Opasraportti

LTK - Medical and Wellness Technology (2015 - 2016)

Medical and Wellness Technology **Bachelor of Health Sciences (BHSc) 180 ECTS Cr**						
Studies and recommended semester	**1. autumn**	**1. spring**	**2. autumn**	**2. spring**	**3. autumn**	**3. spring**
General studies18 ECTS cr						
040012Y Knowledge and Research10 ECTS cr						
Information and Communication Technology 3 ECTS cr	3					
Scientific Communication 3 ECTS cr				3		
Statistical Methods 4 ECTS cr						4
580101Y Introduction to University Studies 2 ECTS cr	2					
901042Y Swedish, written language skills 1 ECTS cr			1			
901043Y Swedish, communication skills 2 ECTS cr			2			
902153Y English for Medical Technology 3 ECTS cr	3					
Basic Studies 72 ECTS cr						
031010P Calculus I 5 ECTS cr	5					
031011P Calculus II 5 ECTS cr		5				
031017P Differential Equations 5 ECTS cr		5				

031019P Matrix Algebra 5 ECTS cr	5					
040901Y Basic Anatomy 2 ECTS cr				2		
040902Y Medical Biochemistry and molecular biology 9 ECTS cr				9		
050004Y Chemistry 3 ECTS cr				3		
764125P Foundations of cellular biophysics 5 ECTS cr		5				
521141P Elementary Programming 5 ECTS cr	5					
580102P Introduction to Medical and Wellbeing Technology 5 ECTS cr	3	2				
761101P Basic Mechanics 5 ECTS cr	5					
761103P Electricity and Magnetism 5 ECTS cr		5				
761104P Wave Motion 5 ECTS cr		5				
766116P Radiation physics, biology and safety 5 ECTS cr				5		
764162P Basic biophysics 3 ECTS cr		3				
Intermediate Studies 70 ECTS cr						
031050A Signal Analysis 5 ECTS cr					5	
040112A Physiology 15 ECTS cr					15	
041201A Basics in eHealth 5 ECTS cr			5			
080901A Introduction to Technology in Clinical Medicine 5 ECTS cr			5			
521109A Electrical Measurement Principles 5 ECTS cr			5			

521287A Introduction to Computer Systems 5 ECTS cr			5			
521302A Circuit Theory 1 5 ECTS cr				5		
521337A Digital Filters 5 ECTS cr						5
521431A Principles of Electronics Design 5 ECTS cr						5
555285A Project management 5 ECTS cr					5	
764324A Biophysical laboratory exercises I 5 ECTS cr			5			
764327A Virtual measurement environments 5 ECTS cr					5	
Bachelor's Thesis and Maturity Test 10 ECTS cr						
580209A Bachelor's Thesis 10 ECTS cr						10
580211A Maturity Test 0 ECTS cr						
Total	**31**	**30**	**28**	**27**	**30**	**24**
Optional Studies 10 ECTS cr			2	3		5
Total 180 ECTS credits						

The studies include all mandatory general, basic and intermediate studies and optional studies so that the total extent of degree is 180 ECTS credits. The studies recommended to perform in the order as presented. The letter Y end of the code refers to the general studies, letter P to basic studies and the letter A to intermediate studies. Before attending to the Electrical and Information courses a student must complete Introduction to Unix exercises. These are carried out during 1. Autumn before Elementary Programming course.

Optional Studies 10 ECTS credits

Optional studies are selected among basic and intermediate studies that support the degree so that the total extent of the degree is at least 180 ECTS credits. In the case of optional studies, if necessary, the student must agree with the organizing department for the participation to the course. Optional studies may include practical training in the field of biomedical engineering of up to 4 ECTS credits (course code 580120A Practical training 1).

Recommended optional studies for Bachelor's degree:

Autumn:

031018P Complex Analysis 4 ECTS credits

465075A Research Techniques for Materials 3,5 ECTS credits

521144A Algorithms and Data Structures 6 ECTS credits

521145A Human-Computer Interaction 5 ECTS credits

521432A Electronics Design I 5 ECTS credits

766326A Atomic physics 1 6 ECTS credits (replaces the course 761105P Atomic and Nuclear Physics 3 ECTS credits)

766328A Thermophysics 6 ECTS credits (replaces the course 761102P Basic Thermodynamics 2 ECTS credits)

811170P Introduction to Information Systems Analysis and Design 6 ECTS credits

Spring:

031021P Probability and Mathematical Statistics 5 ECTS credits

031022P Numerical Analysis 5 ECTS credits

040105Y Basic Epidemiology 1.5 ECTS

521150A Introduction to Internet 5 ECTS credits

555265P Occupational health and safety management

750340A Basics of bioinformatics 3 ECTS credits

753124P Concepts of genetics 4 ECTS credits

763333A Solid state physics 4 ECTS credits

766334A Nuclear and particle physics 2 ECTS credits

811168P Information Security 5 ECTS credits

Autumn or spring:

580120A Practical training 11-4 ECTS credits

580201A Biomedical Engineering Programming Study 5 ECTS credits

Medical and Wellness Technology, Master of Health Sciences (MHSc)

Studies	**1. autumn**	**1. spring**	**2. autumn**	**2. spring**
Compulsory studies 36 ECTS Credits				
764664S Biosystems analysis and simulation 6 ECTS cr			6	
080914S Biomedical Engineering and Medical Physics Seminar ECTS 3cr			3	
521093S Biomedical Instrumentation 5 ECTS cr		5		
521124S Sensors and Measuring Techniques 5 ECTS cr	5			

521273S Biosignal Processing I 5 ECTS cr	5			
764634S Medical Physics and Imaging 6 ECTS cr	6			
764660S Bioelectronics 5 ECTS cr		5		
580210S Master's Thesis 35 ECTS cr			10	25
580211S Maturity Test				
Total	16	10	19	25
Advanced Studies **(one advanced module will be chosen from which need to be executed at least 25 ECTS credits)**				
A) Biomedical Technology (35 ECTS cr)				
040911S Using animals in research 3 ECTS cr		3		
080915S Tissue Biomechanics 5 ECTS cr	5			
465105A Research Techniques for Materials 5 ECTS cr	5			
580401A Basic Biomaterials 2 ECTS cr			2	
580402S Biomedical Imaging Methods 5 ECTS cr		5		
761359A Spectroscopic Methods 5 ECTS cr		5		
080917S Project in Biomedical Technology 10 ECTS cr		5	5	
Total	10	18	7	0
B) Medical Imaging (35 ECTS cr)				
521149S Computer Vision Methods for Medical and Biomedical Images 5 ECTS cr	5			

521466S Machine Vision 5 ECTS cr		5		
521259S Digital video processing 5 ECTS cr	5			
521289S Machine Learning 5 ECTS cr		5		
580402S Biomedical Imaging Methods 5 ECTS cr		5		
080918S Project in Medical imaging 10 ECTS cr			10	
Total	10	15	10	0
C) Health Technology (35 ECTS cr)				
040404A Health technology and rehabilitation 5 ECTS cr		5		
080916S Biomechanics of Human Movement 5 ECTS cr		5		
521114S Wireless Measurements 5 ECTS cr		5		
521430A Electronic Measurement Techniques 5 ECTS cr		5		
521145A Human-Computer Interaction 5 ECTS cr	5			
080919S Project in Health Technology 10 ECTS cr			10	
Total	5	20	10	0
Optional Studies (about 25 ECTS credits) *	**4/4/9**	**2/5/0**	**4/1/1**	**5/5/5**
Total	**30**	**30**	**30**	**30**
Total 120 ECTS credits				

* The table has been made assuming that the student will execute all courses included in advanced module. At least 25 ECTS credits have to be performed from the chosen advanced module. Thus, some of the courses listed in the advanced module can be replaced by optional courses.

Studies include compulsory intermediate and advanced studies, advanced module's studies and optional studies. The student executes compulsory studies (70 ECTS credits), studies of chosen advanced module (at least 25 ECTS credits) and optional studies so that the total extent of the degree is at least 120 ECTS credits. Studies are executed

according to the personal study plan. Studies are executed according to individual timetable depending on the optional studies. Some of the courses are held only every second year.

Optional Studies (about 25 ECTS credits)

Optional studies will be executed so that the total extent of the degree is at least 120 credits. Optional studies can be chosen from other advanced module or from other intermediate and advanced studies that support the degree. In the case of optional studies, if necessary, the student must agree with the organizing department for the participation for the course. Optional studies may include practical training in the field of biomedical engineering of up to 5 credits (580121A Practical training 2).

