Opasraportti

Master's Programme in Biomedical Engineering, MSc (Tech) and MHSc, 2020-21 (2020 - 2021)

University's new study guide for academic year 2020-2021 is published at https://opas.peppi.oulu.fi

The study guide includes information on degrees, curriculums, courses and course timetables. Course registrations are still done in Oodi.

If you have questions on information in the study guide, please contact the study field's Academic Affairs Service Team https://www.oulu.fi/forstudents/faculty-study-affairs

General information

The Master's Programme in Biomedical Engineering is an interdisciplinary programme taught in English. The curriculum includes studies in computer science, biomedicine and medical physics, and the student will select a specialty of his/her interest. The programme is research oriented to offer a strong basis for a research career.

The graduates will obtain a wider-ranging interdisciplinary knowledge in medical and health technologies from theoretical and practical perspective, which profiles their know-how to problem oriented thinking and resolving.

Two faculties at the University of Oulu, Faculty of Medicine (FMED) and Faculty of Information Technology and Electrical Engineering (ITEE) offer the programme jointly. There are two alternative master's degrees with specific focus areas, from which the student has chosen one already when participating in the admissions process. The target degrees are as follows

(1) Master of Science (Technology) (MSc Tech) with focus on biomedical signal and image processing, machine learning, and measurement and analysis of biomedical data (home faculty - ITEE)
(2) Master of Health Sciences (MHSc) with focus on biomechanics, medical imaging and health technology applications (home faculty - FMed)

The degrees granted upon completion of the master´s programme are higher university degrees and based on the Government Decree on University Degrees 794/2004.

The interdisciplinary programme structure and contents are based on the most recent international recommendations for BME education. The student has opportunity to modify personal study profile according to one's own professional interests. After graduation, the students can apply their expertise in a wide variety of occupations available in the field of BME internationally.

Study objectives

After completing the master's degree, the student is able to

* obtain and evaluate critically novel knowledge and special know-how in the field, and use and apply it independently and creatively in the biomedical engineering research and development (R&D),

* conduct research work independently and in teams by using scientific research methods,

* communicate orally and in writing clearly and analytically,

* produce new knowledge for the needs of industry and society,

* participate in industrial R&D and expert tasks in the field,

* implement methods for processing multimodal biomedical signals and images,

* design and implement biomedical measurements, data analysis methods and health applications,

* broaden and deepen one's know-how independently, in view of life-long learning.

Study contents

The extent of the master's degree programme is 120 ECTS credits. Studies consist of

* compulsory advanced studies common for all BME students totaling 70-72 ECTS cr including master´s thesis (30 ECTS cr). Finnish students will complete 70 ECTS cr and international students with Survival Finnish Course - 72 ECTS cr.

* compulsory studies of selected specialization (25 ECTS cr). There are three compulsory specializations (Specialization Modules), one for the students with MSc (Tech) as the target degree (Signal and Image Processing) and two for the students with MHSc as the target degree (Biomechanics and Imaging; Health Technology).

* optional studies 23-25 ECTS cr according to a personal study plan (PSP). In the degree structure there is a list of recommended optional studies, which have been compiled to complement the chosen Specialization Module. However, the student can also choose other courses as optional from modules of intermediate and advanced studies that support the degree.

Possible need for Supplementary Studies (max 15 ECTS cr) will be determined in the beginning of studies when preparing the Personal Study Plan (PSP) depending on contents of earlier degree studies. ECTS credits of the Supplementary Studies will not be included in the total number of the ECTS credits of the degree (120 ECTS cr).

[**Course structure 2020-2021**](#)

Final project

In order to be awarded a master´s degree, a student must complete the required studies including master´s thesis and maturity test. The master's thesis (30 ECTS credits) is an important element of the degree, presenting the readiness for independent research and engineering work.

Thesis can be made in different research groups of the university or in industry or health care system. Master's thesis consists of a research project in the field of biomedical engineering including writing of the thesis. It is typically a solution to a relatively extensive technical assignment. The student applies skills acquired during the studies and complements them with new knowledge when necessary. The work also extends experience in scientific and technical documentation. The student writes the thesis independently with a support from the supervisor. Finally, the student writes a maturity essay demonstrating familiarity with the subject of the master's thesis and language proficiency.

Career opportunities

Graduates of the programme work typically in different expert tasks in education, research, industry and health care service. A graduate can become for example a designer, product developer, researcher, service producer, teacher or entrepreneur. Internationality is often big part of the job description.

Occupational profiles of the graduates:

- Research, teaching, and specialist duties in academia and research institutes
- Developing and testing products in the industry as well as marketing and post-marketing support and managerial tasks
- Consulting on the use and procurement of products, evaluation of performance, maintenance, customization of appliances to clinical and research needs in health care units
- Public official tasks related to the quality control, management, and establishment of safety standards

Graduate profiles: Product developer, Researcher, Product manager, Teacher

Internationalization

The hosting research units responsible for organizing the BME education are internationally well recognized with broad international collaboration networks.

Students of the BME programme have many opportunities for internationalization:

- studying in English in an international student environment
- participation in international research projects
- student exchange
- internship abroad

Co-operation with other parties

The hosting research units have a long history of fruitful cooperation with several clinical departments of the Oulu University Hospital and health technology companies, which offers interesting opportunities for practical training, research projects and thesis works.

Research focus

The degree programme in BME is implemented in an internationally recognized high-quality research environment.

The research areas in the research unit of Medical Imaging, Physics and Technology (MIPT) include biomechanics and multi-modal imaging of the musculoskeletal system in multiple hierarchical levels, risk factors of falls and fractures, and technological solutions for health promotion and healthy aging. More information http://www.mipt-oulu.fi/.

The Physiological Signal Analysis Team is focusing on research of medical data analysis technologies of the cardiovascular system, respiratory system, brain and autonomic nervous system. The medical data is often multi-modal including various physiological signals and medical images. More information at http://www.oulu.fi/cmvs/.

Innovations are created more and more often between traditional scientific disciplines. The Master's programme in BME offers an excellent interdisciplinary ground for expert and development tasks as well as doctoral training.

Postgraduate study opportunities

The Master's degree gives a qualification and good multidisciplinary background for doctoral studies, provided that other requirements for admission are satisfied.

More information:

For Students https://www.oulu.fi/forstudents/ including further links to different issues concerning studying, e.g. different resources (Moodle, Tuudo etc.)

Opiskelijalle https://www.oulu.fi/opiskelijalle/, josta linkkejä edelleen opiskelua koskeviin asioihin kuten esim. työkaluihin (Moodle, Tuudo jne.).

Tutkintorakenteet

Biomedical engineering, MHSc, FMED

Tutkintorakenteen tila: published

Lukuvuosi: 2020-21

Lukuvuoden alkamispäivämäärä: 01.08.2020

Supplementary Studies, max 15 ECTS cr when necessary (enintään 15 op)

Possible need for Supplementary Studies (max 15 ECTS cr) will be determined in the beginning of studies when preparing the Personal Study Plan (PSP) depending on contents of earlier degree studies. ECTS credits of the Supplementary Studies will not be included in the total number of the ECTS credits of the degree (120 ECTS cr).

Common Compulsory Studies, 70-72 ECTS cr (70 - 72 op)

Common Compulsory Studies for students of biomedical engineering (BME) at the Faculty of Medicine (FMED), who´s target degree is Master of Health Sciences (MHSc).

Finnish students will choose the studies under the title "Common Compulsory Studies for Finnish students only" and non-Finnish students - under the title "Common Compulsory Studies for non-Finnish students only".

Common Compulsory Studies for Finnish students only 70 ECTS cr

080925A: Anatomy and Physiology for Biomedical Engineering, 5 op
041201A: Basics in eHealth, 5 op
580202S: Biomedical Engineering Project, 5 op
080928S: Biomedical Engineering Research Methods and Seminar, 5 op
521273S: Biosignal Processing I, 5 op
521242A: Introduction to Biomedical Engineering, 5 op
580213S: Master's Thesis in Biomedical Engineering, 30 op
580211S: Maturity Test, 0 op
580121S: Practical training, 1 - 5 op
521149S: Special Course in Information Technology, 5 - 8 op

Common Compulsory Studies for non-Finnish students only 72 ECTS cr

080925A: Anatomy and Physiology for Biomedical Engineering, 5 op
041201A: Basics in eHealth, 5 op
580202S: Biomedical Engineering Project, 5 op
080928S: Biomedical Engineering Research Methods and Seminar, 5 op
521273S: Biosignal Processing I, 5 op
521242A: Introduction to Biomedical Engineering, 5 op
580213S: Master's Thesis in Biomedical Engineering, 30 op
580211S: Maturity Test, 0 op
580121S: Practical training, 1 - 5 op
521149S: Special Course in Information Technology, 5 - 8 op
900017Y: Survival Finnish, 2 op

Compulsory Studies / BME FMED Specialization Modules (25 op)

BME students at the FMED with MHSc as target degree will choose one of the compulsory Specialization Modules (25 ECTS cr) below, that is either "Biomechanics and Imaging" or "Health Technology".

Specialization Module "Biomechanics and Imaging", 25 ECTS cr

080924S: Biomaterials, 2 - 5 op
080916S: Biomechanics of Human Movement, 5 op
080920S: Diagnostic Imaging, 5 op
080922S: Microscopy and Spectroscopic Imaging, 5 op
080915S: Tissue Biomechanics, 5 op

Specialization Module "Health Technology", 25 ECTS cr

080916S: Biomechanics of Human Movement, 5 op
521093S: Biomedical Instrumentation, 5 op
080927S: Connected Health and mHealth, 5 op
080929S: Health Technology and Multimodal Monitoring, 5 op
521097S: Wireless Measurements, 5 op

Recommended Optional Studies (23 - 25 op)

There are two different modules of Recommended Optional Studies for BME students at the FMED, which have been compiled to complement the chosen Specialization Module ("Biomechanics and Imaging" or "Health Technology"). Optional studies can also be chosen from other modules or intermediate and advanced studies that support the degree.

