

# Opasraportti

## LTK - Medical and Wellness Technology 2008-2009 (2008 - 2009)

UNIVERSITY OF OULU  
FACULTY OF MEDICINE  
DEPARTMENT OF MEDICAL TECHNOLOGY

INFORMATION ON THE DEPARTMENT, DEGREE PROGRAMME AND COURSE DESCRIPTIONS 2008 - 2009

### 1 DEPARTMENT OF MEDICAL TECHNOLOGY

#### 1.1 ECTS Departmental Coordinator

Ms Riikka Heikkinen, e-mail riikka.heikkinen@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/itek>. 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, Riikka Heikkinen  
Assistant, Maarit Kangas  
Assistant, study advisor, Matti Luomala  
Assistant, Pasi Pulkkinen  
Researcher, Mikko Finnilä  
Researcher, Janne Koivumäki  
Researcher, Virpi Muhonen  
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	3.5	7	-
Basic studies	51.5	15	10
Intermediate studies	5	33	30
Elective studies	-	5	10

Bachelor's Thesis	-	-	10
Total	60	60	60

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  
 764162P Introduction to Biophysics, 5 ECTS  
 761104P Wave Motion, 3 ECTS  
 761103P Electricity and Magnetism, 4 ECTS  
 761105P Atom and Nuclear Physics, 3 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  
 040200Y Basics in Telehealthcare, 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	14	-
Advanced studies	23	7
Specialization studies	10	10
Elective studies	13	8
Master's Thesis	-	35
Total	60	60

Specialization studies A or B, minimum 20 ECTS

Choice A: Medical Engineering

Choice B: Biomedical Technology

Year 1, courses:

040108A General Pathology, 3 ECTS  
 040627A Technology and Rehabilitation, 4 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 studies

Elective courses

Suggested elective courses for all:

031022P Numerical Analysis, 5 ECTS

031044A Mathematical Methods, 3 ECTS

521116S Information Systems in Health Care, 4 ECTS

521238S Optoelectrical 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  
 080910A: Applied Diagnostic Radiology, 4 op  
 040408S: Applied physiology, 1 op  
 761105P: Atomic and Nuclear Physics, 3 op  
 580209A: Bachelor's Thesis, 10 op  
 040901Y: Basic Anatomy, 1,5 - 2 op  
 580401A: Basic Biomaterials, 2 op  
 580103A: Basic Biomechanics, 3 op  
 040105Y: Basic Epidemiology, 1,5 op  
 761101P: Basic Mechanics, 4 op  
 040904A: Basic Pharmacology, 1,5 op  
 040200Y: Basics in eHealth, 5 op  
 040903A: Biochemistry II, 4 op  
 040902Y: Biochemistry I, 8 - 9 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  
 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  
 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  
 811122P: Introduction to Programming, 5 op  
 080901A: Introduction to Technology in Clinical Medicine, 5 op  
 580101Y: Introduction to University Studies, 2 op  
 764162P: Introduction to biophysics, 3 op  
 040007Y: Introduction to scientific research, 1,5 op  
 040910S: Laboratory Animal Course For Scientists, 6 op  
 031019P: Matrix Algebra, 3,5 op  
 580211S: Maturity Test, 0 op  
 580211A: Maturity Test, 0 op  
 764369A: Medical Equipments, 3 op  
 764633S: Medical Physics, 4 op  
 040002Y: Medical cell and developmental biology, 7 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  
 761121P: Physical Measurements I, 3 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  
 040627A: Technology and Rehabilitation, 4 op  
 080913A: Technology in Clinical Chemistry, 3 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 Physical Sciences

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

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

764664S Analysis and simulation of biosystems 6.0 op

Ei opintojaksokuvauksia.

#### **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. 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 assistant Pasi Pulkkinen.



**040408S: Applied physiology, 1 op****Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Vuolteenaho, Olli Jaakko Tuomas**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

**761105P: Atomic and Nuclear Physics, 3 op****Opiskelumuoto:** Basic Studies**Laji:** Course**Vastuuyksikkö:** Department of Physical Sciences**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

766326A Atomic physics 1 6.0 op

**ECTS Credits:**

3 credits

**Timing:**

Spring term

**Contents:**

The microscopic building blocks of matter, for example atoms and their nuclei, do not obey the laws of classical physics. The fundamental theories of modern physics, the theory of relativity and quantum mechanics, are required to describe them. Both theories involve some radical changes in our views of the physical world, especially of the nature of space, time, matter and radiation. This course is an introduction to these two theories that underlie our modern world view, and to their application to the description of atoms, nuclei, and fundamental particles. Topics will include: Relativity. Photons, electrons, and atoms. The wave nature of particles. Quantum mechanics. Atomic structure. Nuclear physics. Particle physics.