Recommended optional studies for advanced module Biomedical Technology:

580121A Practical training 2 1-5 ECTS cr

747604S Introduction to biocomputing 3 ECTS cr

750340A Basics of bioinformatics 5 ECTS cr

764322A Cell Membrane Biophysics 7 ECTS cr

764338A Basic Neuroscience 5 ECTS cr

764620S Hemodynamics 4 ECTS cr

764629S Identification of linear systems 5 ECTS cr

521282S Biosignal processing II 5 ECTS cr

521285S Affective Computing 5 ECTS cr

521149S Computer vision methods for medical and biomedical images 5 ECTS cr

521240S Biofotonic and biomedical optics 5 ECTS cr

Recommended optional studies for advanced module Medical Imaging:

580121A Practical training 2 1-5 ECTS cr

031044A Mathematical Methods 3 ECTS cr

031028S Mathematical Signal Processing 5 ECTS cr

521240S Biofotonic and biomedical optics 5 ECTS cr

521280S DSP-laboratory Work 5 ECTS cr

521412A Digital Techniques I 5 ECTS cr

521432A Electronics Design I 5 ECTS cr

521282S Biosignal processing II 5 ECTS cr

521285S Affective Computing 5 ECTS cr

521149S Computer vision methods for medical and biomedical images 5 ECTS cr

580201A Biomedical Engineering Programming Study 5 ECTS cr

766661S NMR Imaging 8 ECTS cr

Recommended optional studies for advanced module Health Technology:

580121A Practical training 2 1-5 ECTS cr

031044A Mathematical Methods 3 ECTS cr

031028S Mathematical Signal Processing 5 ECTS cr

461028S Experimental Methods in Engineering Mechanics 6 ECTS cr

464085A Patenting 5 ECTS cr

812671S Usability Testing 5 ECTS cr

521280S DSP-laboratory Work 5 ECTS cr

521238S Optoelectronic Measurements 5 ECTS cr

521412A Digital Techniques I 5 ECTS cr

521432A Electronics Design I 5 ECTS cr

521282S Biosignal processing II 5 ECTS cr

521285S Affective Computing 5 ECTS cr

580201A Biomedical Engineering Programming Study 5 ECTS cr

555242A Product Development 5 ECTS cr

Tutkintorakenteet

Bachelor's Degree programme in Medical and Wellness Technology, Bachelor of Health Science (180 ect) (copy)

Tutkintorakenteen tila: published

Lukuvuosi: 2015-16

Lukuvuoden alkamispäivämäärä: 01.08.2015

General studies (18 op)

902153Y: English for Medical Technology, 1,5 - 3 op
580101Y: Introduction to University Studies, 2 op
040012Y: Knowledge and Research, 3,5 - 10 op
901043Y: Second Official Language (Swedish), Oral Skills, 2 op
901042Y: Second Official Language (Swedish), Written Skills, 1 op

040901Y: Basic Anatomy, 1,5 - 2 op
764162P: Basic biophysics, 3 op
761111P: Basic mechanics, 5 op
Compulsory
761111P-01: Basic mechanics, lectures and exam, 0 op
761111P-02: Basic mechanics, lab. exercises, 0 op
031010P: Calculus I, 5 op

031075P: Calculus II, 5 op
050004Y: Chemistry, 3 op
031076P: Differential Equations, 5 op
761113P: Electricity and magnetism, 5 op
Compulsory
761113P-01: Electricity and magnetism, lectures and exam, 0 op
761113P-02: Electricity and magnetism, lab. exercises, 0 op
521141P: Elementary Programming, 5 op
764125P: Foundations of cellular biophysics, 5 op
580102P: Introduction to Medical and Wellbeing Technology, 5 op
031078P: Matrix Algebra, 5 op
040902Y: Medical Biochemistry and molecular biology, 8 - 9 op
766116P: Radiation physics, biology and safety, 5 op
Compulsory
766116P-01: Radiation physics, biology and safety, exam, 0 op
766116P-02: Radiation physics, biology and safety, laboratory exercises, 0 op
761114P: Wave motion and optics, 5 op
Compulsory
761114P-01: Wave motion and optics, lectures and exam, 0 op
761114P-02: Wave motion and optics, lab. exercises, 0 op

Intermediate Studies (vähintään 70 op)

041201A: Basics in eHealth, 5 op
764324A: Biophysical laboratory exercises I, 5 op
521302A: Circuit Theory 1, 5 op
521337A: Digital Filters, 5 op
521109A: Electrical Measurement Principles, 5 op
521287A: Introduction to Computer Systems, 5 op
080901A: Introduction to Technology in Clinical Medicine, 5 op
040112A: Physiology, 15 op
compuls12
040112A-01: Physiology, small group teaching, 2,5 op
040112A-011: Physiology, biophysics small group teaching, 0,5 op
040112A-021: Physiology, practicals entry examination, 1 op
040112A-02: Physiology, term paper, 2 op
040112A-03: Physiology, mid-term examination, 3 op
040112A-04: Physiology, final examination, 6 op
521431A: Principles of Electronics Design, 5 op
555285A: Project management, 5 op
031080A: Signal Analysis, 5 op
764327A: Virtual measurement environments, 5 op

Bachelor's Thesis and Maturity Test (10 op)

580209A: Bachelor's Thesis, 10 op
580211A: Maturity Test, 0 op

Optional studies (vähintään 10 op)

Optional studies are selected among basic and intermediate studies that support the degree so that the total extent of the degree is at least 180 credits. In the case of optional studies, if necessary, the student must agree with the organizing department for the participation to the course. Optional studies may include practical training in the field of biomedical engineering of up to 4 credits (course code 580120A Practical training I).

Master's Degree programme in Medical and Wellness Technology, Master of Health Science (120 ect) update

Tutkintorakenteen tila: published

Lukuvuosi: 2015-16

Lukuvuoden alkamispäivämäärä: 01.08.2015

Complementary Studies (enintään 60 op)

Common studies for all (36 op)

764664S: Analysis and simulation of biosystems, 6 op
764660S: Bioelectronics, 5 op
080914S: Biomedical Engineering and Medical Physics Seminar, 3 op
521093S: Biomedical Instrumentation, 5 op
521273S: Biosignal Processing I, 5 op
580211S: Maturity Test, 0 op
764634S: Medical physics and imaging, 5 op
580210S: Pro Gradu, 35 op
521124S: Sensors and Measuring Techniques, 5 op

Advanced Studies (25 - 35 op)

One advanced module will be chosen from which need to be executed at least 25 ECTS credits.

Biomedical Technology

580401A: Basic Biomaterials, 2 op
580402S: Biomedical Imaging Methods, 1 - 5 op
080917S: Project in Biomedical Technology, 5 - 10 op
465105A: Research techniques for materials, 5 op
761359A: Spectroscopic methods, 5 op
080915S: Tissue Biomechanics, 5 op
040911S: Using animals in research - carrying out procedures, 3 op

Medical Imaging

580402S: Biomedical Imaging Methods, 1 - 5 op
521259S: Digital Video Processing, 5 op
521289S: Machine Learning, 5 op
521466S: Machine Vision, 5 op
080918S: Project in Medical Imaging, 5 - 10 op
521149S: Special Course in Information Technology, 5 - 8 op

Health technology

080916S: Biomechanics of Human Movement, 5 op
521430A: Electronic Measurement Techniques, 6 op
040404A: Health technology and rehabilitation, 5 op
521145A: Human-Computer Interaction, 5 op
080919S: Project in Health Technology, 5 - 10 op
521114S: Wireless Measurements, 4 op

Optional studies (vähintään 23 op)

Optional studies are selected among the intermediate and advanced studies that support the degree (so that the total extent of the degree is at least 120 credits). In the case of optional studies, if necessary, the student must agree with the organizing department for the participation for the course. Optional studies may include practical training in the field of biomedical engineering of up to 4 credits (580121A Practical training 2).

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

902153Y: English for Medical Technology, 1,5 - 3 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Negotiated Education

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

Proficiency level:
B2/C1
Status:
Compulsory course
Required proficiency level:
Students are expected to have had English as their A1 or A2 language at school or have acquired equivalent skills.
ECTS Credits:
3 ECTS
Language of instruction:
English
Timing:
1st year
Learning outcomes:
Having completed the course, students will be able to

- understand and use relevant medical and technical vocabulary in professional and academic setting,
- use English in short professional communication, both spoken and written,
- respond appropriately and convincingly to the contribution of others in a professional and/or academic setting,
- summarize academic/scientific texts related to medical technology,

give a presentation on a professional or academic topic related to their field.
Contents:
The course material and communicative tasks cover the following topics:

- basics of medical terminology
- organisation of health care institutions
- devices and tools in health care
- technical description of certain devices in medical technology
- recent innovations in medical technology
- professional and academic organisations and forums in medical technology

Mode of delivery:
Contact and online teaching
Learning activities and teaching methods:
-
Target group:
Students in the degree programs of medical technology
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Specific texts and material prepared by the teacher. Information will be provided at the beginning of the course. Material will be available in Optima during the course.

Assessment methods and criteria:
The course requirements include active participation in classroom work and tutorial (24 hrs) and completion of home assignments (Reading journal and glossary: 20 hrs), presentation of self-selected literature (16 hrs), writing task (20 hrs). Alternatively, an end-of-course examination may be offered. Some course work can be completed online.

Grading:
The evaluation scale is on a scale of 0-5 (hyl/hyv).
Person responsible:
Eva Braidwood
Working life cooperation:
-
Other information:
Students with the matriculation exam grade laudatur or eximia cum laude approbatur are exempted from the first part of the course but need to demonstrate summarizing skills and knowledge of basic medical vocabulary, which they can acquire autonomously using the online material provided by the teacher. Alternatively, they can participate in the first part, too. The same applies to those who have graduated from an IB–program or other English medium secondary education.

