taking part in the lectures and demos. Written final exam.

**Grading:**

1-5 or fail

**Person responsible:**

Professor Timo Jämsä

### 080901A-03: Introduction to Technology in Clinical Medicine, Written assignment, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6 credits

**Language of instruction:**

Finnish

**Timing:**

2nd year, autumn-spring

**Learning outcomes:**

After this course student is familiar with the different applications of medical technology and engineering that are used in different clinical areas.

**Contents:**

Course introduction lectures. Specialists from different clinical areas give lectures and demonstrations, in which main themes and terms of the field are introduced and technical equipment and methods are presented.

**Learning activities and teaching methods:**

Initial exam. Lectures 35 hrs, demonstrations 30 hrs, written work. Final exam.

**Assessment methods and criteria:**

Initial exam and written work. Taking part in the lectures and demos. Written final exam.

**Grading:**

1-5 or fail

**Person responsible:**

Professor Timo Jämsä

### 080901A-04: Introduction to Technology in Clinical Medicine, Exam, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

6 credits

**Language of instruction:**

Finnish

**Timing:**

2nd year, autumn-spring

**Learning outcomes:**

After this course student is familiar with the different applications of medical technology and engineering that are used in different clinical areas.

**Contents:**

Course introduction lectures. Specialists from different clinical areas give lectures and demonstrations, in which main themes and terms of the field are introduced and technical equipment and methods are presented.

**Learning activities and teaching methods:**

Initial exam. Lectures 35 hrs, demonstrations 30 hrs, written work. Final exam.

**Assessment methods and criteria:**

Initial exam and written work. Taking part in the lectures and demos. Written final exam.

**Grading:**

1-5 or fail

**Person responsible:**

Professor Timo Jämsä

## 580101Y: Introduction to University Studies, 2 op

**Opiskelumuoto:** General Studies
**Laji:** Course
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

**Language of instruction:**
Finnish or English
**Timing:**
1st autumn
**Learning outcomes:**
After this course the student is familiar with the university study environment, studying practicalities and the degree program. The student learns to make a personal study plan.
**Contents:**
University studies. University and the learning environment, aims of the studies, structure and content, working methods, services provided for students. How to plan studies and making a personal study plan. Study groups.
**Learning activities and teaching methods:**
Group meetings 20 hrs run by the tutors. Writing the personal study plan. No exam.
**Assessment methods and criteria:**
Taking part into group meetings, making a personal study plan.
**Grading:**
Pass of fail
**Person responsible:**
Tutors, study advisor

*Compulsory*

### 580101Y-01: Introduction to University Studies, tutorial, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

**Language of instruction:**

Finnish or English

**Timing:**

1st autumn

**Learning outcomes:**

After this course the student is familiar with the university study environment, studying practicalities and the degree program. The student learns to make a personal study plan.

**Contents:**

University studies. University and the learning environment, aims of the studies, structure and content, working methods, services provided for students. How to plan studies and making a personal study plan. Study groups.

**Learning activities and teaching methods:**

Group meetings 20 hrs run by the tutors. Writing the personal study plan. No exam.

**Assessment methods and criteria:**

Taking part into group meetings, making a personal study plan.

**Grading:**

Pass of fail

**Person responsible:**

Tutors, study advisor

### 580101Y-02: Introduction to University Studies, conversation, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opintokohteen kielet:** Finnish

**Language of instruction:**

Finnish or English

**Timing:**

1st autumn

**Learning outcomes:**

After this course the student is familiar with the university study environment, studying practicalities and the degree program. The student learns to make a personal study plan.

**Contents:**

University studies. University and the learning environment, aims of the studies, structure and content, working methods, services provided for students. How to plan studies and making a personal study plan. Study groups.

**Learning activities and teaching methods:**

Group meetings 20 hrs run by the tutors. Writing the personal study plan. No exam.

**Assessment methods and criteria:**

Taking part into group meetings, making a personal study plan.

**Grading:**

Pass of fail

**Person responsible:**

Tutors, study advisor

## 764103P: Introduction to biophysics, 2 op

**Voimassaolo:** 01.08.2009 -
**Opiskelumuoto:** Basic Studies
**Laji:** Course

**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

764163P-02 Basic biophysics (part 2) 0.0 op

764163P Basic biophysics 5.0 op

764163P-01 Introduction to Biomedical Physics (part 1) 0.0 op

**ECTS Credits:**
3 credits
**Timing:**
1st spring
**Learning outcomes:**
Acquiring basic knowledge of biophysics useful in more advanced courses.
**Contents:**
The course gives knowledge of basic biological processes from biophysics point of view. The focus is on cellular and molecular mechanisms but also includes introduction to the biophysics of movement and fluid flow phenomena and some other more specialized topics.
**Learning activities and teaching methods:**
Lectures 21 h, written examination.
**Target group:**
Students in Physics B.Sc. program (obligatory) and students aiming for Biophysics minor.
**Recommended optional programme components:**
None. This course is a good starting point for other studies in the field of Biophysics.
**Recommended or required reading:**
Lectures and lecture notes.
**Person responsible:**
Kyösti Heimonen, Marja Hyvönen and Matti Weckström
**Other information:**
https://wiki.oulu.fi/display/764103P/