**Learning activities and teaching methods:**

Lectures 28 h, 4 exercises (8 h), 2 written intermediate examinations or one final examination.

**Target group:**

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**Recommended or required reading:**Textbook: H. D. Young and R. A. Freedman: University Physics, 12<sup>th</sup> edition, Pearson Addison Wesley, 2008 (in part), or earlier editions.

Lecture notes: Juhani Lounila: 761105P Atomi- ja ydinfysiikka, Oulun yliopisto, 2008.

**Person responsible:**

Juhani Lounila

**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

**ECTS Credits:**

2 credits

**Language of instruction:**

Finnish

**Timing:**

1st Spring

**Learning outcomes:**

After this course student is familiar with the basic anatomy of the human body.

**Learning activities and teaching methods:**

Lectures 20 h. Final exam

**Recommended or required reading:**

Material given in the lectures.

**Assessment methods and criteria:**

Written exam.

**Grading:**

1-5 or fail.

**Other information:**

Students have to register according to the instructions of the study advisor. This course is organized by the open university.

## 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

**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:**

Professo 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 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 and Friis: 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

Ei opintojaksokuvauksia.

## 761101P: Basic Mechanics, 4 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

**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

### Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basics for many other fields of physics, also for modern physics.

In the beginning of the mechanics course there is a short presentation of vectors and vector algebra. The mechanics part begins with kinematics where one, two and three dimensional motion is studied, including the projectile and circular motion. Newton's laws of motion start the dynamics part. Work, different forms of energy and conservation of energy are studied. Momentum, impulse and collisions are discussed. Rotational motion and related quantities like moment of inertia are studied. Dynamics of rotational motion include discussion of torque and angular momentum and its conservation. Solving rigid body equilibrium problems is practised. Gravitation with Newton's law of gravitation and circular satellite motion is studied. Periodic motion and fluid mechanics are the final parts of the course.

### 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 <http://physics oulu.fi/fysiikka/oj/761101P>

### Person responsible:

Anita Aikio

**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

**ECTS Credits:**

1,5 credits

**Language of instruction:**

Finnish

**Learning outcomes:**

After this course student is familiar with the basics of different medicinal substances and their effects.

**Contents:**

Different medicinal substances and their effects.

**Learning activities and teaching methods:**

Lectures 12 hours. Final exam.

**Recommended or required reading:**

Pelkonen, Ruskoaho: Lääketieteellinen farmakologia ja toksikologia. 3. painos, Kustannus Oy Duodecim, Helsinki, 2003

or

Koulu, Tuomisto: Farmakologia ja toksikologia. 6. painos, Medisiina, Kuopio, 2001.

**Assessment methods and criteria:**

Written exam

**Grading:**

1-5 or fail

**Person responsible:**

Jukka Hakkola

**Other information:**

Students should register to the course according to the instructions given by the study advisor. The course is organized by the Open University.

**040200Y: Basics in eHealth, 5 op**

**Opiskelumuoto:** General Studies

**Laji:** Course

**Vastuuyksikkö:** Medicine

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

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

5 credits

**Language of instruction:**

Finnish

**Timing:**

Master studies, autumn or spring

**Learning outcomes:**

Student knows the main concepts of telehealth, its technical solutions, importance and applications in the health care services and education. Student is able to utilize and promote telehealthcare in their future work.

**Contents:**

The concepts of telehealthcare, technical solutions and applications in telehealthcare. Social and economical significance. Different ways to evaluate telehealthcare. Future visions.

**Learning activities and teaching methods:**

Lectures 36 hrs, written exercise. The course is also arranged virtually in a web-based environment.

**Recommended or required reading:**

Recommended reading: Graig J., Wootton R. (Eds): An introduction to telemedicine. RSM Press, 1999. Mattila M. (Ed): Telelääketiede. Recallmed, 1999. Journal of Telemedicine and Tele healthcare. Burg G. (Ed): Telemedicine and Teledermatology. Vol 32. Karger, Basel, Freiburg, Paris, 2003.

**Grading:**

1-5 or fail

**Person responsible:**

Doc Ilkka Winblad, FinnTelemedicum

**Other information:**

Students should register to the course according to study advisor's instructions. The course is organized by the Open University.