580101Y: Introduction to University Studies, 2 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
2 ECTS credit points / 54 hours of work
Language of instruction:
Finnish or English
Timing:
1 st year autumn
Learning outcomes:
After the course the student
1. identifies the most important departments, organisations and associations related to studying and knows their function and services
2. identifies the essential features for university studies and study planning in the field of medical and wellness technology
3. identifies ones path of studies
4. can compose and define the first 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 (PSP). Study groups.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Tutor and tutor teacher meetings, drawing the personal study plan, and discussion with the PSP advisor, total 54 hours.
Target group:
1 st year students of Medical and Wellness Technology
Assessment methods and criteria:
Taking part into group meetings, making a personal study plan. Personal study plan discussion about with the study advisor.
Grading:
The course utilizes verbal grading: pass or fail
Person responsible:
Tutors, study advisor
Working life cooperation:
-

040012Y: Knowledge and Research, 3,5 - 10 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Pentti Nieminen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay040012Y Knowledge and Research (OPEN UNI) 3.5 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
3,5 ECTS
Timing:
1 st and 2 nd year
Learning outcomes:
The student knows the role of scientific publications, can use and evaluate information sources critically.
The student is familiar with statistical computing in the fields of medicine, dentistry and health sciences. Further, the student is able to analyze data with basic statistical methods, use basic statistical significance tests and inference methods, and evaluate critically scientific research reports.
Contents:
Scientific communication:
Scientific journals, research articles, critical evaluation of research findings, ethics in scientific publication, study planning, study designs, reporting.
Statistical methods:
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.
Mode of delivery:
Blended teaching
Learning activities and teaching methods:
040012Y-05 (1,5 ECTS Knowledge Management and Research, Lessons and written examination
040012Y-06 (1,0 ECTS) Knowledge Management and Research, Small group exercises
040012Y-07 (1,0 ECTS) Knowledge Management and Research, Practical project

Target group:
Medical, dental and medical wellness technology students
Prerequisites and co-requisites:
Knowledge Management and Research I
Recommended or required reading:
Material in lessons small group lessons.
Uhari M ja Nieminen P: Epidemiologia ja biostatistiikka. Second Edition. Duodecim, 2012.
Assessment methods and criteria:
Regular and active participation in the small group lessons and completion of practical projects. Written examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/fail
Person responsible:
Senior lecturer Pentti Nieminen
Working life cooperation:
No

901043Y: Second Official Language (Swedish), Oral Skills, 2 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Negotiated Education
Opintokohteen kielet: Swedish

901042Y: Second Official Language (Swedish), Written Skills, 1 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Negotiated Education
Opintokohteen kielet: Swedish

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

Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Katri Veijola
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.
Read more about assessment criteria at the University of Oulu webpage.
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.

764162P: Basic biophysics, 3 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field 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
Language of instruction:
Finnish
Timing:
1st spring
Learning outcomes:
Student can describe and explain some basics and concepts of certain areas of biophysics and knows central targets of biophysical research.
Contents:
The content of the course is equivalent to the content of part 2 of the course 764163P Basic biophysics.
Person responsible:
Kyösti Heimonen, Marja Hyvönen, Matti Weckström

761111P: Basic mechanics, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761118P Mechanics 1 5.0 op

761118P-02 Mechanics 1, lab. exercises 0.0 op

761118P-01 Mechanics 1, lectures and exam 0.0 op

ay761111P Basic mechanics (OPEN UNI) 5.0 op

761101P Basic Mechanics 4.0 op

ECTS Credits:
5 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 is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.
Contents:
We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics.
Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 32 h, 8 exercises (16 h), 2 laboratory exercises (8 h), self-study 77 h
Target group:
For the students of the University of Oulu
Prerequisites and co-requisites:
Knowledge of vector calculus and basics of differential and integral calculus
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.
Course material availability can be checked here.
Assessment methods and criteria:
Three mini examinations and end examination or final examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Anita Aikio
Working life cooperation:
No work placement period
Other information:
https://noppa.oulu.fi/noppa/kurssi/761111P/etusivu

Compulsory

761111P-01: Basic mechanics, lectures and exam, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

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

Ei opintojaksokuvauksia.

761111P-02: Basic mechanics, lab. exercises, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

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

Ei opintojaksokuvauksia.

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ilkka Lusikka
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031010P Calculus I (OPEN UNI) 5.0 op

ECTS Credits:
5
Language of instruction:
Finnish
Timing:
Autumn semester, periods 1-3.
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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures 55 h / Group work 22 h.
Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
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).
Assessment methods and criteria:
Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 1-5.
Person responsible:
Ilkka Lusikka
Working life cooperation:
-
Other information:
-

031075P: Calculus II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Lusikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031075P Calculus II (OPEN UNI) 5.0 op

031011P Calculus II 6.0 op

ECTS Credits:
5
Language of instruction:
Finnish
Timing:
Spring, period 3
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. After completing the course the student is able to examine the convergence of series and power series of real terms. Furthermore, the student can explain the use of power series e.g. in calculating limits and is able to solve problems related to differential and integral calculus of real and vector valued functions of several variables.

Contents:
Sequences, series, power series and Fourier series of real terms. Differential and integral calculus of real and vector valued functions of several variables.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 28 h / Group work 28 h.

Target group:
-

Prerequisites and co-requisites:
The recommended prerequisite is the completion of the course Calculus I.

Recommended optional programme components:
-

Recommended or required reading:
Kreyszig, E.: Advanced Engineering Mathematics; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations.

Assessment methods and criteria:
Intermediate exams or a final exam.

Grading:
Numerical grading scale 1-5.

Person responsible:
Ilkka Lusikka

Working life cooperation:
-

Other information:
-

050004Y: Chemistry, 3 op

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Faculty of Biochemistry and Molecular Medicine

Arvostelu: 1 - 5, pass, fail

Opettajat: Karppinen, Peppi Leena Elina

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

031076P: Differential Equations, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031076P	Differential Equations (OPEN UNI)	5.0 op
800320A	Differential equations	5.0 op
031017P	Differential Equations	4.0 op

Ei opintojaksokuvauksia.

761113P: Electricity and magnetism, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field 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
766319A	Electromagnetism	7.0 op
761103P	Electricity and Magnetism	4.0 op

ECTS Credits:
5 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 is able to describe the basic concepts of electricity and magnetism and 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.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 32 h, 6 exercises (12 h), 2 laboratory exercises (8 h), self-study 81 h
Target group:
For the students of the University of Oulu.
Prerequisites and co-requisites:
Knowledge of vector calculus and basics of differential and integral calculus are needed.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 21-31. Also older editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.
Course material availability can be checked here.
Assessment methods and criteria:
Three mini examinations and end examination or final examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Anita Aikio
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/761113P/

Compulsory

761113P-01: Electricity and magnetism, lectures and exam, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field 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
766319A Electromagnetism 7.0 op
761103P Electricity and Magnetism 4.0 op
761121P Laboratory Exercises in Physics 1 3.0 op

Ei opintojaksokuvauksia.

761113P-02: Electricity and magnetism, lab. exercises, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field 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
766319A Electromagnetism 7.0 op
761103P Electricity and Magnetism 4.0 op

Ei opintojaksokuvauksia.

521141P: Elementary Programming, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Mika Rautiainen, Mika Oja
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay521141P Elementary Programming (OPEN UNI) 5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5
Language of instruction:
Finnish, the course can be completed in English by answering the lecture questions and doing the programming exercises and the final exercise.

Timing:
Fall, period 1.
Learning outcomes:
Upon completing the required coursework, the student is able to explain the basic programming concepts and structures and to solve problems using these concepts and structures. Moreover, the student is able to implement small programs independently.
Contents:
Basic concepts of programming, basic structures of programming languages, solving problems by programming.
Mode of delivery:
Web-based teaching + face-to-face teaching
Learning activities and teaching methods:
Learning assignments in a web environment. Contact teaching: 20h of exercise groups.
Target group:
1 st year students of computer science and engineering and electrical engineering and other Students of the University of Oulu.
Prerequisites and co-requisites:
None.
Recommended optional programme components:
The course provides a basis for subsequent programming courses.
Recommended or required reading:
Will be announced at the beginning of the course.
Assessment methods and criteria:
The course is completed by passing all learning assignments, programming exercises and a final exercise project. Read more about assessment criteria at the University of Oulu webpage.
Grading:
pass/fail.
Person responsible:
Mika Oja
Working life cooperation:
-

764125P: Foundations of cellular biophysics, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

764115P	Foundations of cellular biophysics	4.0 op

ECTS Credits:
5 credits
Language of instruction:
Finnish
Timing:
2nd spring
Learning outcomes:
After finishing the course the student is able to describe the foundations or basics of cellular structure and function, to present the biophysical background for some of these, and to solve simple problems and calculations concerning cellular biophysics and -chemistry. In addition, the student can specify and categorize some of the central fields of cell biology and cellular biophysics.
Contents:
In this course cellular function is considered from the point of 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.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 24 h, calculation exercises 9 h, self-study 100 h
Target group:
Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Introduction to biophysics (764103P) is recommended to be done before this course.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
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. Course material availability can be checked here.
Assessment methods and criteria:
Home exam, final exam Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Marja Hyvönen, Kyösti Heimonen
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/764125P/

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

Opiskelumuoto: General Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credit points / 135 hours of work
Language of instruction:
Finnish
Timing:
1st year, autumn
Learning outcomes:
The student can define areas of medical technology and can list technological innovations used in these fields. The student can describe milestones in medical technology from history to present time.
Contents:
Practical examples of medical and wellness technology, introducing terms. Group work based on the material given and presenting the results. Includes also material introduced during theme day.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures, demonstrations and excursions 30h / Group work and theme day 30h / Self-study 75h. Final exam or assignment.
Target group:
1st year students of Medical and Wellness Technology, minor subject students
Recommended or required reading:
Given material.
Assessment methods and criteria:
Participating in the contact teaching, group work and theme day. Final exam or assignment.

Grading:
The course utilizes grading: pass or fail
Person responsible:

University lecturer Riikka Ahola
Working life cooperation:
No

031078P: Matrix Algebra, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Matti Peltola
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031078P	Matrix Algebra (OPEN UNI)	5.0 op
031019P	Matrix Algebra	3.5 op

Ei opintojaksokuvauksia.