## 040007Y: Introduction to scientific research, 1,5 op

**Opiskelumuoto:** General Studies

**Laji:** Course

**Vastuuyksikkö:** Medicine

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Pentti Nieminen

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
1,5 credits
**Timing:**
C2
**Learning outcomes:**
By the end of the course the student will have practiced the following skills:
- understanding scientific research process
- obtaining data
- exploring research methods and analyzing data
- reporting research findings in medical and dental journals

**Contents:**
Scientific communication, study planning, study designs, analyzing research data and reporting. Special points in medical research: ethics in research, regulations in clinical research and use of animals in scientific research.
**Learning activities and teaching methods:**
Lessons 10 h, participation in the Faculty of Medicine Science Day 6 h and homework tasks 18h.
**Assessment methods and criteria:**
Participation in the Faculty of Medicine Science Day and completion of homework.
**Grading:**
Pass/Fail

**Person responsible:**
Docent Pentti Nieminen
**Other information:**
This course is a part of the studies in research skills.

## 040910S: Laboratory Animal Course For Scientists, 6 op

**Voimassaolo:** - 31.07.2012
**Opiskelumuoto:** Advanced Studies
**Laji:** Course
**Vastuuyksikkö:** Laboratory Animal Centre
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Voipio Hanna-marja
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 761121P: Laboratory Exercises in Physics 1, 3 op

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

| | | |
|---|---|---|
| 761115P | Laboratory Exercises in Physics 1 | 5.0 op |
| 761118P-01 | Mechanics 1, lectures and exam | 0.0 op |
| 761115P-02 | Laboratory Exercises in Physics 1, laboratory exercises | 0.0 op |
| 761115P-01 | Laboratory Exercises in Physics 1, lecture and exam | 0.0 op |
| 761114P-01 | Wave motion and optics, lectures and exam | 0.0 op |
| 761113P-01 | Electricity and magnetism, lectures and exam | 0.0 op |

**ECTS Credits:**
3 credits
**Language of instruction:**
The lectures and the instruction material will be in Finnish. The laboratory experiments will be made in groups guided either in Finnish or in English.
**Timing:**
Autumn, spring.
**Learning outcomes:**
Main aim is to learn to make safe physical measurements, use different measurement tools, read different scales, handle the data, calculate the error estimations and make a sensible report of the measurements. After this course the student is able to make laboratory experiments and reports independently.
**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. Different measurements are made with different instruments. As a result the most probable value is determined as well as its errors. Five different works will be made during the course in groups of up to 8 students. The skills obtained during this course can be applied in the other laboratory courses Laboratory exercises in physics 2 and 3.
**Learning activities and teaching methods:**
Lectures 12 h, exercises 20 h (5 x 4 h). Written reports of the experiments and a written examination.
**Target group:**
Compulsory.
**Recommended optional programme components:**
Upper secondary school physics and mathematics.

**Recommended or required reading:**
English material is given from laboratory.
**Person responsible:**
Kari Kaila
**Other information:**
https://wiki.oulu.fi/display/761121P/
Registration for the course and exams will be found by using the code 761121P-01

## 031019P: Matrix Algebra, 3,5 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Mathematics Division

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Matti Peltola

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

031078P Matrix Algebra 5.0 op

**Language of instruction:**
Finnish
**Timing:**
Period 1-3
**Learning outcomes:**
The course gives the elementary theory of linear equations, matrices and vector spaces. The eigenvalues and eigenvectors with applications are introduced.
Learning outcomes **:** After completing the course the student is able to apply arithmetic operations of matrices. He can solve system of linear equations by matrix methods and can apply iterative methods to _nd the solution of the system of linear equations. The student is able to recognise the vector space and can relate the consepts of linear transform and matrix. He can analyse matrices by the parameters, vectors and vector spaces of matrices. The student is able to diagonalize matrices and apply diagonalization to the simple applications.
**Contents:**
Vectors and matrices. Systems of linaer equations. Vector spaces and linear transformations. The rank, nullity, row space and the column space of a matrix. The determinant of a matrix. Eigenvalues and eigenvectors of a matrix. The diagonalization with applications. The iterative methods of solving linear system of equations. The theorems of Gershgorin and Cayley- Hamilton.
**Learning activities and teaching methods:**
Term course. Lectures 4 h/week. Two examinations or final examination.
**Recommended or required reading:**
Grossman, S.I. : Elementary Linear Algebra.