Recommended Optional Studies (BME FMED) for Specialization Module "Biomechanics and Imaging"

521156S	Towards Data Mining
761652S	NMR Imaging
521240S	Biophotonics and Biomedical Optics
521153S	Deep Learning
080921S	Biomedical Ultrasound
521289S	Machine Learning
521466S	Machine Vision
521495A	Artificial Intelligence
521093S	Biomedical Instrumentation
080926A	Introduction to Biomedical Imaging Methods
080923S	Physics in Radiation Therapy
080917S 080918S	Project in Biomedical Technology OR Project in Medical Imaging

Recommended Optional Studies (FMED BME) for Specialization Module "Health Technology"

521156S	Towards Data Mining
464104A	Product Innovations
080915S	Tissue Biomechanics
521124S	Sensors and Measuring Techniques
521240S	Biophotonics and Biomedical Optics
521337A	Digital Filters
521289S	Machine Learning
521495A	Artificial Intelligence
521092A	Electronic Measurement Techniques
521282S	Biosignal Prossessing II
521283S	Big Data Processing and Applications
080919S	Project in Health Technology

Master's Programme in Biomedical Engineering, MSci (TECH)

Tutkintorakenteen tila: published

Lukuvuosi: 2020-21

Lukuvuoden alkamispäivämäärä: 01.08.2020

Supplementary Studies, max 15 ECTS cr when necessary (enintään 15 op)

Possible need for Supplementary Studies (max 15 ECTS cr) will be determined in the beginning of studies when making the Personal Study Plan (PSP) and depending on contents of earlier degree studies. ECTS credits of the Supplementary Studies will not be included in the total number of the ECTS credits of the degree (120 ECTS cr).

Common Compulsory Studies 70-72 ECTS cr (70 - 72 op)

Common Compulsory Studies for students, who´s target degree is Master of Science (Technology).

Finnish students will choose the studies under the title "Common Compulsory Studies for Finnish students only" and non-Finnish students - under the title "Common Compulsory Studies for non-Finnish students only".

Common Compulsory Studies for Finnish students only 70 ECTS cr

521027S: Advanced practical training, 5 op
080925A: Anatomy and Physiology for Biomedical Engineering, 5 op
041201A: Basics in eHealth, 5 op
521284S: Biomedical Engineering Project, 5 op
080928S: Biomedical Engineering Research Methods and Seminar, 5 op
521273S: Biosignal Processing I, 5 op
521009S: Computer Science and Engineering, The Maturity Test for Master`s Degree, 0 op
521467A: Digital Image Processing, 5 op
521242A: Introduction to Biomedical Engineering, 5 op
522987S: Master's Thesis in Biomedical Engineering, 30 op

Common Compulsory Studies for non-Finnish students only 72 ECTS cr

521027S: Advanced practical training, 5 op
080925A: Anatomy and Physiology for Biomedical Engineering, 5 op
041201A: Basics in eHealth, 5 op
521284S: Biomedical Engineering Project, 5 op
080928S: Biomedical Engineering Research Methods and Seminar, 5 op
521273S: Biosignal Processing I, 5 op
521009S: Computer Science and Engineering, The Maturity Test for Master`s Degree, 0 op
521242A: Introduction to Biomedical Engineering, 5 op
522987S: Master's Thesis in Biomedical Engineering, 30 op
521149S: Special Course in Information Technology, 5 - 8 op
900017Y: Survival Finnish, 2 op

Compulsory Studies ITEE BME (Signal and Imaging Processing) 25 ECTS cr (vähintään 25 op)

Please note that in this course list there is a course with code 521149S. Kindly note that under this same code in the WebOodi there are several different course names and ways of execution. In this connection the students are required to complete the course whit the name Function and Analysis of Cardiovascular System.

In addition, please, note that a course 521149S must be completed with 5 ECTS cr.

521285S: Affective Computing, 5 op
521282S: Biosignal Processing II, 5 op
521289S: Machine Learning, 5 op
521466S: Machine Vision, 5 op
521149S: Special Course in Information Technology, 5 - 8 op

Recommended Optional Studies ITEE BME (Signal and Image Processing) 23-25 ECTS cr (vähintään 23 op)

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 modules 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.

Recommended Optional Studies ITEE BME (Signal and Image Processing) 23-25 ECTS cr:

521156S	Towards Data Mining	5
031025A	Introduction to Optimization	5
521348S	Statistical Signal Processing	5
521153S	Deep Learning *	5
521279S	Signal Processing Systems	5
521161S	Multi-Modal Data Fusion	5
080920S	Diagnostic Imaging	5
521495A	Artificial Intelligence	5
521288S	Multiprocessor Programming	5
080926A	Introduction to Biomedical Imaging Methods	1-3
521093S	Biomedical Instrumentation	5
521493S	Computer Graphics	5
521283S	Big Data Processing and Applications	5

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

080925A: Anatomy and Physiology for Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English
Timing:
Master studies, autumn term 1st period – THE COURSE WILL BE ORGANIZED NEXT TIME IN AUTUMN 2021

Learning outcomes:
-
Contents:
-
Mode of delivery:
-
Learning activities and teaching methods:
-
Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
-
Grading:
-
Person responsible:
University lecturer Mikko Finnilä
Working life cooperation:
-
Other information:
THE DESCRIPTION WILL BE UPDATED FOR STUDY GUIDE 2021-2022

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 cr, 135 hours of work

Language of instruction:
English
(native Finnish speakers are allowed to write their essay in Finnish)
Timing:
The main course for students of the (Master´s) degree programmes is held in the spring semester, 3rd period. This course is meant also for exchange students of the Biomedical Engineering programme.
The special edition course is held for exchange students of the Faculty of Medicine (medicine, health sciences) in the autumn semester, 2nd period. Other students can participate in this course depending on availability of free places (limited number of places).
Learning outcomes:
Upon completion of the course:
The student can define central information and communication technology (ICT) 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
The student can understand the position of e-health and telemedicine solutions as a part of the national health care information system.
The student receives an initial view of future health ICT trends from clinical perspective and possibilities to contribute to these with his/her professional background
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 citizens
-        citizens providing their own health data, mHealth-solutions
-        national healthcare information exchange in Finland
-        remote consultations, examples like teleradiology, telepsychiatry, telerehabilitation
-        economical and functional assessment
-        remote education in health care
-        future visions of health care information systems
-        changing current topics in connected health like: artificial Intelligence, knowledge based medicine,
cybersecurity etc according to availability
-        Most presented examples in the course are based on information system installations in Northern Finland
Mode of delivery:
Web-based teaching
Learning activities and teaching methods:
Interactivity takes place in virtual learning environment Moodle. The course consists of videotaped lectures, power point presentations and links to other material available in the web. Performance of duties includes an essay, exam, participating in moderated discussions on the grounds of the lectures.
Web lectures 15h / Web exams 40h / Written tasks/ essay 40h* / Self-study and participation in web discussion 40h
 (*Exchange students can relate their essay to the situation in their home countries)
Target group:
MSc and 3rd year BSc students of degree programmes in medical and wellness technology, biomedical engineering, biophysics, physics, and other degree programs; students of medicine and health sciences and everyone who is interested. Please, note the recommended separate course timings for different groups.
Prerequisites and co-requisites:
None
Recommended optional programme components:
The course is independent and does not require additional studies carried out at the same time.

Recommended or required reading:
All recommended or required reading is offered in the Moodle virtual learning environment or in linked web pages.

Assessment methods and criteria:
Web tasks, contribution to moderated discussion, an essay and course exams and optional final exam.
Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
The course utilizes a numerical grading scale 0 – 5. In the numerical scale zero stands for a fail.
Person responsible:
Professor Jarmo Reponen
Course teacher Nina Keränen, MD, MSc
Course teacher Anna Maijala MSc

580202S: Biomedical Engineering Project, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Finnilä

Opintokohteen kielet: Finnish

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 - 10 ECTS
Language of instruction:
Finnish / English
Timing:
The course can be taken during Master studies in autumn or spring semester, or during the summer period.
However, it is recommended to be completed during the 2nd autumn semester.
Learning outcomes:
Upon completion of the course, the student will be able to solve a research or development problem and report it in writing and by giving an oral presentation.

Contents:
Performing a small-scale research or development project.
Mode of delivery:
Independent work
Learning activities and teaching methods:
The student participates in project within or outside the university. Project topics are available in course folder in Moodle learning platform. The student prepares a personal project plan and after the project, the student prepares a written research report and presents it in a seminar. Additionally, the student participates in two other seminar sessions.
Target group:
Degree students of the Medical and Wellness Technology programme and the Biomedical Engineering programme (primarily BME students at the Faculty of Medicine).
Prerequisites and co-requisites:
-
Recommended optional programme components:
The course is an independent entity
Recommended or required reading:
-
Assessment methods and criteria:
The student prepares a project plan, participates in seminars, and reports project results in written report and in oral presentation.
Read more about assessment criteria at the University of Oulu webpage
Grading:
Pass / Fail
Person responsible:

University lecturer Mikko Finnilä
Working life cooperation:
A company or another organization can commission project. In such case the student agrees on topic and supervision with the client
Other information:
-

080928S: Biomedical Engineering Research Methods and Seminar, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: English

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English
Timing:
Master studies, Autumn term, 1st and 2nd periods
Learning outcomes:
The student familiarizes with the principles of scientific work and research ethics.
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, and give and receive feedback on the presentations.
Contents:
Principles of scientific work. Ethical principles. Lectures, seminars and scientific literature. Publication forums in the field and characteristics of scientific articles. Popularization of science.
Mode of delivery:
Face-to-face teaching, remote connection will be offered for lectures and seminars

Learning activities and teaching methods:
Introduction lectures, presentations and discussion based on the latest scientific publications. Each student will give two presentations and act as an opponent for two (peer-assessment).
Lectures 8h, seminars 26h, home exercise, self-study 101 h.
Target group:
Biomedical Engineering MSc students
Prerequisites and co-requisites:
-
Recommended optional programme components:
The course prepares the student for thesis work
Recommended or required reading:
Material given during lectures, selected scientific articles.
Assessment methods and criteria:
Attending seminars, making presentations and acting as an opponent and peer. The assessment criteria are based on the learning outcomes of the course. More detailed assessment criteria can be found in e-learning platform. 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. Grading is made based on student´s presentations.

Person responsible:
Professor Timo Jämsä
Working life cooperation:
The course prepares for working life.