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

Opiskelumuoto: General Studies
Laji: Course
Vastuuyksikkö: Faculty of Biochemistry and Molecular Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Karppinen, Peppi Leena Elina
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

766116P: Radiation physics, biology and safety, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761116P	Radiation physics, biology and safety	3.0 op

ECTS Credits:
5 credits
Language of instruction:
Finnish
Timing:
2nd or 3rd spring
Learning outcomes:
After finishing the course the student is able to describe the physical mechanisms giving rise to different kinds of radiation and explain the essential effects of ionising radiation function on biological organisms. In addition, the student remembers the essential features of radiation safety and laws and regulations (in Finland) concerning this.
Contents:
The topics of the course include the origin of ionizing radiation e.g. as a result of radioactive decay and in nuclear reactions, the interaction between radiation and matter, the detection and measurements of radiation, physical quantities and measuring units related to radiation, radiation in the environment, and examples of utilizing radiation. The biologic effects of radiation and the legislation on radiation safety are also discussed.

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 26 h, exercises 8 h, laboratory exercises 8 h, self-study 91 h
Target group:
Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
No specific prerequisites
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lecture notes, required law texts (in Finnish)
Assessment methods and criteria:
One written exam
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Seppo Alanko
Working life cooperation:
No work placement period
Other information:
https://noppa.oulu.fi/noppa/kurssi/766116p/etusivu

Compulsory

766116P-01: Radiation physics, biology and safety, exam, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761116P Radiation physics, biology and safety 3.0 op

Ei opintojaksokuvauksia.

766116P-02: Radiation physics, biology and safety, laboratory exercises, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field of Physics
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Alanko
Opintokohteen kielet: Finnish
Leikkaavuudet:

761116P Radiation physics, biology and safety 3.0 op

Ei opintojaksokuvauksia.

761114P: Wave motion and optics, 5 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field 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

761104P Wave Motion 3.0 op

ECTS Credits:
5 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 can name the characterizing quantities (wavelength, period, wave speed), can apply geometrical optics to simple mirror and lens systems, can explain the meaning of interference and diffraction and their applications, like using interference to determine wavelength of radiation.
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.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 32 h, exercises 10 h, 2 laboratory exercises (8 h), self-study 83 h
Target group:
The students of the University of Oulu
Prerequisites and co-requisites:
No specific prerequisites
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2008. Also earlier editions can be used.
Course material availability can be checked here.
Assessment methods and criteria:
Three mini examinations and one end examination or a final examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Ville-Veikko Telkki
Working life cooperation:
No work placement period
Other information:
https://noppa.oulu.fi/noppa/kurssi/761114p/etusivu

Compulsory

761114P-01: Wave motion and optics, lectures and exam, 0 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Basic Studies

Laji: Partial credit

Vastuuyksikkö: Field 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
761104P Wave Motion 3.0 op
761121P Laboratory Exercises in Physics 1 3.0 op

Ei opintojaksokuvauksia.

761114P-02: Wave motion and optics, lab. exercises, 0 op

Voimassaolo: 01.01.2015 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Field 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

Ei opintojaksokuvauksia.

041201A: Basics in eHealth, 5 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Jarmo Reponen
Opintokohteen kielet: English
Leikkaavuudet:

ay041201A Basics in eHealth (OPEN UNI) 5.0 op

ECTS Credits:
5 ECTS credit points / 135 hours of work
Language of instruction:
English
Timing:
2nd year autumn
Learning outcomes:
The student can define central information and communication technological terms and solutions in healthcare, and can list respective applications in healthcare services and training.
The student can evaluate the societal and economic significance of information and communication technology in healthcare
Contents:
- terms and concepts
- societal dimensions
- delivery of health services
- electronic patient records
- data transfer within the health care system
- data transfer between the health care professionals and the patients
- remote consultations, radiologypsychiatry, teleradiology, telepsychiatry

- economical and functional assessment
- remote education
- future visions of health care information systems

Mode of delivery:
Web-based teaching
Learning activities and teaching methods:
Interactivity takes place in virtual learning environment Optima. The course consists of video-taped lectures, power point-presentations and links to other material available in the web. Performance of duties includes an essay, exam, participating in discussions on the grounds of the lectures.
Web lectures 15h / Web exam 40h / Written essay 40h / Self-study and participation to web discussion 40h
Target group:
Students of Medical Technology (medical and wellness technology, biomedical engineering, biophysics, other degree programs), Students of Health Sciences and information technology and everyone who is interested
Recommended or required reading:
All recommended or required reading are offered in Optima virtual learning environment
Assessment methods and criteria:
Web tasks, an essay and final exam
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Professor Jarmo Reponen
Working life cooperation:
No
Other information:
Recommended literature:
Graig J Wootton R, Patterson V (Eds): An introduction to
Telemedicine,RSM Press 2006
Hämäläinen P, Reponen J, Winblad I, Kärki J, Laaksonen M, Hyppönen H, Kangas M (2013) eHealth and eWelfare of Finland, Check point 2011. THL Report 5/ 2013.
(https://www.julkari.fi/bitstream/handle/10024/104368/URN_ISBN_978-952-245-835-3.pdf?sequence=1)
Saranto K, Korpela M (toim) Tietotekniikka ja tiedonhallinta sosiaali-
ja terveydenhuollossa, WSOY, Porvoo-Helsinki-Juva 1999
Winblad I, Reponen J, Hämäläinen P (2012) Tieto- ja viestintäteknologian käyttö terveydenhuollossa vuonna 2011. Tilanne ja kehityksen suunta. [English summary] THL Raportteja 3/2012.
(http://www.julkari.fi/bitstream/handle/10024/80372/825d0af8-f97c-4192-bf5b-ba5e1bf773aa.pdf?sequence=1)

Journals:
Journal of Telemedicine and Telecare
Telemedicine and e-Health
In addition: eLibrary in the Optima comprising updating of the topics of the lectures and some selected essays (by permission of the author)

764324A: Biophysical laboratory exercises I, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521302A: Circuit Theory 1, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
Finnish. Exams can be arranged in English on demand.
Timing:
Spring, period 4
Learning outcomes:
After the course the student can

- write and solve the equations describing the operation of a given electrical circuit
- solve the sinusoidal steady-state solution using complex phasor arithmetics
- solve time responses of electric circuits
- simplify electrical circuits e.g. using equivalent circuits
- simulate simple circuits and choose an appropriate circuit simulation method

Contents:
Equation of basic circuit elements, circuit laws and systematic building of network equations. Calculation of time and frequency responses. Use of complex phasor arithmetics. Basics of the use of circuit simulators.
Mode of delivery:
Classroom.
Learning activities and teaching methods:
30h lectures, 22 h exercises, and a simulation exercise.
Target group:
Finnish BSc students.
Prerequisites and co-requisites:
Matrix algebra, complex arithmetics, differential equations.
Recommended optional programme components:
-
Recommended or required reading:
Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 1-11.
Assessment methods and criteria:
Final exam. Also the simulation exercise must be passed.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Prof. Timo Rahkonen
Working life cooperation:
-
Other information:
-

521337A: Digital Filters, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521337A	Digital Filters (OPEN UNI)	5.0 op

ECTS Credits:
5
Language of instruction:
Finnish, English study material available
Timing:
Spring, period 3.
Learning outcomes:
Upon completing the required coursework, the student is able to specify and design respective frequency selective FIR and IIR filters using the most common methods. He is also able to solve for the impulse and frequency responses of FIR and IIR filters given as difference equations, transfer functions, or realization diagrams, and can present analyses of the aliasing and imaging effects based on the responses of the filters. Moreover, the student is

able to explain the impacts of finite word length in filter design. After the course the student has the necessary basic skills to use signal processing tools available in Matlab environment and to judge the results.

Contents:
1. Sampling theorem, aliasing and imaging, 2. Discrete Fourier transform, 3. Z-transform and frequency response, 4. Correlation and convolution, 5. Digital filter design, 6. FIR filter design and realizations, 7. IIR filter design and realizations, 8. Finite word length effects and analysis, 9. Multi-rate signal processing.

Mode of delivery:
Face-to-face teaching (Lectures), independent work, group work
Learning activities and teaching methods:
Lectures and exercises 50 h. The design exercises familiarize the students with the methods of digital signal processing using the Matlab software package. The rest as independent work.

Target group:
Computer Science and Engineering students and other Students of the University of Oulu.
Prerequisites and co-requisites:
031018P Complex Analysis, 031050A Signal Analysis
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
Lecture notes and exercise materials. Material is in Finnish and in English. Course book: Ifeachor, E., Jervis, B.: Digital Signal Processing, A Practical Approach, Second Edition, Prentice Hall, 2002.

Assessment methods and criteria:
The course can be passed either with week exams or a final exam. In addition, the exercises need to be returned and accepted.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Olli Silvén
Working life cooperation:
None.

521109A: Electrical Measurement Principles, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Saarela

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
Course is lectured in Finnish. Laboratory exercises and the exam can be done in English.
Timing:
Periods 1-2.
Learning outcomes:
Upon completion of the course, students are able to measure basic measurements with a ammeter, voltmeter and oscilloscope. They can operate signal and function generators. 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 electrical safety regulations.
Mode of delivery:
Pure face-to-face teaching.
Learning activities and teaching methods:
Lectures 20h, laboratory exercises 16 h and self-study 100h.

Target group:
Course is compulsory for electrical engineering, information engineering and wellness technology students.
Prerequisites and co-requisites:
None.
Recommended optional programme components:
None.
Recommended or required reading:
Kurssimateriaali Optimasta.
Assessment methods and criteria:
Exam and passed lab exercises.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Grade is based on exam and grade is on numerical scale 1-5.
Person responsible:
Juha Saarela
Working life cooperation:
None.
Other information:
-

521287A: Introduction to Computer Systems, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Leppänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521287A	Introduction to Computer Systems (OPEN UNI)	5.0 op
521142A	Embedded Systems Programming	5.0 op

ECTS Credits:
5 ECTS cr
Language of instruction:
Lecturing in Finnish, course and exercise material available in English.
Timing:
Autumn, periods 1-2. Will be held next time in the autumn of 2016
Learning outcomes:
Upon completing the course, the student understands the basics of computer architecture and CPU operation. Student knows number systems and data representations in computer. Student is familiar of I/O operation with peripheral devices in general. Student is able to implement small programs with the C programming language for general-purpose computers and for embedded systems. Student recognizes how embedded systems programming is different from programming general-purpose computers.
Contents:
Overview of computer architecture and CPU, data types and memory management, interrupts, registers and I/O, general computer and embedded systems programming, basics of the C programming language.
Mode of delivery:
Web-based teaching + face-to-face teaching.
Learning activities and teaching methods:
Lectures (20h), course exercises (10-20h), laboratory exercise (3h) and course project in a group.