## 580211S: Maturity Test, 0 op

**Voimassaolo:** 01.08.2003 -

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Jämsä, Timo Jaakko

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
0 credits
**Timing:**
After completion of the thesis.
**Learning outcomes:**

The student writes an essay in his/her native language on the thesis, to show a good command of the language and the topic of the thesis.
**Learning activities and teaching methods:**
Takes place after master's thesis. Written based on a given topic considering the thesis.
**Grading:**
Pass or fail.
**Person responsible:**
Professor Timo Jämsä

## 580211A: Maturity Test, 0 op

**Voimassaolo:** 01.08.2008 -
**Opiskelumuoto:** Advanced Studies
**Laji:** Course
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**Timing:**
After completion of the bachelor's thesis.
**Learning outcomes:**
The student writes an essay in his/her native language on the thesis, to show a good command of the language and the topic of the thesis.
**Learning activities and teaching methods:**
Takes place after bachelor's thesis. Written based on a given topic considering the thesis.
**Grading:**
Pass or fail.
**Person responsible:**
Professor Timo Jämsä

## 040902Y: Medical Biochemistry and molecular biology, 8 - 9 op

**Opiskelumuoto:** General Studies
**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Johanna Myllyharju
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

*Compulsory*

### 040902Y-01: Medical Biochemistry and molecular biology, 3 op

**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 0,0 - 99,9
**Opettajat:** Johanna Myllyharju
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

**040902Y-02: Medical Biochemistry and molecular biology, 3 op**

**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 0,0 - 99,9
**Opettajat:** Johanna Myllyharju
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

**040902Y-03: Medical Biochemistry and molecular biology, 3 op**

**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Johanna Myllyharju
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 764369A: Medical Equipments, 3 op

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

**Other information:**
https://wiki.oulu.fi/display/764369A/

## 764633S: Medical Physics, 4 op

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

**ECTS Credits:**
4 credits
**Timing:**
4th-5th Autumn
**Learning outcomes:**
The students are familiar with most common devices and technologies used in the hospitals.
**Contents:**
The course gives an introduction to the basic physics related to biomedical equipment used in hospitals (e.g. imaging and therapeutic devices). Covered topics include e.g. x ray imaging, computed tomography, magnetic resonance imaging, isotope techniques, radiation therapy and biomedical signal processing. The course contents may vary depending on the lecturers.
**Learning activities and teaching methods:**
Lectures 30 h, calculus assignments 15 h, exam.
**Target group:**

Physics MSc students with biophysics major or/and medical physics minor, biomedical engineering students.
**Recommended optional programme components:**
Recommended: physics basic courses and Radiation physics, biology and safety (764317A).
**Recommended or required reading:**
Dowsett, Kenny, Johnston. The Physics of Diagnostic Imaging, 2nd ed., Hodder Arnold, 2006
Additional literature depending on the lecturers.
**Person responsible:**
Iikka Salmela
**Other information:**
https://wiki.oulu.fi/display/764633S/

## 040002Y: Medical cell and developmental biology, 7 op

**Opiskelumuoto:** General Studies

**Laji:** Course

**Vastuuyksikkö:** Medicine

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Tuukkanen, Kaarlo Juha Kullervo

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
7credit points
**Timing:**
C1
**Learning outcomes:**
The learning outcomes are to identify the structure of various cell types (especially mammalian cells), the structure and function of cell organelles, cell growth and cell division and the principles of the regulation of cell function, genetic regulation and the common research techniques in cell biology. The student should understand gametogenesis, fertilization, embryonal development (0-40days) and its regulation as well as the development of embryonal malformations. The student should also understand the human growth and development. In addition, the student should learn the basic tissues of the human body and the microscopic structure of the tissues for understanding their normal and pathological function.
**Contents:**
Cell evolution and cell biology, human embryonal development (embryology), basic tissues which make up the organs (histology).
.
**Learning activities and teaching methods:**
Lectures 54 h and small group exercises 15 h
**Recommended or required reading:**
A.L. Kierszenbaum: Histology and Cell Biology: an introduction to pathology. Mosby, St Louis, (the latest edition), or J. Heino, M. Vuento: Biokemian ja solubiologian perusteet. WSOY oppimateriaalit, 1. edition (2007)
B. Young, J.S. Lowe, A. Stevens, J.W. Heath: Wheater's Functional Histology, A Text and Colour Atlas. Elsevier, Churchill Livingstone (or similar Atlas of Histology)
T.W. Sadler: Langman's Medical Embryology. Williams&Wilkins co, Baltimore
Additional material among the following books: 1) M. Niemi, K. Väänänen: Ihmisyksilön kehitysbiologia. Kustannus Oy Duodecim, 1993 2) H. Sariola, M. Filander, T. Heino, J. Jernvall, J. Partanen, K. Sainio, M. Salminen, I. Theseleff: Solusta yksilöksi, Kehitysbiologia. Kustannus Oy Duodecim, 2003
Web material:
http://www.solunetti.fi histology, pathology and embryology (partly under construction)
http://www.thieme.com/dyn/ebooklibrary/index.php
many atlas books, free access from the computers in the internet domain of Oulu University. Handouts of the lectures and practicals.
**Assessment methods and criteria:**
Participation in the small group practicals. The study module includes final examination . Medical cell and developmental biology and histology together with the study module of Anatomy will make the final grade of Anatomy. (See Anatomy study module)
**Grading:**
See Anatomy
**Person responsible:**

Professor Petri Lehenkari (Professor Juha Tuukkanen, leave of absence )
**Other information:**
Medical and dental students have the same study module .
The students in Medical and Wellness Technology have the same study module in extent of 5 credit points when participating in the lectures (54 h), one microscopy practical and the examination.