Other information:
For advanced and doctoral studies

521273S: Biosignal Processing I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen, Zalan Rajna

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits.
Language of instruction:
English.
Timing:
The course unit is held in the autumn semester, during period 2. It is recommended to complete the course at the master's degree level.
Learning outcomes:
After completing the course, student:
1. knows about special characteristics of the biosignals and typical signal processing methods
2. can solve small-scale problems related to biosignal analysis
3. implement small-scale MATLAB software for signal processing algorithms.
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. The laboratory work can alternatively be performed on an online system (MathWorks Grader). Student can do the lab works remotely or in the lab using the same online system.
Learning activities and teaching methods:
Lectures 12h, Laboratory work 24h, Self-study for laboratory working and examination 99 h.
Target group:
Students interested in digital signal processing applications in biomedical engineering, at their master's level studies.
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", R.M Rangayyan, 2nd edition (2015). + Lecture slides + Task assignment specific material.
Assessment methods and criteria:
Face-to-face lectures. Students solve the programming problems in the laboratory work independently, supervised by assistants. The MathWorks Grader online system is used for programming tasks and it also verifies the completed tasks. Written examination.
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.

521242A: Introduction to Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr
Language of instruction:
English
Timing:
Period 1
Learning outcomes:
After completing the course, the student has a basic knowledge of the biomedical engineering discipline and the applications of engineering science to biomedical problems.

Contents:
Biomedical engineering is a multidisciplinary field of study that ranges from theory to applications at the interface between engineering, medicine and biology. This course will introduce the subdisciplines within biomedical engineering, including such as systems physiology, bioinstrumentation, bioimaging, biophotonics and biomedical signal analysis. General issues of the subdisciplines will be presented together with selected examples and clinical applications. A number of lectures will be given by professionals working in health tech companies, University of Oulu and Oulu University Hospital, presenting different fields of the biomedical engineering. In addition, course offerings of biomedical engineering at the University of Oulu are introduced.
Mode of delivery:
Face-to-face teaching. Under some circumstances distance learning using online material is possible (please, ask the teacher).

Learning activities and teaching methods:
The course includes online material, lectures and a group project. Lectures 28h and laboratory exercises 4 h and self-study 100h

Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Participation in lectures or using the online material and writing a work report.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1 - 5, pass, fail
Person responsible:
Teemu Myllylä
Working life cooperation:
Guest lecturers
Other information:
-

580213S: Master's Thesis in Biomedical Engineering, 30 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: English

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
30 ECTS credits / 810 hours of work
Language of instruction:
Finnish or English
Timing:
Master studies, final year
Learning outcomes:
The student is able to independently describe and solve a research problem on the grounds of learned knowledge and skills. The student is able to report the work in written form according to the scientific reporting principles.
Contents:
Research project in the field of biomedical engineering or medical & wellness technology. Writing of the thesis.
Mode of delivery:
Independent work
Learning activities and teaching methods:
A research group of the university, industry or health care system can commission thesis. The student writes the thesis independently supported by the supervisor. The student should agree in advance on topic, contents and supervision with the responsible professor of the course.
Target group:
Master Students of Medical and Wellness Technology and Biomedical Engineering
Prerequisites and co-requisites:
-
Recommended optional programme components:
580211S Maturity test
Recommended or required reading:
-
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:
Professor Timo Jämsä
Working life cooperation:
The student can write the thesis in an organization outside the university
Other information:
It is recommendable that before starting to prepare the Master's Thesis the student has completed approximately 60 ECTS cr of the master studies.

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

Proficiency level:

-
Status:

-
Required proficiency level:

-
ECTS Credits:
0 ECTS
Language of instruction:
Finnish / Swedish or English
Timing:
The student takes the Maturity Test in connection with and as a part of the Master´s Thesis.

Learning outcomes:
The student is able to produce intelligible to all paper about his/her field of study and communicate in the language used in the Maturity Test and in this way show his/her command of language and thorough knowledge of the field in question.
Contents:
Contents of the Maturity Test correspond to the topic of the thesis.
Mode of delivery:
Essay
Learning activities and teaching methods:
The student writes the maturity test in invigilated exam on topic related to his/her thesis
There are instructions for writing a Maturity Test in university´s learning platform and university´s website (in Finnish) at http://www.oulu.fi/yliopisto/node/35126.

Target group:
Master´s students of Biomedical Engineering and Medical & Wellness Technology
Prerequisites and co-requisites:
The student can take the Maturity Test as soon as he/she has submitted master´s thesis for review and received permission from the supervisor to register for the test.
Recommended optional programme components:
580213S Master´s Thesis in Biomedical Engineering

Recommended or required reading:

-
Assessment methods and criteria:
The supervisor evaluates and approves contents of the Maturity Test.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / fail
Person responsible:
Professor Timo Jämsä
Working life cooperation:

-
Other information:

-

580121S: Practical training, 1 - 5 op

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

Proficiency level:

-
Status:

-
Required proficiency level:

-
ECTS Credits:
1-5 ECTS cr, 27 – 135 hours of work

Language of instruction:
Finnish / English
Timing:
The course can be taken in autumn or spring semester, or during the summer period.
Learning outcomes:
Upon completion of the course, the student
- knows basic skills required in working life,
- recognizes his/her own skills,
- is able to present those in the CV.
Contents:
Practical training in the field
Mode of delivery:
Practical training in the field
Learning activities and teaching methods:
The student finds the place for practical training by him/herself and agrees on the training with the person responsible for the course. 1 ECTS cr equals approximately to two weeks of training. Practical training includes writing a plan before the training and after the training - updating the CV and evaluation of the learned skills. The student submits the documents to person responsible for acceptance.
The course can be credited based on earlier working experience using RPL-protocol (recognition of prior learning).

Target group:
Master´s students of Medical and Wellness Technology and Biomedical Engineering
Prerequisites and co-requisites:
Student needs to have adequate basic skills for the training tasks required by the training place
Recommended optional programme components:
The course is an independent entity, but the student is expected to have adequate basic skills for learning in the training.
Recommended or required reading:
-
Assessment methods and criteria:
Before the training period, the person responsible for the course evaluates the eligibility of the position. The student makes a plan for the training and the objectives. After the training period student evaluates skills learned in relation to working skills and studies. Student presents letter of reference and other documentation (CV and form "Application for approval of practical training") to the person responsible. If the student wishes to have the course credited based on earlier working experience, he/she fills in RPL-form in OSAT system and attaches with the form CV and letter of reference.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / Fail
Person responsible:
University lecturer Mikko Finnilä
Working life cooperation:
Practical training can take place in companies, universities and other research organizations
Other information:
-

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

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5-8
Language of instruction:
English
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:
Professor of CSE
Working life cooperation:
-
Other information:
Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi.

080925A: Anatomy and Physiology for Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English
Timing:
Master studies, autumn term 1st period – THE COURSE WILL BE ORGANIZED NEXT TIME IN AUTUMN 2021

Learning outcomes:
-

Contents:

-

Mode of delivery:

-

Learning activities and teaching methods:

-

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

-

Grading:

-

Person responsible:
University lecturer Mikko Finnilä
Working life cooperation:

-

Other information:
THE DESCRIPTION WILL BE UPDATED FOR STUDY GUIDE 2021-2022

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 cr, 135 hours of work

Language of instruction:
English
(native Finnish speakers are allowed to write their essay in Finnish)
Timing:
The main course for students of the (Master´s) degree programmes is held in the spring semester, 3rd period. This course is meant also for exchange students of the Biomedical Engineering programme.
The special edition course is held for exchange students of the Faculty of Medicine (medicine, health sciences) in the autumn semester, 2nd period. Other students can participate in this course depending on availability of free places (limited number of places).
Learning outcomes:
Upon completion of the course:
The student can define central information and communication technology (ICT) 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
The student can understand the position of e-health and telemedicine solutions as a part of the national health care information system.
The student receives an initial view of future health ICT trends from clinical perspective and possibilities to contribute to these with his/her professional background
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 citizens
- citizens providing their own health data, mHealth-solutions
- national healthcare information exchange in Finland
- remote consultations, examples like teleradiology, telepsychiatry, telerehabilitation
- economical and functional assessment
- remote education in health care
- future visions of health care information systems
- changing current topics in connected health like: artificial Intelligence, knowledge based medicine, cybersecurity etc according to availability
- Most presented examples in the course are based on information system installations in Northern Finland

Mode of delivery:
Web-based teaching

Learning activities and teaching methods:
Interactivity takes place in virtual learning environment Moodle. The course consists of videotaped lectures, power point presentations and links to other material available in the web. Performance of duties includes an essay, exam, participating in moderated discussions on the grounds of the lectures.
Web lectures 15h / Web exams 40h / Written tasks/ essay 40h* / Self-study and participation in web discussion 40h
 (*Exchange students can relate their essay to the situation in their home countries)

Target group:
MSc and 3rd year BSc students of degree programmes in medical and wellness technology, biomedical engineering, biophysics, physics, and other degree programs; students of medicine and health sciences and everyone who is interested. Please, note the recommended separate course timings for different groups.

Prerequisites and co-requisites:
None

Recommended optional programme components:
The course is independent and does not require additional studies carried out at the same time.

Recommended or required reading:
All recommended or required reading is offered in the Moodle virtual learning environment or in linked web pages.

Assessment methods and criteria:
Web tasks, contribution to moderated discussion, an essay and course exams and optional final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
The course utilizes a numerical grading scale 0 – 5. In the numerical scale zero stands for a fail.

Person responsible:
Professor Jarmo Reponen
Course teacher Nina Keränen, MD, MSc
Course teacher Anna Maijala MSc

580202S: Biomedical Engineering Project, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Finnilä

Opintokohteen kielet: Finnish

Proficiency level:

-
Status:

-
Required proficiency level:

-
ECTS Credits:
5 - 10 ECTS
Language of instruction:

Finnish / English
Timing:
The course can be taken during Master studies in autumn or spring semester, or during the summer period.
However, it is recommended to be completed during the 2nd autumn semester.
Learning outcomes:
Upon completion of the course, the student will be able to solve a research or development problem and report it in writing and by giving an oral presentation.