Target group:
3rd year students of electrical engineering.
Prerequisites and co-requisites:
Elementary programming 521141P.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Lecture notes. Mano M., Computer System Architecture. Prentice Hall, 1993. Williams, E.: Make: AVR Programming, Learning to Write Software for Hardware, O'Reilly, 2014.

Assessment methods and criteria:
Students complete the course exercises after lectures, participate to the laboratory exercise and complete the course project in a group. Assessment is based on the exercises and the course project. More detailed information on assessment can be found from the course Web page, https://noppa.oulu.fi/noppa/kurssi/521287a/.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:
Teemu Leppänen, Mika Rautiainen.
Working life cooperation:
No.
Other information:
521287A Introduction to Computer Systems replaces course 521142A Embedded systems programming for electrical engineering students.

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

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credit points / 135 hours of work
Language of instruction:
Finnish
Timing:
2nd year, autumn
Learning outcomes:
The student can list technologies in different fields of medical technology, can describe the working principle of these technologies and evaluate the advantages and limitationc of the technologies.

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.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Initial exam. Lectures 30 h / Demonstrations 10 h / Written work 10h / Self-study 85h. Final exam which is based on lectures and all to the given materials.
Target group:
Students of Medical Technology (medical and wellness technology, biophysis, other degree programs)
Recommended or required reading:
Boook of initial exam T. Sora, P. Antikainen, M. Laisalmi, S. Vierula: Sairaanhoidon teknologia, WSOY 2002. The material addressed during the lectures.
Assessment methods and criteria:
Initial exam and written work. Taking part in the lectures and demos. Final exam which includes essays. To participate to the final exam initial exam and written work has to be accepted.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No

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

ECTS Credits:
15 ECTS credits /402 hours of work
Language of instruction:
Finnish. Some lectures, a practical and some of the term papers in English.
Timing:
The course unit is held in the autumn semester. The course must be completed during the first two years of the Medical School curriculum
Learning outcomes:
After completion of the course the student:
- knows the principles of the function, regulation, and interrelations of the cells, tissues and organ systems of the healthy human being, as required for independent work as a physician or dentist
- can evaluate the knowledge and apply it for investigations of clinical physiological problems and mechanisms of diseases
- can follow and evaluate the development of physiology as a science, and maintain and improve knowledge in it
- can apply knowledge in physiology for acquiring, evaluating and reporting scientific medical and dental information

After reaching the learning aims the student has sufficient knowledge and skills in physiology for studies leading to the degrees of Licenciate of Medicine and Licenciate of Dentistry, and for continuous learning.
Contents:
1. Cell physiology
2. Fundamentals of Biophysics
3. Organ physiology
4. Physiological regulation and integrative physiology
5. Applied physiology
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Guidance and tutorial (3 h), lectures (106 h), practicals (38 h), term paper (2 h), interim and final examinations (8 h), independent study (245 h).
Target group:
Second year medical and dental students.
Prerequisites and co-requisites:
The student should have completed the courses of Anatomy, Cell Biology, and Medical Biochemistry & Molecular Biology.
Recommended optional programme components:
-
Recommended or required reading:
-Ganong's Review of Medical Physiology (most recent edition).
- Practicals Textbook (in Finnish): Fysiologian harjoitustyöt (Oulun yliopiston oppimateriaalia-sarja, Lääketiede D, most recent edition).
- Lecture notes can be found in Optima Environment (http://optima.oulu.fi).
The availability of the textbook in the library can be checked here.

Assessment methods and criteria:
At the beginning of the course there is an examination on the subject of the practicals, which has to be passed. In the middle of the course there is an interim examination on the course contents 1-3, and at the end the final examination. The student has to obtain one third of the maximum points to pass these examinations. Detailed requirements can be found during the course period in the document Course Instructions in the Optima Environment (http://optima.oulu.fi).
Grading:
The course unit utilizes a numerical grading scale 1-5. Zero stands for a fail.
Person responsible:

Professor Olli Vuolteenaho
Working life cooperation:
No

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040112A-01: Physiology, small group teaching, 2,5 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 0,0 - 99,9
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-011: Physiology, biophysics small group teaching, 0,5 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-021: Physiology, practicals entry examination, 1 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-02: Physiology, term paper, 2 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 1 - 5, pass, fail
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-03: Physiology, mid-term examination, 3 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 0,0 - 99,9
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

040112A-04: Physiology, final examination, 6 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Partial credit
Vastuuyksikkö: Medicine
Arvostelu: 0,0 - 99,9
Opettajat: Vuolteenaho, Olli Jaakko Tuomas
Opintokohteen kielet: Finnish
Leikkaavuudet:
040102A-10 Final exam 0.0 op

Ei opintojaksokuvauksia.

521431A: Principles of Electronics Design, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Häkkinen
Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
Finnish.
Timing:
Spring, period 4
Learning outcomes:
On completion of the study module students should be able to analyze and design such electronic building blocks as rectifiers, clamping circuits, amplifiers and CMOS logic elements using diodes, operational amplifiers and MOS and bipolar junction transistors.
Contents:
Analogue and digital circuits, basic amplifier related concepts, operational amplifier, diodes and diode circuits, single stage bipolar and MOS transistor amplifiers, small signal modeling and analyzing ac properties of amplifiers, internal structures of digital circuits (mainly CMOS), MOS/CMOS switch.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 30 h and exercises 20 h.
Target group:
-
Prerequisites and co-requisites:
Circuit Theory I
Recommended optional programme components:
Recommended course Principles of Semiconductor Devices

Recommended or required reading:
Lecture notes, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 1-8 and 15 partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 1-5 and 14.
Assessment methods and criteria:
Final or 2 mid-term exams.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 1-5.
Person responsible:
Juha Häkkinen
Working life cooperation:
-
Other information:
-

555285A: Project management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

555288A	Project Management	5.0 op
ay555285A	Project management (OPEN UNI)	5.0 op
555282A	Project Management	4.0 op
555280P	Basic Course of Project Management	2.0 op

ECTS Credits:
5 ECTS credits.

Language of instruction:
Finnish. English material may also be used.

Timing:
Period 1.

Learning outcomes:
The objective of the course is to familiarise the student with the basics and the basic methods of project management. Upon completion the student can explain the essential concepts related to project management. He /she can present the main features of a project plan and can use different methods of partitioning a project. The student can also schedule a project and estimate its costs. The student can explain the terms related to Earned value method and can apply the method on simple tasks. Upon completion the student recognizes the essential tasks of project risk management.

Contents:
Defining project management, project planning, organising and scope management, schedule management, cost management, earned value calculation and project risk management, project stakeholder management.

Mode of delivery:
The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:
Lectures or web-based lectures 16h, self-study 118h

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:
No prerequisites exist.

Recommended optional programme components:
This course is part of the 25 ECTS module of Industrial engineering and management that also includes555225P Basics of industrial engineering and management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management.

Recommended or required reading:
Lecture material, exercise book, Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY

Assessment methods and criteria:
The course includes three mandatory assignments, exercise book and exam. The course grading is based on the exam. Well completed assignments and exercise book may raise grading.

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

Person responsible:
Professor Jaakko Kujala.

Working life cooperation:
No.

Other information:
Substitutes courses 555280P Basic Course of Project Management + 555282A Project Management.

031080A: Signal Analysis, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kotila, Vesa Iisakki
Opintokohteen kielet: Finnish
Leikkaavuudet:

031050A Signal Analysis 4.0 op

Ei opintojaksokuvauksia.

764327A: Virtual measurement environments, 5 op

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

764627S Virtual measurement environments 5.0 op

ECTS Credits:
5 credits
Language of instruction:
Finnish
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.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 10 h, project work about 60 h, self-study 63 h
Target group:
Students in biophysics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
None, but basics of programming principles are useful.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Lecture and exercises notes
Assessment methods and criteria:
Project reports
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Matti Weckström
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/764327A/

580209A: Bachelor's Thesis, 10 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
10 ECTS credit points / 270 hours of work.
Language of instruction:
Finnish or English
Timing:
3rd year
Learning outcomes:
The studend can describe a research problem, solve it and reports this both in written form. The student can present his study orally at the seminar.
Contents:
Guided research or development work in the field of medical & wellness technology and writing of the thesis.
Mode of delivery:
Indpendent work.
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.
Target group:
Bachelor Students of Medical and Wellness Technology.
Assessment methods and criteria:
Writing the thesis and an oral presentation.
Read more about assessment criteria at the University of Oulu webpage.
Grading:

The course utilizes grading: pass or fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No
Other information:
It is recommended that before starting to do the bachelor's thesis student has at least credits.