## 040011Y: Medical informatics, 2 op

**Opiskelumuoto:** General Studies
**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Pentti Nieminen
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 040011Y-01: Medical informatics, module 1, information and Communication Technology, 0,5 op

**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Paadar, Matti Reino Isak
**Opintokohteen kielet:** Finnish

**Timing:**
C1
**Learning outcomes:**
By the end of the course the student will have practiced the following skills:
- using information and communication technology resources in the University of Oulu,
- using workstations available in the Medical Faculty,
- applying basic software necessary in the studies

**Contents:**
Workstations, information security and confidentiality, networks, office software
**Learning activities and teaching methods:**
Lectures 2 h, group work in computer class-room 6-8 h and completion of a practical project 4 h. Group works include practical work with the university network, web-learning environment and software installed in the workstations.
**Assessment methods and criteria:**
Regular and active participation in the small group lessons and completion of a practical project.
**Grading:**
Pass/Fail
**Person responsible:**
Docent Pentti Nieminen
**Other information:**
This course is a part of the studies in research skills.

## 040011Y-02: Medical informatics, module 2, literature retrieval, 1 op

**Opiskelumuoto:** General Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Pentti Nieminen

**Opintokohteen kielet:** Finnish

**Learning outcomes:**
By the end of the course the student should be able to:
- search research articles using basic literature retrieval methods
- use bibliographic databases available at the Medical Faculty
**Contents:**
. Library information systems, 2. Medical and dental publications, 3. Scientific online journals, 4. Medline, 5. Medic, 6. Scopus, 7. Cochrane, 8. Electronic books, 9. Reference management software.
**Learning activities and teaching methods:**
Lectures 4 h, group lessons in computer class-room 9 h and completion of practical projects 10 h.
**Assessment methods and criteria:**
Regular and active participation in the small group lessons and completion of practical projects.
**Grading:**
Pass/Fail
**Person responsible:**
Docent Pentti Nieminen
**Other information:**
This course is a part of the studies in research skills.

## 764680S: Neural information processing, 5 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
5 credits
**Language of instruction:**
Can be taught also in English.
**Timing:**
4 $^{th}$ autumn
**Learning outcomes:**
After passing this course the student can describe and explain the basic principles in the information processing of neurons. The student is also able to solve, analyze and calculate problems and exercises concerning this field. In addition the student is able to start deeper studies on the literature of this scientific field.
**Contents:**
The course introduces the basics of the cellular functions concerning neural information processing, for example: nerve cell membrane phenomena, synaptic functions, neural signals, neuronal information. In addition some special issues of neuronal information processing are dealt with.
**Learning activities and teaching methods:**
Lectures ca. 30 h, calculation exercises 15 h, exam, home exam.
**Target group:**
This is an optional course for the students in the biophysics master program (major) and in biophysics minor.
**Recommended optional programme components:**
Cell membrane biophysics (764323A or 764623S) is recommended to be done before this course.
**Recommended or required reading:**
Lectures and other material given during the course.
**Person responsible:**
Matti Weckström, Kyösti Heimonen
**Other information:**
https://wiki.oulu.fi/display/764680S/

## 040112A: Physiology, 15 op

**Voimassaolo:** 01.08.2005 -

**Opiskelumuoto:** Basic Studies

**Laji:** Course
**Vastuuyksikkö:** Medicine
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Vuolteenaho, Olli Jaakko Tuomas
**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 580121A: Practical training, 1 - 5 op

**Voimassaolo:** 01.08.2005 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Practical training
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
1 credits
**Timing:**
Master studies, elective course
**Learning outcomes:**
Student gets working experience in the field of biomedical engineering.
**Assessment methods and criteria:**
Practical training in the field. The student should fill out the form about training and return it to the department.
**Grading:**
Practical training can be accepted to elective studies. Maximum is 4 ECTS. One ECTS is equal to three weeks training.
**Person responsible:**
Professor Timo Jämsä
**Other information:**
Practical Training 2 can be included in the Master's Degree. For more information, please contact assistant Maarit Kangas.

## 580120A: Practical training 1, 1 - 5 op

**Voimassaolo:** 01.08.2005 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Practical training
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
1 credits
**Timing:**
From 1st to 3rd year, elective course
**Learning outcomes:**
Student gets working experience in the field of biomedical engineering.
**Assessment methods and criteria:**
Practical training in the field. The student fills the form for training and returns it to the department.
**Grading:**
Practical training can be accepted to elective studies. Maximum is 4 ECTS. One ECTS is equal to three week of training.

**Person responsible:**
Professor Timo Jämsä
**Other information:**
Practical Training 1 can be included in the Bachelor's Degree. For more information, please contact assistant Maarit Kangas.