Contents:
Performing a small-scale research or development project.
Mode of delivery:
Independent work
Learning activities and teaching methods:
The student participates in project within or outside the university. Project topics are available in course folder in Moodle learning platform. The student prepares a personal project plan and after the project, the student prepares a written research report and presents it in a seminar. Additionally, the student participates in two other seminar sessions.
Target group:
Degree students of the Medical and Wellness Technology programme and the Biomedical Engineering programme (primarily BME students at the Faculty of Medicine).
Prerequisites and co-requisites:
-
Recommended optional programme components:
The course is an independent entity
Recommended or required reading:
-
Assessment methods and criteria:
The student prepares a project plan, participates in seminars, and reports project results in written report and in oral presentation.
Read more about assessment criteria at the University of Oulu webpage
Grading:
Pass / Fail
Person responsible:
University lecturer Mikko Finnilä
Working life cooperation:
A company or another organization can commission project. In such case the student agrees on topic and supervision with the client
Other information:
-

080928S: Biomedical Engineering Research Methods and Seminar, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: English

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English

Timing:
Master studies, Autumn term, 1st and 2nd periods
Learning outcomes:
The student familiarizes with the principles of scientific work and research ethics.
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, and give and receive feedback on the presentations.
Contents:
Principles of scientific work. Ethical principles. Lectures, seminars and scientific literature. Publication forums in the field and characteristics of scientific articles. Popularization of science.
Mode of delivery:
Face-to-face teaching, remote connection will be offered for lectures and seminars

Learning activities and teaching methods:
Introduction lectures, presentations and discussion based on the latest scientific publications. Each student will give two presentations and act as an opponent for two (peer-assessment).
Lectures 8h, seminars 26h, home exercise, self-study 101 h.
Target group:
Biomedical Engineering MSc students
Prerequisites and co-requisites:
-
Recommended optional programme components:
The course prepares the student for thesis work
Recommended or required reading:
Material given during lectures, selected scientific articles.
Assessment methods and criteria:
Attending seminars, making presentations and acting as an opponent and peer. The assessment criteria are based on the learning outcomes of the course. More detailed assessment criteria can be found in e-learning platform. 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. Grading is made based on student´s presentations.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
The course prepares for working life.

Other information:
For advanced and doctoral studies

521273S: Biosignal Processing I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen, Zalan Rajna

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits.
Language of instruction:
English.
Timing:
The course unit is held in the autumn semester, during period 2. It is recommended to complete the course at the master's degree level.
Learning outcomes:
After completing the course, student:
1. knows about special characteristics of the biosignals and typical signal processing methods

2. can solve small-scale problems related to biosignal analysis
3. implement small-scale MATLAB software for signal processing algorithms.

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. The laboratory work can alternatively be performed on an online system (MathWorks Grader). Student can do the lab works remotely or in the lab using the same online system.

Learning activities and teaching methods:
Lectures 12h, Laboratory work 24h, Self-study for laboratory working and examination 99 h.

Target group:
Students interested in digital signal processing applications in biomedical engineering, at their master's level studies.

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", R.M Rangayyan, 2nd edition (2015). + Lecture slides + Task assignment specific material.

Assessment methods and criteria:
Face-to-face lectures. Students solve the programming problems in the laboratory work independently, supervised by assistants. The MathWorks Grader online system is used for programming tasks and it also verifies the completed tasks. Written examination.
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.

521242A: Introduction to Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr

Language of instruction:
English

Timing:
Period 1

Learning outcomes:
After completing the course, the student has a basic knowledge of the biomedical engineering discipline and the applications of engineering science to biomedical problems.

Contents:
Biomedical engineering is a multidisciplinary field of study that ranges from theory to applications at the interface between engineering, medicine and biology. This course will introduce the subdisciplines within biomedical engineering, including such as systems physiology, bioinstrumentation, bioimaging, biophotonics and biomedical signal analysis. General issues of the subdisciplines will be presented together with selected examples and clinical applications. A number of lectures will be given by professionals working in health tech companies, University of Oulu and Oulu University Hospital, presenting different fields of the biomedical engineering. In addition, course offerings of biomedical engineering at the University of Oulu are introduced.

Mode of delivery:

Face-to-face teaching. Under some circumstances distance learning using online material is possible (please, ask the teacher).

Learning activities and teaching methods:
The course includes online material, lectures and a group project. Lectures 28h and laboratory exercises 4 h and self-study 100h

Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Participation in lectures or using the online material and writing a work report.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1 - 5, pass, fail
Person responsible:
Teemu Myllylä
Working life cooperation:
Guest lecturers
Other information:
-

580213S: Master's Thesis in Biomedical Engineering, 30 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: English

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
30 ECTS credits / 810 hours of work
Language of instruction:
Finnish or English
Timing:
Master studies, final year
Learning outcomes:
The student is able to independently describe and solve a research problem on the grounds of learned knowledge and skills. The student is able to report the work in written form according to the scientific reporting principles.
Contents:
Research project in the field of biomedical engineering or medical & wellness technology. Writing of the thesis.
Mode of delivery:
Independent work
Learning activities and teaching methods:
A research group of the university, industry or health care system can commission thesis. The student writes the thesis independently supported by the supervisor. The student should agree in advance on topic, contents and supervision with the responsible professor of the course.
Target group:

Master Students of Medical and Wellness Technology and Biomedical Engineering
Prerequisites and co-requisites:
-
Recommended optional programme components:
580211S Maturity test
Recommended or required reading:
-
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:
Professor Timo Jämsä
Working life cooperation:
The student can write the thesis in an organization outside the university
Other information:
It is recommendable that before starting to prepare the Master's Thesis the student has completed approximately 60 ECTS cr of the master studies.

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

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
0 ECTS
Language of instruction:
Finnish / Swedish or English
Timing:
The student takes the Maturity Test in connection with and as a part of the Master´s Thesis.

Learning outcomes:
The student is able to produce intelligible to all paper about his/her field of study and communicate in the language used in the Maturity Test and in this way show his/her command of language and thorough knowledge of the field in question.
Contents:
Contents of the Maturity Test correspond to the topic of the thesis.
Mode of delivery:
Essay
Learning activities and teaching methods:
The student writes the maturity test in invigilated exam on topic related to his/her thesis
There are instructions for writing a Maturity Test in university´s learning platform and university´s website (in Finnish) at http://www.oulu.fi/yliopisto/node/35126.

Target group:
Master´s students of Biomedical Engineering and Medical & Wellness Technology
Prerequisites and co-requisites:
The student can take the Maturity Test as soon as he/she has submitted master´s thesis for review and received permission from the supervisor to register for the test.
Recommended optional programme components:

580213S Master´s Thesis in Biomedical Engineering

Recommended or required reading:
-
Assessment methods and criteria:
The supervisor evaluates and approves contents of the Maturity Test.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / fail
Person responsible:
Professor Timo Jämsä
Working life cooperation:
-
Other information:
-

580121S: Practical training, 1 - 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Finnilä, Jämsä, Timo Jaakko

Opintokohteen kielet: Finnish

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
1-5 ECTS cr, 27 – 135 hours of work

Language of instruction:
Finnish / English
Timing:
The course can be taken in autumn or spring semester, or during the summer period.
Learning outcomes:
Upon completion of the course, the student
- knows basic skills required in working life,
- recognizes his/her own skills,
- is able to present those in the CV.
Contents:
Practical training in the field
Mode of delivery:
Practical training in the field
Learning activities and teaching methods:
The student finds the place for practical training by him/herself and agrees on the training with the person responsible
for the course. 1 ECTS cr equals approximately to two weeks of training. Practical training includes writing a plan
before the training and after the training - updating the CV and evaluation of the learned skills. The student submits
the documents to person responsible for acceptance.
The course can be credited based on earlier working experience using RPL-protocol (recognition of prior learning).

Target group:
Master´s students of Medical and Wellness Technology and Biomedical Engineering
Prerequisites and co-requisites:
Student needs to have adequate basic skills for the training tasks required by the training place
Recommended optional programme components:
The course is an independent entity, but the student is expected to have adequate basic skills for learning in the
training.

Recommended or required reading:
-
Assessment methods and criteria:
Before the training period, the person responsible for the course evaluates the eligibility of the position. The student makes a plan for the training and the objectives. After the training period student evaluates skills learned in relation to working skills and studies. Student presents letter of reference and other documentation (CV and form "Application for approval of practical training") to the person responsible. If the student wishes to have the course credited based on earlier working experience, he/she fills in RPL-form in OSAT system and attaches with the form CV and letter of reference.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / Fail
Person responsible:
University lecturer Mikko Finnilä
Working life cooperation:
Practical training can take place in companies, universities and other research organizations
Other information:
-

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

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5-8
Language of instruction:
English
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:
Professor of CSE

Working life cooperation:

-

Other information:

Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi.

900017Y: Survival Finnish, 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

    ay900017Y   Survival Finnish Course (OPEN UNI)   2.0 op

Proficiency level:
A1.1
Status:
The course is intended for the international students in every faculty at the University of Oulu.
Required proficiency level:
No previous Finnish studies.
ECTS Credits:
2 ECTS cr
Language of instruction:
Finnish and English.
Timing:
-
Learning outcomes:
By the end of the course the student can understand and use some very common everyday expressions and phrases, and s/he can locate informational content in simple texts and messages. The student also knows the basic characteristics of Finnish language and Finnish communication styles.
Contents:
This is an introductory course which aims to help students to cope with the most common everyday situations in Finnish. During the course, students learn some useful everyday phrases, some general features of the vocabulary and grammar, and the main principles of pronunciation.

The topics and communicative situations covered in the course are: general information about the Finnish language, some politeness phrases (how to greet people, thank and apologize), introducing oneself, giving and asking for basic personal information, numbers, some time expressions (how to tell and ask the time, days of the week, time of day), food, drink and asking about prices.

The structures studied are: personal pronouns and their possessive forms, forming affirmative, negative and interrogative sentences, the conjugation of some verbs, the basics of the partitive singular and some local cases for answering the 'where'-question.
Mode of delivery:
Contact teaching, on-line learning and independent work. There will be organized also one on-line group in each semester.
Learning activities and teaching methods:
Lessons 2 times a week (26 h, including the final exam) and guided self study (24 h).
Target group:
International degree and post-graduate degree students, exchange students and the staff members of the University.
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Will be provided during the course.
Assessment methods and criteria:
Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.

Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
Grading scale is on a pass/fail basis.
Person responsible:
Arja Haapakoski
Working life cooperation:
-
Other information:
Sign-up in WebOodi or in Tuudo.

080924S: Biomaterials, 2 - 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Finnilä

Opintokohteen kielet: English

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 ECTS credits, 135 hours of work.

Language of instruction:
English
Timing:
Master studies, spring term, 3rd period.