### **040903A: Biochemistry II, 4 op**

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Medicine

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

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

### **040902Y: Biochemistry i, 8 - 9 op**

**Opiskelumuoto:** General Studies

**Laji:** Course

**Vastuuyksikkö:** Medicine

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

**Opettajat:** Pihlajaniemi, Taina Annikki

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

### **764660S: Bioelectronics, 5 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

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

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

### **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

**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 learns 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, spring

**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:**

In Finnish

**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 Physical Sciences

**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

**Learning outcomes:**

The course provides knowledge of signal processing methods that can be used for computerized biosignal (like ECG, EEG) analysis purposes.

Learning outcomes: After passing the course, the student can explain the importance of artifact filtering for the reliability of signal analysis and select a proper solution for most common application situations. In addition, (s)he can explain the central methods to analyze the contents of biosignals. The student can describe the most common signal decomposition methods and can apply them to biosignals.

**Contents:**

Biosignals, digital filtering, spectrum, wavelets, PCA, ICA, complexity measures

**Learning activities and teaching methods:**

: Lectures. Programming task assignment with experimental work with biosignals. Written exam.

**Recommended optional programme components:**

The basic engineering math courses, digital filtering, programming skills.

**Recommended or required reading:**

lecture transparencies, scientific articles, book excerpts. 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

Ei opintojaksokuvauksia.

## 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

**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

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

764623S Cell membrane biophysics 7.0 op

Ei opintojaksokuvauksia.

**040004Y: Chemistry, 6 op****Opiskelumuoto:** General Studies**Laji:** Course**Vastuuyksikkö:** Medicine**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Pihlajaniemi, Taina Annikki**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 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.

**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

**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

**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:**

O. Aumala: Mittaustekniikan perusteet, Otatiето 1999 (in Finnish). A.D. Helfrich, W.D. Cooper: Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall, 1990.

## 761103P: Electricity and Magnetism, 4 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

**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

**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 short: Electric field and potential, Coulomb's law, Gauss law, capacitors and dielectrics, electric current, resistivity, electromotive force, DC circuits, magnetic field, magnetic forces and its applications, Ampere's law, 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

## 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*.

Teknolgiateollisuus. 336 s. **Additional literature:** Bridger, R. (2009). *Introduction to ergonomics*. 3rd edition. CRC Press ; SFS-ergonomiastandardit (EN-ISO, [www.sfs.fi](http://www.sfs.fi)), Copies from lectures.

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

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

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

**Opintokohteen kielet:** Finnish

**Leikkaavuudet:**

764125P Foundations of cellular biophysics 5.0 op

**ECTS Credits:**

2 credits

**Recommended or required reading:**

<http://physics oulu.fi/biofysiikka/oj/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

Ei opintojaksokuvauksia.

## 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

Ei opintojaksokuvauksia.

### **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:**

Introductory 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

Ei opintojaksokuvauksia.

## **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

## **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

**ECTS Credits:**

1,5 credits

**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 or fail

**Person responsible:**

Tutors, study advisor Matti Luomala

## 764162P: Introduction to biophysics, 3 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

**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

Ei opintojaksokuvauksia.

## 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

Ei opintojaksokuvauksia.

## 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.

## 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

**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 find the solution of the system of linear equations. The student is able to recognise the vector space and can relate the concepts 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 linear 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

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

### 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

Ei opintojaksokuvauksia.

### 764369A: Medical Equipments, 3 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

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

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

### **764633S: Medical Physics, 4 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

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

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

### **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

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

Ei opintojaksokuvauksia.

### **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

Ei opintojaksokuvauksia.

### **764680S: Neural information processing, 5 op**

**Opiskelumuoto:** Advanced Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

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

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

5 credits

**Recommended or required reading:**

<http://physics oulu.fi/biofysiikka/oj/764680S/>

## 761121P: Physical Measurements I, 3 op

**Opiskelumuoto:** Basic Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

**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

**Timing:**

Autumn, spring.

**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 "Fysikaalisten tieteiden harjoitustyöt" and "Fysiikan harjoitustyöt".

**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:**

Instruction book in Finnish: J.Lounila: 761121P Fysikaaliset mittaukset, laboratoriotöiden työohje. English material is given from laboratory.

<http://physics oulu.fi/fysiikka/oj/761121P/>

**Person responsible:**

Kari Kaila

## 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

**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:** A,B,N,C,M,EX,L

**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:**

**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

**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

Ei opintojaksokuvauksia.