## 521431A: Principles of Electronics Design, 5 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Electrical Engineering

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Kari Määttä

**Opintokohteen kielet:** Finnish

**Language of instruction:**
Finnish.
**Timing:**
Period 1-3.
**Learning outcomes:**
To give the students all the basic information that all electrical engineers needs about circuit techniques of analogue electronics and internal structure of digital circuits.
**Contents:**
Analogue and digital circuits, basic amplifier related concepts, operational amplifier, diodes and diode circuits, single stage bipolar- and MOS-transistor amplifiers and how to bias them, small signal modeling and analyzing ac-properties of the amplifiers, internal structures of digital circuits (mainly CMOS), the principles of AD/DA -conversion and principles of VLSI-technology.
**Learning activities and teaching methods:**
Lectures and exercises. Final exam.
**Recommended optional programme components:**
Basic knowledge in Circuit Theory (Circuit Theory I). Also, understanding the basic operation of semiconductors helps (Principles of Semiconductor Devices).
**Recommended or required reading:**
Handout. Sedra, Smith: Microelectronic Circuits (4th edition), chapters 1, 3-5, 10.9, 13 and 14. OR Hambley: Electronics (2nd edition), chapters 1, 2, 3, 4, 5; 6 partially and some parts of other chapters.

## 580210S: Pro Gradu, 35 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Diploma thesis

**Vastuuyksikkö:** Institute of Health Sciences

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
35 credits
**Language of instruction:**
Finnish or English
**Timing:**
Master studies
**Learning outcomes:**
The main objective is to apply theoretical knowledge and problem solving and reporting skills in practical problems. The student is able to work independently using principles of scientific work.
**Contents:**
Research project in the field of medical & wellness technology and writing of the thesis.
**Learning activities and teaching methods:**

Thesis can be made at different research groups of the university or in industry or health care system. The student writes the thesis independently supported by the supervisor. The topic and contents should be discussed with the professor beforehand.
**Grading:**
Latin grades: approbatur, lubenter approbatur, non sine laude approbatur, cum laude approbatur, magna cum laude approbatur, eximia cum laude approbatur, laudatur.
**Person responsible:**
Professor Timo Jämsä

## 031021P: Probability and Mathematical Statistics, 5 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Mathematics Division

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

ay031021P Probability and Mathematical Statistics (OPEN UNI) 5.0 op

**Language of instruction:**
Finnish
**Timing:**
Period 4-6
**Learning outcomes:**
The course provides the student the fundamental knowledge of the basic concepts of probability, random variables, management of statistical material, hypothesis testing and estimation methods. Learning outcomes **:** After completing the course the student is able to use the basic concepts of probability and most important random variables and is also able to apply these to calculate probabilities and expected values. The student is also able to analyze statistical material by calculating confidence intervals, formulating and testing hypotheses and by performing maximum likelihood estimations.
**Contents:**
Basic concepts of probability, conditional probability, discrete and continuous random variables and their distributions, expectation and variance, joint distributions, central limit theorem, elements of statistics, interval of confidence, hypothesis testing, maximum likelihood estimation.
**Learning activities and teaching methods:**
Term course. Lectures 4 h/week. Two examinations or a final examination.
**Recommended optional programme components:**
Calculus I and Calculus II.
**Recommended or required reading:**
Milton J.S. and Arnold J.C.: Introduction to Probability and Statistics, McGraw-Hill (1992).

## 521053S: Product Responsibility to Medical Devices, 2 op

**Voimassaolo:** - 31.07.2012

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Electrical Engineering

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Hannu Sorvoja

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 811175P: Programming Assignment I, 2 op

**Opiskelumuoto:** Basic Studies
**Laji:** Course
**Vastuuyksikkö:** Department of Information Processing Science
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Ilkka Räsänen
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
2 ECTS
**Timing:**
1st year, periods 2 + 3

**Learning outcomes:**
Objective: Student can systematically design, implement and test simple pro-grams using C-language as a target language.
Learning Outcomes: to deepen the understanding of design, implementation and testing in programming
**Contents:**
- problem analysis
- design
- implementation
- documentation
**Learning activities and teaching methods:**
Independent working + 2 workshop
**Target group:**
1st year
**Recommended optional programme components:**
Introduction to programming
**Recommended or required reading:**
Introduction to programming lecture material

**Assessment methods and criteria:**
Accomplish programming assignment
**Grading:**
1-5
**Person responsible:**
Ilkka Räsänen

## 764317A: Radiation physics, biology and safety, 3 op

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

## 902006Y: Reading for Academic Purposes, 1,5 op

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

| | | |
|---|---|---|
| ay902006Y | Reading for Academic Purposes (OPEN UNI) | 1.5 op |

**Proficiency level:**
B2/C1
**Status:**
This course is compulsory for the students who choose English but are not exempted on the basis of their matriculation exam grade or an exemption exam. An alternative course is 903007Y German.
**Required proficiency level:**
Students are expected to have had English as their A1 or A2 language at school or to have acquired equivalent skills.
**ECTS Credits:**
1,5 credits
**Timing:**
1st year spring term for the students of medicine and dentistry, and 2 nd year spring term for wellness technology students.
**Learning outcomes:**
**Objective: The learning outcomes of the course include**

- employing appropriate reading strategies (skimming, scanning and strategies of extensive reading) to identify main points, locate information and synthesize knowledge in the academic texts of the student's field of study

- recognizing the discipline and genre -specific conventions of the target texts as manifested in distinctive patterns of text organization, phraseology and word formation

- inferring textual meaning based on an understanding of text organization, cohesive devices, grammatical structures and patterns of word formation

- combining information from various academic sources, creating a synthesis, and summarizing