Learning outcomes:
Upon completion of this course student is familiar with biomaterials and tissue engineering terminology.
Student knows the most frequently used characterization methods in biomaterials research.
Student is able to explain foreign body reaction and biocompatibility.
Student can list different material types used in biomaterials and tissue engineering and is able to understand how material characteristics affect biocompatibility.
Student gains basic information of drug delivery and tissue engineering as well as manufacturing methods for tissue engineering scaffolds.
Student is able to do aseptic work and cell culture
Contents:
Biomaterials and tissue engineering terminology, basic properties of biomaterials, Characterization, Surface modification, Sterilization, Biomaterial types (Metals, Ceramics, Polymers and Natural polymers), Biocompatibility (Biological systems, Cell and tissue interaction with biomaterials, Biocompatibility evaluation methods), Drug delivery, Tissue engineering, Clinical applications.
Mode of delivery:
Blended teaching
Learning activities and teaching methods:
Lectures 20 h, interactive lecture 2 h, group work (exercises) 8 h, reporting 36 h, self-study 65 h. Exam 4 h
Target group:
Biomedical Engineering MSc students. Other master and doctoral students interested in biomaterials
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Lecture material based on selected chapters of the book: Biomaterials Science: An Introduction to Materials in Medicine. 3rd ed. Oxford: Elsevier, 2013. Ratner, B. D., Hoffman, A. S., Schoen, F. J. & Lemons, J. E.

Assessment methods and criteria:
Peer-reviewed project reports, 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 fail
Person responsible:
University Lecturer Mikko Finnilä
Working life cooperation:
-
Other information:
-

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

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English
Timing:
Master´s studies, spring term 4th period
Learning outcomes:
The student can describe the main challenges of movement biomechanics and principles for motion analysis.
The student understands 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 sensors and motion analysis. Biomechanical modeling of movement. Balance measurement. Fall biomechanics. Measurement of physical activity.
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 14h / Assignment and group work 54h / Self-study 67h. Final exam

Target group:
Master´s students of biomedical engineering, medical and wellness technology, information technology and other related degree programs. Master´s students of physics (biomedical physics). Other interested master's and postgraduate students.
Prerequisites and co-requisites:
The student needs to have basic knowledge on statistical analysis, sensors and measurement techniques and signal processing. It is also recommended to have basic knowledge of anatomy and physiology.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time. Tissue biomechanics will be studied in the course 080915S.

Recommended or required reading:

Material given during lectures
Assessment methods and criteria:
Accepted home exercises and lab assignments, 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. Grading is made based on the exercise report and exam.

Person responsible:
Professor Timo Jämsä
Working life cooperation:
None
Other information:
-

080920S: Diagnostic Imaging, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:

-
Status:

-
Required proficiency level:

-
ECTS Credits:
5 ECTS
Language of instruction:
English
Timing:
Master studies, autumn, 2nd period
Learning outcomes:
The student is able to define the physical principles on which various medical imaging 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 and ultrasound
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 27h, demonstrations 8h, exercises 8h and preparing reports and independent studying 92h. Final exam.
Target group:
Students of biomedical engineering and medical and wellness technology, information technology, master degree students in physics with biophysics as major or/and medical physics as minor, other minor subject students. Also for other students of the University of Oulu.

Prerequisites and co-requisites:
Recommended: basic courses in physics and course Radiation physics, biology and safety (766116P, 761116P, 764117P or 764317A).
Recommended optional programme components:
Other courses of biomedical engineering
Recommended or required reading:
Dowsett, Kenny, Johnston: The Physics of Diagnostic Imaging, 2nd ed., Hodder Arnold, 2006.
Assessment methods and criteria:
Mandatory parts of the course: Participation in demonstrations, accepted written reports relating to demonstrations and written final exam.

Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course utilizes a numerical grading scale 1-5 or fail. Course grade is based on score of the final exam.
Possibility to earn additional points from mathematical exercises.
Person responsible:
Professor Miika Nieminen
Working life cooperation:
Demonstrations are held in hospital environment and are related to diagnostics.
Other information:
-

080922S: Microscopy and Spectroscopic Imaging, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Lassi Rieppo

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credit points /135 hours of work.
Language of instruction:
English
Timing:
The course is organized every second year (in uneven years) in spring semester during period 3, next time in spring 2021. It is recommendable to complete the course during Master studies.
Learning outcomes:
Upon completion of the course, the student can:
• Explain the physical and technical background of basic optical microscopy methods, confocal microscopy, hyperspectral imaging, and infrared- and Raman spectroscopic imaging
• describe the properties of grayscale image, RGB image and spectral image
• Perform microscopic and spectroscopic imaging in practice
• Perform basic quantitative analysis for microscopic images
• Perform univariate and multivariate analysis for spectral image data
Contents:
• Basics of optical microscopy
• Basics of optical microscopy
• Bright field microscopy and digital densitometry
• Polarized light microscopy
• Phase-contrast microscopy, differential interference contrast microscopy, and confocal microscopy
• Basic image analysis methods
• Hyperspectral imaging, infrared and Raman spectroscopic imaging
• Univariate and multivariate spectral analysis methods
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 20 h / Exercises 8 h / Demonstrations 6 h, Practical microscopy assignment 15 h / Self-study 86 h. Final exam.
Target group:
Master students of medical and wellness technology, biomedical engineering and physics (biomedical physics major and minor subject students). The course is also suitable for other interested students with adequate prerequisites.
Prerequisites and co-requisites:
Basic knowledge on physics, calculus, differential equations and matrix algebra is required. The ability to use Matlab software is recommended as it will be used in the exercises.
Recommended or required reading:
Material given during the course
Assessment methods and criteria:
Accepted practical assignment and written final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.
Person responsible:
Dr Lassi Rieppo
Working life cooperation:
The course does not contain working life cooperation.

080915S: Tissue Biomechanics, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:

-
Status:

-
Required proficiency level:

-
ECTS Credits:
5 ECTS, 135 hours of work
Language of instruction:
English
Timing:
The course is held in the autumn semester, during period 2. It is recommended to complete the course during Master studies.
Learning outcomes:
The student can describe the main biomechanical characteristics of different tissues and cells as well as failure mechanisms of tissues.
Student understands relationship between biomechanical properties and tissue composition and structure.
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. Cell biomechanics. Biomechanical modeling of tissues.
Mode of delivery:
Blended teaching.
Learning activities and teaching methods:
Lectures 20h, Calculation assignment 10h, interactive lecture and group work 4 h, assignment 8h and preparing report 18h and self-study 75h.

Target group:
Master students of Biomedical Engineering. The course is also suitable for other interested degree and postgraduate students with adequate prerequisites.
Prerequisites and co-requisites:
It is recommended that the student has basic knowledge of anatomy and physiology, mechanics, differential equations, and matrix algebra.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time. Motion biomechanics will be studied in the course 080916S Biomechanics of Human Movement.
Recommended or required reading:
Material and reading given during the course.
Assessment methods and criteria:
Mandatory parts of the course: accepted assignment with written report and written final exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. Course grade is based on score of the final exam.

Possibility to earn additional points from mathematical exercises.
Person responsible:
University lecturer Mikko Finnilä
Working life cooperation:
-
Other information:
-

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

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English
Timing:
Master´s studies, spring term 4th period
Learning outcomes:
The student can describe the main challenges of movement biomechanics and principles for motion analysis.
The student understands 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 sensors and motion analysis. Biomechanical modeling of movement. Balance measurement. Fall biomechanics. Measurement of physical activity.
Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
Lectures 14h / Assignment and group work 54h / Self-study 67h. Final exam

Target group:
Master´s students of biomedical engineering, medical and wellness technology, information technology and other related degree programs. Master´s students of physics (biomedical physics). Other interested master's and postgraduate students.
Prerequisites and co-requisites:
The student needs to have basic knowledge on statistical analysis, sensors and measurement techniques and signal processing. It is also recommended to have basic knowledge of anatomy and physiology.
Recommended optional programme components:
The course is an independent entity and does not require additional studies carried out at the same time. Tissue biomechanics will be studied in the course 080915S.

Recommended or required reading:

Material given during lectures
Assessment methods and criteria:
Accepted home exercises and lab assignments, 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. Grading is made based on the exercise report and exam.

Person responsible:
Professor Timo Jämsä
Working life cooperation:
None
Other information:
-

521093S: Biomedical Instrumentation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: Finnish

Leikkaavuudet:

   521107S   Biomedical Instrumentation   6.0 op

ECTS Credits:
5
Language of instruction:
English.
Timing:
Period 4.
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 signals commonly measured 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). Introduction to medical imaging and monitoring methods and instruments and physical therapy devices. Electrical safety aspects.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures/exercises 30 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:
Teemu Myllylä
Working life cooperation:
No.

080927S: Connected Health and mHealth, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jarmo Reponen

Opintokohteen kielet: English

Proficiency level:

-
Status:

-
Required proficiency level:

-
ECTS Credits:
5 ECTS, 135 hours of work
Language of instruction:
English
Timing:
The course is held in the autumn semester period I (1st period)
Learning outcomes:

Upon completion of the course:
-The students will have knowledge about the current overall status of clinical use of health information systems and related tools (e.g. e-Health, telemedicine, Virtual Hospital, ODA-portal and other self-care portals) in Finland
-The students will have knowledge about the state of the art development in mobile health technology solutions and connected health projects.
-The students have been introduced to some practical development examples taking place in OYS Testlab and possibly in other Oulu health test labs
-The students have had an opportunity to consult with some enterprises currently working in the m-Health / Connected health domain.
-Depending on the student composition of the course, the students have learned collaboration and co-creation in a multiprofessional environment in the medical information and communication technology domain.
Contents:

-terms and concepts
-overview of information and communication technology and information systems in Finnish healthcare
-new processes that activate patient: virtual hospital, self-care models
-current update about mHealth, Connected Health, Artificial Intelligence in health care, secondary use of healthcare information
-collaborative development process in multiprofessional healthcare environment
-introduction to test laboratories
-case example, depending of current R&D&I work at the time of course
-web discussions and possible group assignments

Mode of delivery:
Blended teaching
Learning activities and teaching methods:
The implementation methods of the course vary. The course will consist of a combination of self-learning materials and activating workshops and other modules. The below mentioned numbers of hours are approximations, because the actual contents will vary according to available development projects:

-virtual learning material in the university virtual learning environment (recorded lectures, examples, additional material) /with self-learning 40 hours of student´s time
-activating facilitated workshops, where the iterative innovation process is introduced to the students + introductions to the test laboratory environment + special key-note lectures either in the virtual environment or as participatory lectures in seminars/with self-learning 40 hours of student`s time
-Discussions and participation to web tasks /with self-learning 40 h of student´s time
-Exams and related work/with self-learning 15 h hours of student´s time

Target group:
Students of the Master´s Programs in Biomedical Engineering and Medical & Wellness Technology. The course will also be available as an elective course for medicine, health sciences, information technology and other interested degree programs.