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

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Department of Physical Sciences

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

**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

## 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

**Learning outcomes:**

By the end of the course the student will have practiced the following skills

- extracting information, identifying main points and inferring meanings from the academic texts of the student's field of study by using appropriate reading techniques (skimming and scanning)
- recognizing discipline and culture-specific conventions (text-structures, grammatical patterns, phraseology and word formation), meanings and patterns in the academic texts of the target field
- detailed understanding and summarising of target field academic texts
- combining information from various academic sources, creating a synthesis, and assessing the sources used

**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.

**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 **November 28th, 2008 at 9-12 in lecture hall 101A (Aapistie 7)**. The exemption exam is voluntary and can be taken only once. Students sign up for the exam in **WebOodi** from November 17th - 24th. The students not exempted in the above ways are required to participate in the course. Students sign up for the course in WebOodi from January 5th-30th 2009. 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

- medicine: 4th year fall term
- dentistry: 3rd year spring term
- wellness technology: 1st year fall term

### **Learning outcomes:**

The core skills practiced 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,
- responding appropriately and convincingly to the contribution of other speakers in a professional or academic conversation,
- summarizing orally texts on professional and academic topics in the target field,
- giving a presentation on a professional or academic topic relating to the student's field of study.

### **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:**

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 11th-18th**. 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

**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 Physical Sciences

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

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

5 credits

**Timing:**

Not every year

**Contents:**

Intermediate course on different spectroscopic methods.  
Basics of infrared, mass and NMR spectroscopy and röntgen analytics.

**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 or required reading:**

Material is delivered during the course.

**Person responsible:**

Jukka Jokisaari

## 040627A: Technology and Rehabilitation, 4 op

**Opiskelumuoto:** Intermediate Studies

**Laji:** Course

**Vastuuyksikkö:** Open University, Oulu

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

**Opintokohteen kielet:** Finnish

**ECTS Credits:**

4 credits

**Language of instruction:**

Finnish

**Timing:**

Master studies, autumn semester

**Learning outcomes:**

After this course student knows the special aspects, devices and applications in rehabilitation and gerontechnology.

**Contents:**

The special aspects, devices and applications in rehabilitation and gerontechnology.

**Learning activities and teaching methods:**

Lectures 18 hrs. Learning diary.

**Recommended or required reading:**

Salminen A-L. (toim.) 2003. Apuvälinekirja. Kehitysvammaliitto. Tammer-Paino Oy. Suomen Kuntaliitto & Sosiaali- ja terveysministeriö. 2003. Apuvälinepalveluiden laatusuositus. Oppaita 2003:7. Suomen Kuntaliitto. 2004. Apuvälinepalvelunimikkeistö - opas terveydenhuoltoon. Kuntatalon paino, Helsinki. Toimintakykyyn liittyvän kuntoutuksen ohjeet (www.vkk.fi, yhteistyötahoille, Korvaustoiminnan ohjeet) Viramo P. Kuntoutusratkaisuja dementoituneen arkeen. Von Stephen T. & Martinsen H. 1999. Johdatus puhetta tukevaan kommunikointiin. Kehitysvammaliitto. [in Finnish]

**Assessment methods and criteria:**

Learning diary.

**Grading:**

1.5 or fail.

**Other information:**

Students should register to the course according to study advisor's instructions. The course is organized by the Open University.

## 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

**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, enzymatic 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:**

Professori Timo Jämsä

**764327A: Virtual measurement environments, 5 op****Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuyksikkö:** Department of Physical Sciences**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

764627S Virtual measurement environments 5.0 op

**ECTS Credits:**

5 credits

**Recommended or required reading:**<http://physics oulu.fi/biofysiikka/oj/764327A/>**761104P: Wave Motion, 3 op****Opiskelumuoto:** Basic Studies**Laji:** Course**Vastuuyksikkö:** Department of Physical Sciences**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

**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.

**Recommended or required reading:**

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 12<sup>th</sup> edition, 2008, chapters 15, 16, 32 - 36 and 38. Also 11<sup>th</sup> and 10<sup>th</sup> editions can be used.

**Person responsible:**

Sami Heinäsmäki

**Other information:**

See <http://physics.oulu.fi/opetus/>

## 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.

**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 argue 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. The course is passed with a literal final exam (70 %) and a contemporary seminar (30 %)

**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.