- critical reading: recognizing the author's communicative purpose and point of view, assessing the validity of textual arguments, recognizing implications, understanding the communicative value of the text
**Target group:**
Students in the degree programs of medicine, dentistry, and wellness technology
**Recommended or required reading:**
Information will be provided at the beginning of the course.
**Assessment methods and criteria:**
The course requirements include active participation in classroom work and completion of home assignments. Alternatively, an end-of-course examination may be offered. The evaluation scale is 0-5.
**Grading:**
The evaluation scale is 1-5.
**Person responsible:**
Riitta Sallinen
**Other information:**
Students with the matriculation exam grade laudatur or eximia cum laude approbatur , or who have graduated from an IB -program will be exempted from the course but can participate voluntarily. For the rest of the students **an exemption exam will be offered on December 3rd, 2010 at 13-16 in lecture hall A101.**The exemption exam is voluntary and can be taken only once. Students **sign up for the exam in WebOodi from November 15th - 30th.** The students not exempted in the above ways are required to participate in the course. Students **sign up for the course in WebOodi from February 1st-29th 2011.** Information on the time and place of the classes will be provided in Optima and WebOodi.

## 902007Y: Scientific Communication, 1,5 op

**Voimassaolo:** 01.08.1995 -

**Opiskelumuoto:** Language and Communication Studies

**Laji:** Course

**Vastuuyksikkö:** Language Centre

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** English

**Leikkaavuudet:**

| | | |
|---|---|---|
| ay902007Y | Scientific Communication (OPEN UNI) | 1.5 op |

**Proficiency level:**
B2/C1
**Status:**
This course is compulsory for the students who have chosen English. An alternative course is 903008Y German.
**Required proficiency level:**
Students are expected to have had English as their A1 or A2 language at school or to have acquired equivalent skills.
**ECTS Credits:**
1,5 credits
**Timing:**
Students in the degree program of
o medicine: 4th year fall term
o dentistry: 3rd year spring term
o wellness technology: 1st year fall term
**Learning outcomes:**
**The learning outcomes of the course include**
- accuracy of pronunciation, word stress and intonation especially in the language used for professional and academic communication in the student's field of study,
- using English fluently and accurately to communicate knowledge and express opinions in a conversation relating to the target field,
- an ability to summarize orally texts on professional and academic topics in the target field,- an ability to give a presentation on a professional or academic topic relating to the student's field of study.

Students with adequate oral skills previously acquired, may choose, as an alternative, **a writing course with learning outcomes such as an ability**
- to write a research article that follows the main discourse conventions of the target field,
- to use grammatical patterns that are stylistically appropriate for the research articles of the target field,
- to use general scientific vocabulary and field specific terminology in an idiomatic way,
- to create field-specific patterns of text structure,
- to develop a systematic argument with supporting detail.
**Target group:**
Students in the degree programs of medicine, dentistry, and wellness technology
**Recommended or required reading:**
Information will be provided at the beginning of the course.
**Assessment methods and criteria:**
Assessment is based on active participation in classroom activities, completion of home assignments and the presentations given/completion of writing assignments.
**Grading:**
The evaluation scale is 0-5.
**Person responsible:**
Riitta Sallinen
**Other information:**
Medical students **sign up** for the course **in WebOodi from August 17th-23rd 2010.** Information on the time and place of the classes will be provided in Optima and WebOodi.
Wellness technology and dentistry students sign up at their departments.

## 901020Y: Second Official Language (Swedish), 3 op

**Voimassaolo:** 01.08.1995 -

**Opiskelumuoto:** Language and Communication Studies

**Laji:** Course

**Vastuuyksikkö:** Language Centre

**Opintokohteen kielet:** Swedish

Ei opintojaksokuvauksia.

## 521124S: Sensors and Measuring Techniques, 5 op

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Electrical Engineering

**Arvostelu:** 1 - 5, pass, fail

**Opettajat:** Myllylä, Risto Antero

**Opintokohteen kielet:** Finnish

**Language of instruction:**
In Finnish. Materials also available in English.

**Timing:**
Period 1-2.

**Learning outcomes:**
The objective of the course is to present common practical solutions for electrically measuring physical quantities. This course covers especially sensors and methods used in process industry.
Learning outcomes: After the course the student is capable to explain the operating principles of different sensors and can select a right sensor for each measuring target. He/she is able to quantify the requirements that affect sensor selection as well as recognize and evaluate the uncertainty of a measurement. In addition the student is able to plan and design sensor signal conditioning circuits.

**Contents:**
Methods for measuring displacement, velocity, acceleration, torque, liquid level, pressure, flow, humidity, sound and temperature. Ultrasound, optical and nuclear measurement techniques and applications, material analyses such as pH measurement and gas concentration, pulp and paper measurements and smart sensors.

**Learning activities and teaching methods:**
Lectures and exercises. The course is passed by a final exam.

**Recommended or required reading:**
H. N. Norton: Handbook of Transducers, Prentice Hall P T R, 1989 or 2002; lecture notes (in Finnish); exercise notes (also in English)

## 764359A: Spectroscopic methods, 5 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**ECTS Credits:**
5 credits

**Timing:**
Not lectured every year.

**Learning outcomes:**
After a successful pass of the course, 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 röntgen analytics are introduced.