Prerequisites and co-requisites:
-

Recommended optional programme components:
It is recommended that the student has completed the course 041201A Basics in eHealth.

Recommended or required reading:
Recommended or required reading is offered in Oulu University´s virtual learning environment and in linked web pages. The teachers can recommend additional material in the beginning of the course

Assessment methods and criteria:
Web tasks, contribution to moderated discussion and workshops, and course exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
The course utilizes a numerical grading scale 1 – 5 or fail.

Person responsible:
Professor Jarmo Reponen (responsible teacher)
Professor Minna Pikkarainen
Course assistant teacher Anna Maijala MSc

Working life cooperation:
The facilitated workshops are meant to be organized in collaboration with OuluHealth TestLabs and enterprises according to availability.

Other information:
-

080929S: Health Technology and Multimodal Monitoring, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: English

Proficiency level:

-

Status:

-

Required proficiency level:

-

ECTS Credits:
5 ECTS credit points /135 hours of work

Language of instruction:
English

Timing:
The course is held in the Spring semester, during period III.

Learning outcomes:
The course provides students with a broad overview of the health technology that is currently in development and becoming for home and/or clinical use.
Students learn the concepts of multimodal monitoring and examples of its usage in clinical applications and in medical research (including human and animal studies).

Contents:

Multimodal monitoring is increasingly being employed in clinical monitoring and in the study of human physiology. It is the simultaneous measurement of multiple physiological parameters to provide better context for their interpretation and correlations, and to enable studies of relationships between different physiological signals. Besides the concepts of multimodal monitoring, this course provides students a broad overview of the health technology that is currently in development and becoming for home or clinical use. Moreover, their usage in medical applications and for different study purposes (human and animal) are dealt.

Mode of delivery:
Web-based teaching + Face-to-face teaching
Learning activities and teaching methods:
Lectures, demonstrations, seminars and self-study

Target group:
Medical and biomedical engineering students
Prerequisites and co-requisites:
-
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:
Reading material will be provided during the course.
Assessment methods and criteria:
The assessment of the course is based on the learning outcomes of the course, based on the seminar work and 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:
Adjunct professor Teemu Myllylä
Working life cooperation:
There is no working life cooperation in this course
Other information:
-

521097S: Wireless Measurements, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Christian Schuss

Opintokohteen kielet: English

Leikkaavuudet:

   521114S   Wireless Measurements   4.0 op

   521114S-01   Wireless Measurements, exam   0.0 op

   521114S-02   Wireless Measurements, exercise work   0.0 op

ECTS Credits:
5 ECTS credits / 128h
Language of instruction:
In English
Timing:
Period 3.
Learning outcomes:
1. can tell and justifying argument the benefits and challenges of using wireless measurement solutions
2. can apply the most important standards when designing wireless measurement solutions
3. can apply wireless technologies in industrial, traffic, environmental, home and healthcare measurements
Contents:
Basics of wireless measurement technologies and standards, wireless sensors and sensor networks, wireless building and smart home 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:
Lectures 22h. Seminars 6-12h depending on the number of students participating the course. The students prepare seminar presentations about contemporary topics selected by themselves or proposed by the teacher and give 10 minutes presentation to other students in the seminars.
Target group:
Master level students regardless of master's programme.
Prerequisites and co-requisites:
No prerequirements, but basics of measurements systems are recomended.
Recommended optional programme components:
The course replaces previous courses with same name, but different credits and code.
Recommended or required reading:
Lecture notes and seminar reports is Optima.
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:
Grade is on numerical scale 1-5.
Person responsible:
Christian Schuss
Working life cooperation:
No.

521027S: Advanced practical training, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Riku Hietaniemi

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish or English
Timing:
This course can be taken in periods I-IV. The recommended time to take this course is during summer of the fourth year.
Learning outcomes:
Student can apply knowledge and skills learned during university studies to complete work assignments in his/her own field.
Student can evaluate and develop himself/herself as a learner and worker.
Student can plan and evaluate his/her time management and working methods.
Student is capable of working in systematic and goal-oriented manner in group as well as independently.
Student can name important factors that direct the actions of work community and the employer.
Student can name duties where he/she can work after graduating from university.
Contents:
Planning and preparation, carrying out work assignments in the students field of studies, documentation of own accomplishments, writing report and reflection.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
Student independently finds a place to work to complete the course. To pass the course minimum of two months of full time work is required. Work can also be carried out in multiple periods. The course works includes a) Making a practice plan for the working period 4 h, b) Documentation of progress during working 20 h, c) Learning while working 108 h, d) Final raport and reflection 8 h.
Target group:
Master level students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

The course does not require additional studies carried out at the same time. While carrying out the course working assigments are compared to already completed studies.

Recommended or required reading:

No required material

Assessment methods and criteria:

Course is carried out by working minimum of two months in a work accepted by study program responsible person. Before starting the actual work the student needs to make a plan for the working period and return it to the responsible person. A weekly report is required from every working week. These reports have to turned in before the working period ends. After the working period is over the student writes a final report and returns it to the responsible person. Signed testimonial from the employer is also required with the final report.

Grading:

The course is graded as "pass/fail"

Person responsible:

Riku Hietaniemi

Working life cooperation:

The course is carried out as practical training.

Other information:

This course is alternative to 521013A Advanced Practical Training, 3 ECTS.

Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi.

080925A: Anatomy and Physiology for Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:

-

Status:

-

Required proficiency level:

-

ECTS Credits:

5 ECTS, 135 hours of work

Language of instruction:

English

Timing:

Master studies, autumn term 1st period – THE COURSE WILL BE ORGANIZED NEXT TIME IN AUTUMN 2021

Learning outcomes:

-

Contents:

-

Mode of delivery:

-

Learning activities and teaching methods:

-

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-
Assessment methods and criteria:
-
Grading:
-
Person responsible:
University lecturer Mikko Finnilä
Working life cooperation:
-
Other information:
THE DESCRIPTION WILL BE UPDATED FOR STUDY GUIDE 2021-2022

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 cr, 135 hours of work

Language of instruction:
English
(native Finnish speakers are allowed to write their essay in Finnish)
Timing:
The main course for students of the (Master´s) degree programmes is held in the spring semester, 3rd period. This course is meant also for exchange students of the Biomedical Engineering programme.
The special edition course is held for exchange students of the Faculty of Medicine (medicine, health sciences) in the autumn semester, 2nd period. Other students can participate in this course depending on availability of free places (limited number of places).
Learning outcomes:
Upon completion of the course:
The student can define central information and communication technology (ICT) 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
The student can understand the position of e-health and telemedicine solutions as a part of the national health care information system.
The student receives an initial view of future health ICT trends from clinical perspective and possibilities to contribute to these with his/her professional background
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 citizens
-        citizens providing their own health data, mHealth-solutions
-        national healthcare information exchange in Finland
-        remote consultations, examples like teleradiology, telepsychiatry, telerehabilitation
-        economical and functional assessment
-        remote education in health care
-        future visions of health care information systems

- changing current topics in connected health like: artificial Intelligence, knowledge based medicine, cybersecurity etc according to availability
- Most presented examples in the course are based on information system installations in Northern Finland

Mode of delivery:
Web-based teaching

Learning activities and teaching methods:
Interactivity takes place in virtual learning environment Moodle. The course consists of videotaped lectures, power point presentations and links to other material available in the web. Performance of duties includes an essay, exam, participating in moderated discussions on the grounds of the lectures.
Web lectures 15h / Web exams 40h / Written tasks/ essay 40h* / Self-study and participation in web discussion 40h
 (*Exchange students can relate their essay to the situation in their home countries)

Target group:
MSc and 3rd year BSc students of degree programmes in medical and wellness technology, biomedical engineering, biophysics, physics, and other degree programs; students of medicine and health sciences and everyone who is interested. Please, note the recommended separate course timings for different groups.

Prerequisites and co-requisites:
None

Recommended optional programme components:
The course is independent and does not require additional studies carried out at the same time.

Recommended or required reading:
All recommended or required reading is offered in the Moodle virtual learning environment or in linked web pages.

Assessment methods and criteria:
Web tasks, contribution to moderated discussion, an essay and course exams and optional final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
The course utilizes a numerical grading scale 0 – 5. In the numerical scale zero stands for a fail.

Person responsible:
Professor Jarmo Reponen
Course teacher Nina Keränen, MD, MSc
Course teacher Anna Maijala MSc

521284S: Biomedical Engineering Project, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits

Language of instruction:
English.

Timing:
As part of the master level studies, in any period suitable to the student.

Learning outcomes:
1. has develop skills for being initiative, creativity, application of theoretical knowledge, programming and cooperation.

Contents:
A small-scale research work in an active research group. Topics will be selected from the needs of present research activities in the site of work and the interests of student. Main emphasis is on the development and application of methods and algorithms for biomedical data processing. Often the work includes programming with Matlab, C or Java languages.

Mode of delivery:
Self-study under supervision.

Learning activities and teaching methods:
First the research group is studied to get understanding of what are its goals. Detailed task description is written with the advisor. Typically, the work includes study of theoretical background information, programming, testing and simulations, and documentation. Task assignments can be applied at any time all year round.

Target group:

Master-level students that are interested in biomedical engineering. 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.
Courses such as Biosignal processing I and II, Biomedical image processing and Machine learning are
recommended. Programming skills, especially 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:
Literature and scientific articles depending on the task assignment.
Assessment methods and criteria:
Course assessment is based on the technical report.
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

080928S: Biomedical Engineering Research Methods and Seminar, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opettajat: Jämsä, Timo Jaakko
Opintokohteen kielet: English

Proficiency level:

-
Status:

-
Required proficiency level:

-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English
Timing:
Master studies, Autumn term, 1st and 2nd periods
Learning outcomes:
The student familiarizes with the principles of scientific work and research ethics.
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, and give and receive feedback on the
presentations.
Contents:
Principles of scientific work. Ethical principles. Lectures, seminars and scientific literature. Publication forums in the
field and characteristics of scientific articles. Popularization of science.
Mode of delivery:
Face-to-face teaching, remote connection will be offered for lectures and seminars

Learning activities and teaching methods:
Introduction lectures, presentations and discussion based on the latest scientific publications. Each student will give
two presentations and act as an opponent for two (peer-assessment).
Lectures 8h, seminars 26h, home exercise, self-study 101 h.
Target group:
Biomedical Engineering MSc students
Prerequisites and co-requisites:

-
Recommended optional programme components:
The course prepares the student for thesis work
Recommended or required reading:
Material given during lectures, selected scientific articles.
Assessment methods and criteria:
Attending seminars, making presentations and acting as an opponent and peer. The assessment criteria are based on the learning outcomes of the course. More detailed assessment criteria can be found in e-learning platform. 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. Grading is made based on student´s presentations.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
The course prepares for working life.