580211A: Maturity Test, 0 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
0 ECTS
Language of instruction:
Finnish or Swedish.
Timing:
After completion of the bachelor's thesis.
Learning outcomes:
The student can produce mature text in popular form of the research field and thus show ones familiarity to the field.
Contents:
Depends on the topic of the thesis.
Mode of delivery:
Literary work.
Learning activities and teaching methods:
Takes place after bachelor's thesis. Written based on a given topic considering the thesis.
Target group:
Bachelor Students of Medical and Wellness Technology
Recommended optional programme components:
Will be written after the Bachelor's Thesis has been submitted for review.
Assessment methods and criteria:
Student writes an essay in his/her native language about the topic of the Bachelor’s thesis to show a good command of the language and the content of the thesis
Grading:
Pass or fail. Both the contents and language are assessed.
Person responsible:
University lecturer Riikka Ahola

764664S: Analysis and simulation of biosystems, 6 op

Voimassaolo: 01.01.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

764364A Analysis and simulation of biosystems 6.0 op

ECTS Credits:
6 credits
Language of instruction:

Finnish (or English)
Timing:
4th 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. Further, with those skills the student will be able to build simulations of relatively simple biosystems and analyze their properties.
Contents:
See 764364A Analysis and simulation of biosystems
Person responsible:
Matti Weckström, Iikka Salmela

764660S: Bioelectronics, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 credits
Language of instruction:
English
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.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 24 h, MatLab-based project work 10 h, calculation exercises 15 h, self-study 84 h
Target group:
Primarily for the students of the degree programme in physics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Physics courses, programming skills.
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
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.
Course material availability can be checked here.
Assessment methods and criteria:
Final exam
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Matti Weckström
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/764660S/

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

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
3 ECTS credit points / 81 hours of work
Language of instruction:
Finnish or English
Timing:
Master studies, autumn or spring.
Learning outcomes:
The student can identify the essential features of scientific publications. The student can present the central content of a scientific article to others. The student can present critical questions related to a scientific presentation.
Contents:
Assigned topics are reviewed in seminar meetings.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Introduction lectures, presentations and discussion of the latest scientific publications on the basis. Each student will give two presentations and opponed two performances.
Lectures and seminars 16h / Self-study 65h.
Target group:
Students of Medical Technology (medical and wellness technology, biomedical engineering, biophysics, other degree programs)
Recommended or required reading:
Selected scientific articles.
Assessment methods and criteria:
Attending seminars, making presentations and acting as an opponent.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No
Other information:
Also for doctoral studies

521093S: Biomedical Instrumentation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Igor Meglinski

Opintokohteen kielet: Finnish

Leikkaavuudet:

521107S	Biomedical Instrumentation	6.0 op

ECTS Credits:
5
Language of instruction:
English.
Timing:
Period 3.
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, introduction to medical imaging methods and instruments, ear measurements, heart pacing and defibrillators, physical therapy devices, intensive care and operating room devices and electrical safety aspects.

Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures/exercises 42 h and self-study 100 h.
Target group:
Students interested in biomedical measurements.
Prerequisites and co-requisites:
None
Recommended optional programme components:
Course replaces earlier courses Biomedical measurements and Biomedical instrumentation.

Recommended or required reading:
R. S. Khandpur: Biomedical Instrumentation, Technology and Applications, McGraw-Hill, 2005 and J. G. Webster: Medical Instrumentation, Application and Design, 4th edition, John Wiley & Sons, 2010.
Assessment methods and criteria:
The course is passed by the final exam or optionally with the assignments/test agreed at the first lecture.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1 - 5.
Person responsible:
Igor Meglinski
Working life cooperation:
No.

521273S: Biosignal Processing I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
English. Examination can be taken in English or Finnish.
Timing:
The course unit is held in the autumn semester, during period II. It is recommended to complete the course at the end of studies.
Learning outcomes:
After passing the course, student knows special characteristics of the biosignals and typical signal processing methods. Student can solve small-scale problems related to biosignal analysis.
Contents:
Biomedical signals. Digital filtering. Analysis in time-domain and frequency domain. Nonstationarity. Event detection. Signal characterization.
Mode of delivery:
Face-to-face teaching and guided laboratory work.

Learning activities and teaching methods:
Lectures 10h, Laboratory work 20h, Self-study 20h, written examination.
Target group:
Students interested in biomedical engineering, preferably at their master's level studies.
Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:
The mathematic studies of the candidate degree program of computer science and engineering, or equivalent.
Programming skills, especially basics of the Matlab. Basic knowledge of digital signal processing.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
The course is based on selected chapters of the book "Biomedical Signal Analysis, A Case-Study Approach", R.M Rangayyan. 516 pages. + Lecture transparencies + Task assignment specific material.
Assessment methods and criteria:
Laboratory work is supervised by assistants who also check that the task assignments are completed properly. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Tapio Seppänen
Working life cooperation:
No.

580211S: Maturity Test, 0 op

Voimassaolo: 01.08.2003 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
0 ECTS
Language of instruction:
Finnish or Swedish / English
Timing:
After completion of Master's Thesis.
Learning outcomes:
The student can produce mature text in popular form of the research field and thus show ones familiarity to the field.
Contents:
Depends on the topic of the thesis.
Mode of delivery:
Literary work.
Learning activities and teaching methods:
Takes place after master's thesis. Written based on a given topic considering the thesis.
Target group:
Master Students of Medical and Wellness Technology.
Recommended optional programme components:
Will be written after the Master's Thesis has been submitted for a review.
Assessment methods and criteria:
Writing the Maturity test or the abstract of the Master's Thesis in the student's native language Finnish or Swedish. If the student's native language is another than Finnish or Swedish the Faculty will define separately the requirements for the language test.
If the language of the study programme is English, the abstract of the Master's thesis can be accepted as a maturity test if the student has written a maturity test earlier in Bachelor's degree in English. Otherwise the Faculty will define separately the requirements for the maturity test."
Grading:

Pass or fail. The contents will be assessed by the person responsible. If the student has not made the maturity test as part of the bachelor degree, the language will be assessed by a teacher of the Languages and Communication, University of Oulu Extension School.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No

764634S: Medical physics and imaging, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
6 credits
Language of instruction:
English
Timing:
4th-5th Autumn
Learning outcomes:
The student is able to define the physical principles on which various medical diagnostic and therapeutic devices are based upon.
Contents:
The course acquaints the students to the basic physics related to imaging modalities and therapeutic systems used in hospitals. Covered topics include e.g. x-ray imaging, computed tomography, magnetic resonance imaging, nuclear medicine, radiation therapy and methods of clinical neurophysiology.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 32 h, calculus assignments 4 h, demonstrations 6 h, reporting 25 h, self-study 112 h
Target group:
Physics MSc students with biophysics major or/and medical physics minor, biomedical engineering students. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
Recommended: physics basic courses and Radiation physics, biology and safety (766116P, 761116P, 764117P or 764317A).
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Dowsett, Kenny, Johnston: The Physics of Diagnostic Imaging, 2nd ed., Hodder Arnold, 2006.
Webster: Medical instrumentation: application and design, 4th ed, John Wiley & Sons, 2010.
Podgorsak: Radiation Oncology Physics – A handbook for teachers and students, IAEA, 2005 (http://www-pub.iaea.org/mtcd/publications/pdf/pub1196_web.pdf).

Additional literature depending on the lecturers.
Course material availability can be checked here.
Assessment methods and criteria:
One written examination
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Miika Nieminen
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/764634S/

580210S: Pro Gradu, 35 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
35 ECTS credit points / 945 hours of work.
Language of instruction:
Finnish or English
Timing:
Master studies
Learning outcomes:
The student can independently solve a research problem, and describe and solve it. The student can report the work in written form according to the scientific report principles.
Contents:
Research project in the field of medical & wellness technology and writing of the thesis.
Mode of delivery:
Independent work.
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.
Target group:
Master Students of Medical and Wellness Technology.
Assessment methods and criteria:
Writing the thesis.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No
Other information:
It is recommended that before starting to do the Master's Thesis student has completed about 60 credits from master studies.

521124S: Sensors and Measuring Techniques, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Matti Kinnunen, Myllylä, Risto Antero

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
English.

Timing:
Period 1.
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.
Mode of delivery:
Pure face-to-face teaching.
Learning activities and teaching methods:
Lectures 26h, exercises 12h and self-study 100h.
Target group:
4 year students.
Prerequisites and co-requisites:
No.
Recommended optional programme components:
No.
Recommended or required reading:
H. N. Norton: Handbook of Transducers, Prentice Hall P T R, 1989 or 2002; lecture and exercise notes.
Assessment methods and criteria:
The course is passed by a final exam and passed exercises.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Igor Meglinski
Working life cooperation:
No.

580401A: Basic Biomaterials, 2 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
2 ECTS credit points / 54 hours of work.
Language of instruction:
Finnish or english
Timing:
Master studies, Autumn. The course is not organized every year.
Learning outcomes:
The student can list essential biological and tissue-replacing materials and can describe their properties. The student identifies and can explain the basics of interactions between biomaterials and tissues.
Contents:
Biocompatibility, metallic and ceramic implantation materials, polymers, biodegradable materials, bioglass, multifunctional biomaterials, tissue engineering, examples of applications.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 18 h / self-study 36 h. Essay.
Target group:
Master Students of Medical and Wellness technology and all other who are intressed in biomaterials.
Recommended or required reading:
Lecture material. Literature: Introduction to biomaterials: Basic Theory with Engineering Application. C. Mauli Agrawal. Joo L. Ong, Mark R. Appleford, and Gopinath Mani. Cambridge texts in Biomedical Engineering
Assessment methods and criteria:
Participating to class and essay.
Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No
Other information:
This course is a part of specialization Biomedical Technology.