**Learning activities and teaching methods:**
Lectures 46 h, exercises 24 h. Two written examinations or one final examination.

**Target group:**
Compulsory for students in biophysics. Recommended for students directing at some of the lines in atomic, molecular and materials physics.

**Recommended optional programme components:**
None.

**Recommended or required reading:**
Partly distributed through net, and partly as paper copies during the course.

**Person responsible:**

Jukka Jokisaari

## 080913A: Technology in Clinical Chemistry, 3 op

**Opiskelumuoto:** Intermediate Studies
**Laji:** Course
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**
3 credits
**Language of instruction:**
Finnish
**Timing:**
Master studies, autumn or spring. The course is not organized every year.
**Learning outcomes:**
After this course student is familiar with the basic laboratory techniques and equipment used in clinical diagnostics.
**Contents:**
Introduction to laboratory diagnostics. Fotometry, chromatography, electrophoresis, potentiometry, immunochemical methods, entsymatic methods, cell counting, molecule biology techniques, point of care analytics, hematological analyzers.
**Learning activities and teaching methods:**
Initial exam, seminars, final exam
**Recommended or required reading:**
Laboratoriolääketiede, kliininen kemia ja hematologia. Kandidaattikustannus Oy, 2003.
**Assessment methods and criteria:**
Initial exam, seminars and final exam.
**Grading:**
1-5 or fail. Final grade is the average of the grades of seminar presentation and written exam.
**Person responsible:**
Professor Timo Jämsä
**Other information:**
Course is organised every other year.

*Compulsory*

### 080913A-04: Technology in Clinical Chemistry, Exam, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Maarit Kangas
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

3 credits

**Language of instruction:**

Finnish

**Timing:**

Master studies, autumn or spring. The course is not organized every year.

**Learning outcomes:**

After this course student is familiar with the basic laboratory techniques and equipment used in clinical diagnostics.

**Contents:**

Introduction to laboratory diagnostics. Fotometry, chromatography, electrophoresis, potentiometry, immunochemical methods, entsymatic methods, cell counting, molecule biology techniques, point of care analytics, hematological analyzers.

**Learning activities and teaching methods:**

Initial exam, seminars, final exam

**Recommended or required reading:**

Laboratoriolääketiede, kliininen kemia ja hematologia. Kandidaattikustannus Oy, 2003.

**Assessment methods and criteria:**

Initial exam, seminars and final exam.

**Grading:**

1-5 or fail. Final grade is the average of the grades of seminar presentation and written exam.

**Person responsible:**

Professor Timo Jämsä

**Other information:**

Course is organised every other year.

### 080913A-03: Technology in Clinical Chemistry, Written assignment, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

3 credits

**Language of instruction:**

Finnish

**Timing:**

Master studies, autumn or spring. The course is not organized every year.

**Learning outcomes:**

After this course student is familiar with the basic laboratory techniques and equipment used in clinical diagnostics.

**Contents:**

Introduction to laboratory diagnostics. Fotometry, chromatography, electrophoresis, potentiometry, immunochemical methods, entsymatic methods, cell counting, molecule biology techniques, point of care analytics, hematological analyzers.

**Learning activities and teaching methods:**

Initial exam, seminars, final exam

**Recommended or required reading:**

Laboratoriolääketiede, kliininen kemia ja hematologia. Kandidaattikustannus Oy, 2003.

**Assessment methods and criteria:**

Initial exam, seminars and final exam.

**Grading:**

1-5 or fail. Final grade is the average of the grades of seminar presentation and written exam.

**Person responsible:**

Professor Timo Jämsä

**Other information:**

Course is organised every other year.

### 080913A-02: Technology in Clinical Chemistry,Contact teaching, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

3 credits

**Language of instruction:**

Finnish

**Timing:**

Master studies, autumn or spring. The course is not organized every year.

**Learning outcomes:**

After this course student is familiar with the basic laboratory techniques and equipment used in clinical diagnostics.

**Contents:**

Introduction to laboratory diagnostics. Fotometry, chromatography, electrophoresis, potentiometry, immunochemical methods, entsymatic methods, cell counting, molecule biology techniques, point of care analytics, hematological analyzers.

**Learning activities and teaching methods:**

Initial exam, seminars, final exam

**Recommended or required reading:**

Laboratoriolääketiede, kliininen kemia ja hematologia. Kandidaattikustannus Oy, 2003.

**Assessment methods and criteria:**

Initial exam, seminars and final exam.

**Grading:**

1-5 or fail. Final grade is the average of the grades of seminar presentation and written exam.

**Person responsible:**

Professor Timo Jämsä

**Other information:**

Course is organised every other year.

### 080913A-01: Technology in Clinical Chemistry, Pre-assignment, 0 op

**Voimassaolo:** 01.08.2010 -
**Opiskelumuoto:** Intermediate Studies
**Laji:** Partial credit
**Vastuuyksikkö:** Institute of Health Sciences
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Jämsä, Timo Jaakko
**Opintokohteen kielet:** Finnish

**ECTS Credits:**

3 credits

**Language of instruction:**

Finnish

**Timing:**

Master studies, autumn or spring. The course is not organized every year.