Other information:
For advanced and doctoral studies

521273S: Biosignal Processing I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen, Zalan Rajna

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits.
Language of instruction:
English.
Timing:
The course unit is held in the autumn semester, during period 2. It is recommended to complete the course at the master's degree level.
Learning outcomes:
After completing the course, student:
1. knows about special characteristics of the biosignals and typical signal processing methods
2. can solve small-scale problems related to biosignal analysis
3. implement small-scale MATLAB software for signal processing algorithms.
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. The laboratory work can alternatively be performed on an online system (MathWorks Grader). Student can do the lab works remotely or in the lab using the same online system.
Learning activities and teaching methods:
Lectures 12h, Laboratory work 24h, Self-study for laboratory working and examination 99 h.
Target group:
Students interested in digital signal processing applications in biomedical engineering, at their master's level studies.
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", R.M Rangayyan, 2nd edition (2015). + Lecture slides + Task assignment specific material.
Assessment methods and criteria:

Face-to-face lectures. Students solve the programming problems in the laboratory work independently, supervised by assistants. The MathWorks Grader online system is used for programming tasks and it also verifies the completed tasks. Written examination.

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.

521009S: Computer Science and Engineering, The Maturity Test for Master`s Degree, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
0; The maturity test is integrated in the MSc Thesis credits (30 ECTS).
Language of instruction:
Finnish/Swedish/other
Timing:
Periods 1-4
Learning outcomes:
After the maturity test, the student has demonstrated that his/her language skills meet the requirements of the work life.
Contents:
The aim of the maturity test is to confirm the student's familiarity of the thesis area as well as his/her command of the domestic language of his/her school education.
Mode of delivery:
The maturity test is written in a controlled event, on a topic provided by the thesis supervisor.
Learning activities and teaching methods:
Written essay, approximately 3 pages hand written text or 380 words / 3040 characters.
Target group:
-
Prerequisites and co-requisites:
The maturity test can be written when the thesis is complete or being finished.
Recommended optional programme components:
-
Recommended or required reading:
MSc Thesis.
Assessment methods and criteria:
The maturity test is evaluated and approved by the thesis supervisor.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/fail.
Person responsible:
Thesis supervisor.
Working life cooperation:
-

521467A: Digital Image Processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Heikkilä, Janne Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

   ay521467A   Digital Image Processing (OPEN UNI)   5.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work

Language of instruction:
Lectures in Finnish and exercises in English. Course can be passed in Finnish and English.

Timing:
Spring, period 4.

Learning outcomes:
Upon completion of the course the student:
- understands the basic theory of digital image processing and knows its main applications,
- is able to apply spatial and frequency domain and wavelet based methods in image enhancement, restoration, compression and segmentation.

Contents:
1. Introduction
2. Fundamentals of digital image
3. Intensity transformations and spatial filtering
4. Image processing in frequency domain
5. Restoration
6. Color image processing
7. Wavelets and multi-scale processing
8. Compression
9. Morphological image processing
10. Segmentation

Mode of delivery:
Face-to-face teaching.

Learning activities and teaching methods:
Lectures 24 h, exercises 14 h and homework assignments 30 h. The rest is independent work.

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

Prerequisites and co-requisites:
521141P Elementary Programming or equivalent Python programming skills.

Recommended optional programme components:
None.

Recommended or required reading:
Gonzalez, R.C., Woods, R.E.: Digital Image Processing, Third Edition, Prentice-Hall, 2008, Chapters 1-10. Lecture notes and exercise

Assessment methods and criteria:
The course is completed by passing the exam and 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:
Janne Heikkilä

Working life cooperation:
None.

Other information:
Course is in Moodle: https://moodle.oulu.fi/course/view.php?id=6840

521242A: Introduction to Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr
Language of instruction:
English
Timing:
Period 1
Learning outcomes:
After completing the course, the student has a basic knowledge of the biomedical engineering discipline and the applications of engineering science to biomedical problems.

Contents:
Biomedical engineering is a multidisciplinary field of study that ranges from theory to applications at the interface between engineering, medicine and biology. This course will introduce the subdisciplines within biomedical engineering, including such as systems physiology, bioinstrumentation, bioimaging, biophotonics and biomedical signal analysis. General issues of the subdisciplines will be presented together with selected examples and clinical applications. A number of lectures will be given by professionals working in health tech companies, University of Oulu and Oulu University Hospital, presenting different fields of the biomedical engineering. In addition, course offerings of biomedical engineering at the University of Oulu are introduced.
Mode of delivery:
Face-to-face teaching. Under some circumstances distance learning using online material is possible (please, ask the teacher).

Learning activities and teaching methods:
The course includes online material, lectures and a group project. Lectures 28h and laboratory exercises 4 h and self-study 100h

Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Participation in lectures or using the online material and writing a work report.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1 - 5, pass, fail
Person responsible:
Teemu Myllylä
Working life cooperation:
Guest lecturers
Other information:
-

522987S: Master's Thesis in Biomedical Engineering, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
30
Language of instruction:
English
Timing:
Second year of MSc
Learning outcomes:
The student knows the background and methods for the research field of his/her thesis, and is able to perform relatively large research project as well as to handle reporting of the results.
Contents:
Research project in the field of biomedical engineering and writing of the thesis.

Mode of delivery:
Face-to-face (supervision meetings)and 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:
Second year MSc students (International Master's Degree Programme in Biomedical Engineering).
Prerequisites and co-requisites:
-
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
-
Assessment methods and criteria:
Writing the thesis. Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale: 1 – 5
Person responsible:
Professor Tapio Seppänen
Working life cooperation:
Yes
Other information:
Detailed instructions:
http://www.oulu.fi/cse/studying/masters-thesis

521027S: Advanced practical training, 5 op

Voimassaolo: 01.01.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Riku Hietaniemi

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits
Language of instruction:
Finnish or English
Timing:
This course can be taken in periods I-IV. The recommended time to take this course is during summer of the fourth year.
Learning outcomes:
Student can apply knowledge and skills learned during university studies to complete work assignments in his/her own field.
Student can evaluate and develop himself/herself as a learner and worker.
Student can plan and evaluate his/her time management and working methods.
Student is capable of working in systematic and goal-oriented manner in group as well as independently.

Student can name important factors that direct the actions of work community and the employer.
Student can name duties where he/she can work after graduating from university.
Contents:
Planning and preparation, carrying out work assignments in the students field of studies, documentation of own accomplishments, writing report and reflection.
Mode of delivery:
Independent work.
Learning activities and teaching methods:
Student independently finds a place to work to complete the course. To pass the course minimum of two months of full time work is required. Work can also be carried out in multiple periods. The course works includes a) Making a practice plan for the working period 4 h, b) Documentation of progress during working 20 h, c) Learning while working 108 h, d) Final raport and reflection 8 h.
Target group:
Master level students.
Prerequisites and co-requisites:
-
Recommended optional programme components:
The course does not require additional studies carried out at the same time. While carrying out the course working assigments are compared to already completed studies.
Recommended or required reading:
No required material
Assessment methods and criteria:
Course is carried out by working minimum of two months in a work accepted by study program responsible person. Before starting the actual work the student needs to make a plan for the working period and return it to the responsible person. A weekly report is required from every working week. These reports have to turned in before the working period ends. After the working period is over the student writes a final report and returns it to the responsible person. Signed testimonial from the employer is also required with the final report.
Grading:
The course is graded as "pass/fail"
Person responsible:
Riku Hietaniemi
Working life cooperation:
The course is carried out as practical training.
Other information:
This course is alternative to 521013A Advanced Practical Training, 3 ECTS.
Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi.

080925A: Anatomy and Physiology for Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Health Sciences
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:
-
Status:
-
Required proficiency level:
-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English
Timing:
Master studies, autumn term 1st period – THE COURSE WILL BE ORGANIZED NEXT TIME IN AUTUMN 2021

Learning outcomes:

-
Contents:
-
Mode of delivery:
-
Learning activities and teaching methods:
-
Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
-
Grading:
-
Person responsible:
University lecturer Mikko Finnilä
Working life cooperation:
-
Other information:
THE DESCRIPTION WILL BE UPDATED FOR STUDY GUIDE 2021-2022

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 cr, 135 hours of work

Language of instruction:
English
(native Finnish speakers are allowed to write their essay in Finnish)
Timing:
The main course for students of the (Master´s) degree programmes is held in the spring semester, 3rd period. This course is meant also for exchange students of the Biomedical Engineering programme.
The special edition course is held for exchange students of the Faculty of Medicine (medicine, health sciences) in the autumn semester, 2nd period. Other students can participate in this course depending on availability of free places (limited number of places).
Learning outcomes:
Upon completion of the course:
The student can define central information and communication technology (ICT) 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
The student can understand the position of e-health and telemedicine solutions as a part of the national health care information system.
The student receives an initial view of future health ICT trends from clinical perspective and possibilities to contribute to these with his/her professional background

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 citizens
-       citizens providing their own health data, mHealth-solutions
-       national healthcare information exchange in Finland
-       remote consultations, examples like teleradiology, telepsychiatry, telerehabilitation
-       economical and functional assessment
-       remote education in health care
-       future visions of health care information systems
-       changing current topics in connected health like: artificial Intelligence, knowledge based medicine, cybersecurity etc according to availability
-       Most presented examples in the course are based on information system installations in Northern Finland

Mode of delivery:
Web-based teaching

Learning activities and teaching methods:
Interactivity takes place in virtual learning environment Moodle. The course consists of videotaped lectures, power point presentations and links to other material available in the web. Performance of duties includes an essay, exam, participating in moderated discussions on the grounds of the lectures.
Web lectures 15h / Web exams 40h / Written tasks/ essay 40h* / Self-study and participation in web discussion 40h
 (*Exchange students can relate their essay to the situation in their home countries)

Target group:
MSc and 3rd year BSc students of degree programmes in medical and wellness technology, biomedical engineering, biophysics, physics, and other degree programs; students of medicine and health sciences and everyone who is interested. Please, note the recommended separate course timings for different groups.