580402S: Biomedical Imaging Methods, 1 - 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Simo Saarakkala

Opintokohteen kielet: English

ECTS Credits:
1-5 ECTS credit points / 27-135 hours of work.
Language of instruction:
English
Timing:
Master studies, spring. The course is not organized every year.
Learning outcomes:
The student understands and can describe the basic principles and main applications of imaging methods used in biomedical research.
Contents:
Differences between in vivo, ex vivo and in vitro imaging. Light and electron microscopy. Optical projection and coherence tomography. Optical in vivo imaging. Magnetic resonance imaging. Fourier transform infrared imaging spectroscopy. Raman imaging spectroscopy. Micro-computed tomography. Ultrasound imaging. Basics of image analysis and interpretation.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Differences between in vivo, ex vivo and in vitro imaging. Light and electron microscopy. Optical projection and coherence tomography. Optical in vivo imaging. Magnetic resonance imaging. Fourier transform infrared imaging spectroscopy. Raman imaging spectroscopy. Micro-computed tomography. Ultrasound imaging. Basics of image analysis and interpretation.
Target group:
Master Students of Medical and Wellness technology and Biomedical Engineering and all other who are interested in methods of biomedical imaging
Recommended or required reading:
Required literature is given in the lectures.
Assessment methods and criteria:
Participation in the lectures and demonstrations, study diary. Exercises. Written exam. The course can be taken as 1, 2, 3 or 5 ECTS.

1 ECTS # participation in the lectures
2 ECTS # participation in the lectures and demonstrations
3 ECTS # participation in the lectures and demonstrations + practical assignment
5 ECTS # participation in the lectures and demonstrations + practical assignment and final exam
Grading:
The 1, 2 or 3 ECTS courses utilize verbal grading: pass or fail. The 5 ECTS course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Associate Professor Simo Saarakkala
Working life cooperation:
No
Other information:
This course is a part of specialization of Biomedical Technology and Medical imaging.

080917S: Project in Biomedical Technology, 5 - 10 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: Finnish

ECTS Credits:
10 ECTS credit points / 270 hours of work.
Language of instruction:
Finnish or English
Timing:
Master studies
Learning outcomes:
The student is abel to solve a research problem and report it in writing.
Contents:
Performing a small ressearch project.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
The student participates in a research project within or outside the university. The student prepares a personal project plan according to separate specifications. At the end of the project, the student prepares a written research report and presents it in a seminar.
Target group:
Master Students of Medical and Wellness Technology.
Assessment methods and criteria:
Preparing a project plan, project implementation, preparing a written report and presenting it in seminar.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No
Other information:
This course is part of the specialization of Biomedical Technology.

465105A: Research techniques for materials, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Nousiainen, Olli Pekka
Opintokohteen kielet: Finnish
Leikkaavuudet:

465075A	Research Techniques for Materials	3.5 op

Ei opintojaksokuvauksia.

761359A: Spectroscopic methods, 5 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766359A Spectroscopic methods 7.0 op

ECTS Credits:
5 credits
Language of instruction:
Finnish
Timing:
Every second year (odd year), spring term
Learning outcomes:
After completion, student knows the principles of various spectroscopic methods and what kind of physical /biophysical phenomena can be studied and what kind of information can be obtained with these methods.
Contents:
Basic principles of infrared, mass and NMR spectroscopy and X-ray analytics are introduced
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 46 h, exercises 24 h, self-study 63 h
Target group:
Compulsory for students in biophysics. Recommended for students directing at some of the lines in atomic, molecular and materials physics. Also for the other students of the University of Oulu.
Prerequisites and co-requisites:
No specific prerequisites
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
Partly distributed through net, and partly as paper copies during the course.
Assessment methods and criteria:
Two written examinations or one final examination.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale 0 – 5, where 0 = fail
Person responsible:
Ville-Veikko Telkki
Working life cooperation:
No work placement period
Other information:
https://wiki.oulu.fi/display/761359A/

080915S: Tissue Biomechanics, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credit points /135 hours of work.
Language of instruction:
English
Timing:

Master studies, Autumn
Learning outcomes:
The student can describe the main biomechanical characteristics of different tissues as well as their failure mechanisms. The student can perform practical biomechanical experiments, analyze measurement data, interpret results, and report them using good scientific reporting practice. The student understand how numerical modeling can be used to solve problems in tissue biomechanics.
Contents:
Introduction to tissue biomechanics. Most important biomechanical parameters and material models. Experimental measurements of biomechanical properties of tissues. Structure, composition and mechanical properties of different tissues. Biomechanical modeling of tissues.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 15h / Exercises 8h / Assignment 8h / Self-study 104h. Final exam.
Target group:
Students of Medical Technology (medical and wellness technology, biomedical engineers, biophysics, other degree programs) and all other who are interested
Prerequisites and co-requisites:
Basic knowledge on cell biology, anatomy and physiology, mechanics differential equations and matrix algebra.

Recommended or required reading:
Material given during lectures.
Assessment methods and criteria:
Accepted exercises, written exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Associate Professor Simo Saarakkala
Working life cooperation:
No
Other information:
This course is a part of the specialization of Biomedical Technology

040911S: Using animals in research - carrying out procedures, 3 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Laboratory Animal Centre

Arvostelu: 1 - 5, pass, fail

Opettajat: Voipio Hanna-marja

Opintokohteen kielet: Finnish

Leikkaavuudet:

040900S	Using animals in research - carrying out procedures	2.5 op

Ei opintojaksokuvauksia.

580402S: Biomedical Imaging Methods, 1 - 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Simo Saarakkala

Opintokohteen kielet: English

ECTS Credits:

1-5 ECTS credit points / 27-135 hours of work.
Language of instruction:
English
Timing:
Master studies, spring. The course is not organized every year.
Learning outcomes:
The student understands and can describe the basic principles and main applications of imaging methods used in biomedical research.
Contents:
Differences between in vivo, ex vivo and in vitro imaging. Light and electron microscopy. Optical projection and coherence tomography. Optical in vivo imaging. Magnetic resonance imaging. Fourier transform infrared imaging spectroscopy. Raman imaging spectroscopy. Micro-computed tomography. Ultrasound imaging. Basics of image analysis and interpretation.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Differences between in vivo, ex vivo and in vitro imaging. Light and electron microscopy. Optical projection and coherence tomography. Optical in vivo imaging. Magnetic resonance imaging. Fourier transform infrared imaging spectroscopy. Raman imaging spectroscopy. Micro-computed tomography. Ultrasound imaging. Basics of image analysis and interpretation.
Target group:
Master Students of Medical and Wellness technology and Biomedical Engineering and all other who are interested in methods of biomedical imaging
Recommended or required reading:
Required literature is given in the lectures.
Assessment methods and criteria:
Participation in the lectures and demonstrations, study diary. Exercises. Written exam. The course can be taken as 1, 2, 3 or 5 ECTS.

1 ECTS # participation in the lectures
2 ECTS # participation in the lectures and demonstrations
3 ECTS # participation in the lectures and demonstrations + practical assignment
5 ECTS # participation in the lectures and demonstrations + practical assignment and final exam
Grading:
The 1, 2 or 3 ECTS courses utilize verbal grading: pass or fail. The 5 ECTS course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Associate Professor Simo Saarakkala
Working life cooperation:
No
Other information:
This course is a part of specialization of Biomedical Technology and Medical imaging.

521259S: Digital Video Processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa Rahtu

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
English
Timing:
Autumn, period 2.
Learning outcomes:
In this course students become familiar with basics of video processing and communications. The emphasis is in video representation and coding.

After completing the course the student is able to explain the basic formats and representations of digital video signals. He can analyze the frequency properties of video signals as well as the effects of sampling of multi-dimensional signals, and he can specify digital filters for video sampling rate conversions. He is able to model video content by using simple two- and three-dimensional models, and apply certain well-known methods for video motion estimation. The student can explain the essential parts of the techniques used in video coding and the most important properties of common video coding standards. He can also describe the general principles of scalable video coding and error resilient video coding.

Contents:

1. Video formation, 2. Fourier analysis of video signals, 3. Sampling of multi-dimensional signals, 4. Video sampling rate conversion, 5. Video modeling, 6. Motion estimation, 7. Foundations of video coding, 8. Waveform-based coding, 9. Scalable video coding, 10. Video compression standards, 11. Error control in video communications.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (20 h), exercises (10 h) and Matlab homework assignments (16 h).

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Digital Image Processing, Digital Filters.

Recommended optional programme components:

521466S Machine Vision. This course provide complementary information on analysis and processing of digital video. The course is recommended to be studied either in advance or simultaneously.

Recommended or required reading:

Y. Wang, J. Ostermann, Y. Zhang: Video processing and communications, Prentice-Hall, 2002, chapters 1-6, 8, 9, 11, 13, 14. Additional material about H.264/AVC and HEVC standards. Lecture notes and exercise material.

Assessment methods and criteria:

The course is passed with final exam and accepted homework assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Esa Rahtu

Working life cooperation:

No.

521289S: Machine Learning, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

521497S-01	Pattern Recognition and Neural Networks, Exam	0.0 op
521497S-02	Pattern Recognition and Neural Networks; Exercise Work	0.0 op
521497S	Pattern Recognition and Neural Networks	5.0 op

ECTS Credits:

5

Language of instruction:

English. Examination can be taken in English or Finnish.

Timing:

The course unit is held in the spring semester, during period III. It is recommended to complete the course at the end of studies.

Learning outcomes:

After completing the course the student can design simple optimal classifiers from the basic theory and assess their performance. The student can explain the Bayesian decision theory and apply it to derive minimum error classifiers and minimum cost classifiers. The student can apply the basics of gradient search method to design a linear discriminant function. The student can apply regression techniques to practical machine learning problems.