**Learning outcomes:**

After this course student is familiar with the basic laboratory techniques and equipment used in clinical diagnostics.

**Contents:**

Introduction to laboratory diagnostics. Fotometry, chromatography, electrophoresis, potentiometry, immunochemical methods, entsymatic methods, cell counting, molecule biology techniques, point of care analytics, hematological analyzers.

**Learning activities and teaching methods:**

Initial exam, seminars, final exam

**Recommended or required reading:**

Laboratoriolääketiede, kliininen kemia ja hematologia. Kandidaattikustannus Oy, 2003.

**Assessment methods and criteria:**

Initial exam, seminars and final exam.

**Grading:**

1-5 or fail. Final grade is the average of the grades of seminar presentation and written exam.

**Person responsible:**

Professor Timo Jämsä

**Other information:**

Course is organised every other year.

## 764327A: Virtual measurement environments, 5 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physics

**Arvostelu:** 1 - 5, pass, fail

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

764627S Virtual measurement environments 5.0 op

**ECTS Credits:**
5 credits
**Timing:**
3rd autumn
**Learning outcomes:**
The students will learn how to construct sofware environments for measurements and data analysis.
**Contents:**
The course gives basic skills to use MATLAB and LabView programming environments to construct their own (custom) programs, with which they can both measure and analyze data with the computer.
**Learning activities and teaching methods:**
Lectures 10 h, project work about 60 h. Project reports.
**Target group:**
Students in Physics B.Sc. program (obligatory) and students aiming for Biophysics minor.
**Recommended optional programme components:**
None, but basics of programming principles are useful. The skills acquired in this course can be used in various courses and laboratory projects.
**Person responsible:**
Matti Weckström, Jouni Takalo
**Other information:**
https://wiki.oulu.fi/display/764327A/

## 761104P: Wave Motion, 3 op

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

761310A Wave motion and optics 5.0 op
761310A-01 Wave motion and optics, lectures and exam 0.0 op
761310A-02 Wave motion and optics, lab. exercises 0.0 op
761114P-01 Wave motion and optics, lectures and exam 0.0 op
761114P-02 Wave motion and optics, lab. exercises 0.0 op
761114P Wave motion and optics 5.0 op

**ECTS Credits:**
3 credits
**Language of instruction:**
Lectures and exercises in Finnish. Material in English.
**Timing:**
Spring
**Learning outcomes:**
The student can classify different types of wave motions and knows the characterizing quantities (wavelength, period, wave speed), can apply geometrical optics to simple mirror and lens systems, knows the meaning of interference and diffraction and can apply these in simple cases.
**Contents:**
Basic course on wave motion, and geometric and wave optics.
Wave motion and propagation. Acoustics. Geometric optics: basic principles, mirrors and lenses. Electromagnetic waves. Wave optics: interference, diffraction, and polarization. Optical instruments. Photometry. Laser.
**Learning activities and teaching methods:**
Lectures 32 h, exercises 10 h, four mini examinations and one end examination or a final examination.
**Target group:**
For students of minor subject.
**Recommended optional programme components:**
Upper secondary school physics and mathematics.
**Person responsible:**
Sami Heinäsmäki
**Other information:**
https://wiki.oulu.fi/display/761104P/

## 521114S: Wireless Measurements, 4 op

**Voimassaolo:** 01.08.2005 -
**Opiskelumuoto:** Advanced Studies
**Laji:** Course
**Vastuuyksikkö:** Department of Electrical Engineering
**Arvostelu:** 1 - 5, pass, fail
**Opettajat:** Esko Alasaarela
**Opintokohteen kielet:** Finnish
**Leikkaavuudet:**

521097S Wireless Measurements 5.0 op

**Language of instruction:**
In Finnish or in English if three or more foreign students participate.

**Timing:**
Period 4
**Learning outcomes:**
The objective of the course is to supply student with basic understanding of methods, standards and components, which are needed in the wireless measurements of industrial, traffic, environmental and healthcare applications. Learning outcomes: Upon completing the course, the student can apply wireless technologies in industrial, traffic, environmental and healthcare measurements. He/she can tell and argument the benefits and challenges of using wireless measurement solutions and is able to apply the most important standards in his/her engineering work. In addition, he/she can use a representing set of industrial and scientific applications of wireless measurements to develop his/her own solutions.

**Contents:**
Basics of wireless measurement technologies and standards, wireless sensors and sensor networks, wireless industrial measurement and testing applications, wireless measurement applications in traffic, wireless environmental measurements and wireless human health monitoring.
**Learning activities and teaching methods:**
The course is lectured intensively within one period. At the end of the period the students prepare presentations about contemporary themes selected by them or proposed by the teacher and give 15-20 minutes presentation to other students in the seminars.
**Recommended optional programme components:**
Basics of measurement technology and Electronic measurement technology or equivalent basic knowledge.

**Recommended or required reading:**
Lecture notes (in English) prepared by the teacher and contemporary seminar presentations with their source material.
**Assessment methods and criteria:**
The course is passed with a literal final exam (70 %) and a contemporary seminar (30 %)