Contents:
Introduction. Bayesian decision theory. Discriminant functions. Parametric and non-parametric classification. Feature extraction. Classifier design. Example classifiers. Statistical regression methods.
Mode of delivery:
Face-to-face teaching and guided laboratory work.
Learning activities and teaching methods:
Lectures 10h, Laboratory work 20h, Self-study 20h, Independent task assignment, written examination.
Target group:
Computer Science and Engineering students and other students of the University of Oulu who are interested in data analysis technology.
Prerequisites and co-requisites:
The mathematic studies of the candidate degree program of computer science and engineering, or equivalent. Programming skills, especially basics of the Matlab.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
Duda RO, Hart PE, Stork DG, Pattern classification, John Wiley & Sons Inc., 2nd edition, 2001. Handouts.
Assessment methods and criteria:
Laboratory work is supervised by assistants who also check that the task assignments are completed properly. The independent task assignment is graded. The course ends with a written exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. The final grade is established by weighing the written exam by 2/3 and the task assignment by 1/3.
Person responsible:
Tapio Seppänen
Working life cooperation:
No

521466S: Machine Vision, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa Rahtu

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
In English
Timing:
Spring, periods 3.
Learning outcomes:
This course provides an introduction to machine vision, and its applications to practical image analysis problems. Common computer vision methods and algorithms as well as principles of image formation are studied.
Upon completion of the course, the student can utilize common machine vision methods for various image analysis problems. He is able to detect and recognize objects using features computed from images. He can use motion information in image analysis and model matching in image registration and object recognition. The student can explain the basics of geometric computer vision and is able to calibrate cameras as well as to obtain 3D coordinate measurements from the scene using for example stereo imaging. After the course the student has the rudimentary skills to use the Matlab environment and its tools for implementing machine vision methods and analyzing the results.
Contents:
1. Introduction, 2. Imaging and image representation, 3. Color and shading, 4. Image features, 5. Recognition, 6. Texture, 7. Motion from 2D image sequences, 8. Matching in 2D, 9. Perceiving 3D from 2D images, 10. 3D reconstruction.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures (20 h), exercises (16 h) and Matlab homework assignments (16 h).

Target group:
Computer Science and Engineering students and other Students of the University of Oulu.
Prerequisites and co-requisites:
521467A Digital Image Processing
Recommended optional programme components:
521467A Digital Image Processing and Machine Learning. This courses provide complementary information on pattern recognition and classification applied in machine vision. It is recommended to be studied simultaneously.
Recommended or required reading:
Shapiro L.G., Stockham G.C.: Computer vision, Prentice Hall, 2001. Szeliski R: Computer Vision: Algorithms and Applications, Springer, 2011. Lecture notes, exercise material.
Assessment methods and criteria:
The course is passed with final exam and accepted homework assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Esa Rahtu
Working life cooperation:
No.

080918S: Project in Medical Imaging, 5 - 10 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
10 ECTS credit points / 270 hours of work.
Language of instruction:
Finnish or English
Timing:
Master studies
Learning outcomes:
The student is able to solve a research problem and perort it written.
Contents:
Performing a samlla research project.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
The student participates in a research project within or outside the university. The student prepares a personal project plan according to separate specifications. At the end of the project, the student prepares a written research report and presents it in a seminar.
Target group:
Master Students of Medical and Wellness Technology
Assessment methods and criteria:
Preparing a project plan, project implementation, preparing a written report and presenting it in a seminar.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No
Other information:
This course is a part of the specialization of Medical Imaging.

521149S: Special Course in Information Technology, 5 - 8 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ojala, Timo Kullervo

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5-8
Language of instruction:
English; Finnish when only Finnish-speaking students.
Timing:
Autumn and Spring, periods 1-4.
Learning outcomes:
The learning outcomes are defined based on the course topic.
Contents:
Varies yearly.
Mode of delivery:
Face-to-face teaching, also web-based teaching can be used.
Learning activities and teaching methods:
Lectures, exercises, design exercise, project work and seminars depending on the topic of the year. The implementation of the course will be informed separately. The course can be given several times with different contents during the academic year and it can be included into the degree several times.
Target group:
M.Sc. level students of Computer Science and Engineering; other students are accepted if there is space in the classes.
Prerequisites and co-requisites:
Will be defined based on the contents.
Recommended optional programme components:
No.
Recommended or required reading:
Will be announced at the first lecture
Assessment methods and criteria:
Depends on the working methods.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
CSE dept. professors
Working life cooperation:
-

080916S: Biomechanics of Human Movement, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credit points / 135 hours of work.
Language of instruction:
English

Timing:
Master studies, Spring
Learning outcomes:
The student can describe the main challenges of movement biomechanics and principles for motion analysis. The student knows basics of biomechanical measurement and modeling of movement. The student can perform practical biomechanical experiments, analyze measurement data, interpret results, and report them using good scientific reporting practice.
Contents:
Musculoskeletal biomechanics. Motion analysis. Biomechanical modeling of the body. Exercise biomechanics and measurement of physical activity. Biomechanical measurements.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 12h / Assignment 54h / Self-study 69h. Final exam.
Target group:
Students of Medical Technology (medical and wellness technology, biomedical engineers, biophysics, other degree programs) and all other who are interested
Prerequisites and co-requisites:
It is recommended to have basic knowledge on anatomy and physiology, sensors and measurement techniques and signal processing.
Recommended or required reading:
Material given during lectures.
Assessment methods and criteria:
Accepted home exercises and assignments, written exam. The exam includes definition and explanation assignments and problems.

Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No
Other information:
This course is a part of the specialization of Health Technology.

521430A: Electronic Measurement Techniques, 6 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Saarela

Opintokohteen kielet: Finnish

Leikkaavuudet:

521092A	Electronic Measurement Techniques	5.0 op
521171A	Electronic Measurement Techniques	6.5 op
521171A-01	Electronic measurement techniques, exam	0.0 op
521171A-02	Electronic measurement techniques, exercise work	0.0 op

ECTS Credits:
6,0
Language of instruction:
Lectures are in Finnish. Calculation exercises are in Finnish but same material is available in English. Laboratory exercises can be done in English.
Timing:
4-6 (next in 2015)
Learning outcomes:
The goal of the course is to deepen the knowledge of the field of electronic measurement techniques, to become familiar with censoring principles, measurements of amplifier and filter properties, interference problems and common connector and digital interface solutions and the principles of the processing of measurement results.

Learning outcomes: Upon completion of the course, students can plan and implement complicated measurements with oscilloscopes and basic measurements with spectrum analyzers and light detectors. Students can measure common sources of noise and interference and can name means to control them. Students can name methods to realize electrical quantities.

Contents:
Calibration, measurement amplifiers, spectrum analysers and correlation measurements, noise and interference, grounding, CMR and processing of measurement results

Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures and laboratory exercises. One or two exams and passed lab exercises.
Target group:
Course is compulsory for electrical engineering, information engineering and wellness technology students.
Prerequisites and co-requisites:
Electrical Measurement Principles, Analogue Electronics I, Digital Techniques I.
Recommended optional programme components:
Replaces course 521171A, 6,5 cr

Recommended or required reading:
Ask the lecturer.
Assessment methods and criteria:
Exam and passed lab exercises.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Juha Saarela
Working life cooperation:
-
Other information:
-

040404A: Health technology and rehabilitation, 5 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Open University, Oulu

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay040404A	Health technology and rehabilitation (OPEN UNI)	5.0 op

Ei opintojaksokuvauksia.

521145A: Human-Computer Interaction, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5

Language of instruction:
In English.
Timing:
Autumn, periods 2
Learning outcomes:
Upon completing the course the student is able to explain the Human Computer Interaction (HCI) fundamentals, explain evaluation and prototyping techniques, explain how HCI can be incorporated in the software development process.
Contents:
Human and computer fundamentals, design and prototyping, evaluation techniques, data collection and analysis.
Mode of delivery:
Face to face teaching.
Learning activities and teaching methods:
Lectures (20 h), exercises (20 h), and practical work (95 h). The course is passed with an approved practical work. The implementation is fully English.
Target group:
Computer Science and Engineering students and other Students of the University of Oulu.
Prerequisites and co-requisites:
None. No prior courses are required.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
All necessary material will be provided by the instructor.
Assessment methods and criteria:
The assessment is project-based. Students have to complete three group-based activities throughout the semester: design & prototyping (40%), conduct an evaluation (40%), and complete a report of the activities (20%). Passing criteria: all 3 elements (designs, evaluation, report) must be completed, each receiving more than 50% of the available points.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Vassilis Kostakos
Working life cooperation:
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080919S: Project in Health Technology, 5 - 10 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

ECTS Credits:
10 ECTS credit points / 270 hours of work.
Language of instruction:
Finnish or English
Timing:
Master studies
Learning outcomes:
The student is able to solve a research problem and report it in writing.
Contents:
Performing a small project.
Mode of delivery:
Independent work.
Learning activities and teaching methods:

The student participates in a research project within or outside the university. The student prepares a personal project plan according to separate specifications. At the end of the project, the student prepares a written research report and presents it in a seminar.
Target group:
Master Students of Medical and Wellness Technology.
Assessment methods and criteria:
Preparing a project plan, project implementation, preparing a written report and presenting it in a seminar.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes grading: pass or fail.
Person responsible:
University lecturer Riikka Ahola
Working life cooperation:
No
Other information:
This course is a part of the specialization of Health Technology.

521114S: Wireless Measurements, 4 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Esko Alasaarela

Opintokohteen kielet: Finnish

Leikkaavuudet:

521097S	Wireless Measurements	5.0 op

ECTS Credits:
4
Language of instruction:
In Finnish or in English if two or more foreign students participate.
Timing:
Period 4
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.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
25 h lectures and seminars. 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.
Target group:
Last phase students
Prerequisites and co-requisites:
Basics of measurement technology and electronic measurement technology or equivalent basic knowledge.
Recommended optional programme components:
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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 written final exam (70 %) and a contemporary seminar (30 %)

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

Grading:

1-5

Person responsible:

Esko Alasaarela

Working life cooperation:

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Other information:

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