Prerequisites and co-requisites:
None

Recommended optional programme components:
The course is independent and does not require additional studies carried out at the same time.

Recommended or required reading:
All recommended or required reading is offered in the Moodle virtual learning environment or in linked web pages.

Assessment methods and criteria:
Web tasks, contribution to moderated discussion, an essay and course exams and optional final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
The course utilizes a numerical grading scale 0 – 5. In the numerical scale zero stands for a fail.

Person responsible:
Professor Jarmo Reponen
Course teacher Nina Keränen, MD, MSc
Course teacher Anna Maijala MSc

521284S: Biomedical Engineering Project, 5 op

Voimassaolo: 01.01.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits
Language of instruction:
English.
Timing:
As part of the master level studies, in any period suitable to the student.
Learning outcomes:

1. has develop skills for being initiative, creativity, application of theoretical knowledge, programming and cooperation.
Contents:
A small-scale research work in an active research group. Topics will be selected from the needs of present research activities in the site of work and the interests of student. Main emphasis is on the development and application of methods and algorithms for biomedical data processing. Often the work includes programming with Matlab, C or Java languages.
Mode of delivery:
Self-study under supervision.
Learning activities and teaching methods:
First the research group is studied to get understanding of what are its goals. Detailed task description is written with the advisor. Typically, the work includes study of theoretical background information, programming, testing and simulations, and documentation. Task assignments can be applied at any time all year round.
Target group:
Master-level students that are interested in biomedical engineering. 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. Courses such as Biosignal processing I and II, Biomedical image processing and Machine learning are recommended. Programming skills, especially 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:
Literature and scientific articles depending on the task assignment.
Assessment methods and criteria:
Course assessment is based on the technical report.
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

080928S: Biomedical Engineering Research Methods and Seminar, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Health Sciences

Arvostelu: 1 - 5, pass, fail

Opettajat: Jämsä, Timo Jaakko

Opintokohteen kielet: English

Proficiency level:

-
Status:

-
Required proficiency level:

-
ECTS Credits:
5 ECTS, 135 hours of work

Language of instruction:
English
Timing:
Master studies, Autumn term, 1st and 2nd periods
Learning outcomes:
The student familiarizes with the principles of scientific work and research ethics.
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, and give and receive feedback on the presentations.

Contents:
Principles of scientific work. Ethical principles. Lectures, seminars and scientific literature. Publication forums in the field and characteristics of scientific articles. Popularization of science.
Mode of delivery:
Face-to-face teaching, remote connection will be offered for lectures and seminars

Learning activities and teaching methods:
Introduction lectures, presentations and discussion based on the latest scientific publications. Each student will give two presentations and act as an opponent for two (peer-assessment).
Lectures 8h, seminars 26h, home exercise, self-study 101 h.
Target group:
Biomedical Engineering MSc students
Prerequisites and co-requisites:
-
Recommended optional programme components:
The course prepares the student for thesis work
Recommended or required reading:
Material given during lectures, selected scientific articles.
Assessment methods and criteria:
Attending seminars, making presentations and acting as an opponent and peer. The assessment criteria are based on the learning outcomes of the course. More detailed assessment criteria can be found in e-learning platform. 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. Grading is made based on student´s presentations.
Person responsible:
Professor Timo Jämsä
Working life cooperation:
The course prepares for working life.

Other information:
For advanced and doctoral studies

521273S: Biosignal Processing I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Seppänen, Zalan Rajna

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits.
Language of instruction:
English.
Timing:
The course unit is held in the autumn semester, during period 2. It is recommended to complete the course at the master's degree level.
Learning outcomes:
After completing the course, student:
1. knows about special characteristics of the biosignals and typical signal processing methods
2. can solve small-scale problems related to biosignal analysis
3. implement small-scale MATLAB software for signal processing algorithms.
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. The laboratory work can alternatively be performed on an online system (MathWorks Grader). Student can do the lab works remotely or in the lab using the same online system.

Learning activities and teaching methods:
Lectures 12h, Laboratory work 24h, Self-study for laboratory working and examination 99 h.
Target group:
Students interested in digital signal processing applications in biomedical engineering, at their master's level studies.
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", R.M Rangayyan, 2nd edition (2015). + Lecture slides + Task assignment specific material.
Assessment methods and criteria:
Face-to-face lectures. Students solve the programming problems in the laboratory work independently, supervised by assistants. The MathWorks Grader online system is used for programming tasks and it also verifies the completed tasks. Written examination.
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.

521009S: Computer Science and Engineering, The Maturity Test for Master`s Degree, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
0; The maturity test is integrated in the MSc Thesis credits (30 ECTS).
Language of instruction:
Finnish/Swedish/other
Timing:
Periods 1-4
Learning outcomes:
After the maturity test, the student has demonstrated that his/her language skills meet the requirements of the work life.
Contents:
The aim of the maturity test is to confirm the student's familiarity of the thesis area as well as his/her command of the domestic language of his/her school education.
Mode of delivery:
The maturity test is written in a controlled event, on a topic provided by the thesis supervisor.
Learning activities and teaching methods:
Written essay, approximately 3 pages hand written text or 380 words / 3040 characters.
Target group:
-
Prerequisites and co-requisites:
The maturity test can be written when the thesis is complete or being finished.
Recommended optional programme components:
-
Recommended or required reading:
MSc Thesis.
Assessment methods and criteria:
The maturity test is evaluated and approved by the thesis supervisor.
Read more about assessment criteria at the University of Oulu webpage.
Grading:

Pass/fail.
Person responsible:
Thesis supervisor.
Working life cooperation:
-

521242A: Introduction to Biomedical Engineering, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Myllylä

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr
Language of instruction:
English
Timing:
Period 1
Learning outcomes:
After completing the course, the student has a basic knowledge of the biomedical engineering discipline and the applications of engineering science to biomedical problems.

Contents:
Biomedical engineering is a multidisciplinary field of study that ranges from theory to applications at the interface between engineering, medicine and biology. This course will introduce the subdisciplines within biomedical engineering, including such as systems physiology, bioinstrumentation, bioimaging, biophotonics and biomedical signal analysis. General issues of the subdisciplines will be presented together with selected examples and clinical applications. A number of lectures will be given by professionals working in health tech companies, University of Oulu and Oulu University Hospital, presenting different fields of the biomedical engineering. In addition, course offerings of biomedical engineering at the University of Oulu are introduced.
Mode of delivery:
Face-to-face teaching. Under some circumstances distance learning using online material is possible (please, ask the teacher).

Learning activities and teaching methods:
The course includes online material, lectures and a group project. Lectures 28h and laboratory exercises 4 h and self-study 100h

Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
-
Assessment methods and criteria:
Participation in lectures or using the online material and writing a work report.
Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
1 - 5, pass, fail
Person responsible:
Teemu Myllylä
Working life cooperation:
Guest lecturers
Other information:
-

522987S: Master's Thesis in Biomedical Engineering, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
30
Language of instruction:
English
Timing:
Second year of MSc
Learning outcomes:
The student knows the background and methods for the research field of his/her thesis, and is able to perform relatively large research project as well as to handle reporting of the results.
Contents:
Research project in the field of biomedical engineering and writing of the thesis.

Mode of delivery:
Face-to-face (supervision meetings)and 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:
Second year MSc students (International Master's Degree Programme in Biomedical Engineering).
Prerequisites and co-requisites:
-
Recommended optional programme components:
No alternative course units or course units that should be completed simultaneously
Recommended or required reading:
-
Assessment methods and criteria:
Writing the thesis. Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical grading scale: 1 – 5
Person responsible:
Professor Tapio Seppänen
Working life cooperation:
Yes
Other information:
Detailed instructions:
http://www.oulu.fi/cse/studying/masters-thesis

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

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5-8

Language of instruction:
English
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:
Professor of CSE
Working life cooperation:
-
Other information:
Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi.

900017Y: Survival Finnish, 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900017Y   Survival Finnish Course (OPEN UNI)   2.0 op

Proficiency level:
A1.1
Status:
The course is intended for the international students in every faculty at the University of Oulu.
Required proficiency level:
No previous Finnish studies.
ECTS Credits:
2 ECTS cr
Language of instruction:
Finnish and English.
Timing:
-
Learning outcomes:

By the end of the course the student can understand and use some very common everyday expressions and phrases, and s/he can locate informational content in simple texts and messages. The student also knows the basic characteristics of Finnish language and Finnish communication styles.

Contents:

This is an introductory course which aims to help students to cope with the most common everyday situations in Finnish. During the course, students learn some useful everyday phrases, some general features of the vocabulary and grammar, and the main principles of pronunciation.

The topics and communicative situations covered in the course are: general information about the Finnish language, some politeness phrases (how to greet people, thank and apologize), introducing oneself, giving and asking for basic personal information, numbers, some time expressions (how to tell and ask the time, days of the week, time of day), food, drink and asking about prices.

The structures studied are: personal pronouns and their possessive forms, forming affirmative, negative and interrogative sentences, the conjugation of some verbs, the basics of the partitive singular and some local cases for answering the 'where'-question.

Mode of delivery:

Contact teaching, on-line learning and independent work. There will be organized also one on-line group in each semester.

Learning activities and teaching methods:

Lessons 2 times a week (26 h, including the final exam) and guided self study (24 h).

Target group:

International degree and post-graduate degree students, exchange students and the staff members of the University.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Will be provided during the course.

Assessment methods and criteria:

Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.

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

Grading:

Grading scale is on a pass/fail basis.

Person responsible:

Arja Haapakoski

Working life cooperation:

-

Other information:

Sign-up in WebOodi or in Tuudo.

521285S: Affective Computing, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Guoying Zhao

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits

Language of instruction:

In English

Timing:

Fall, periods 1

Learning outcomes:

After completing the course, student

1. is able to explain the emotion theory and modeling

2. is able to implement algorithms for emotion recognition from visual and audio signals, and the fusion of multi-modalities
3. has the ideas of wide applications of affective computing
Contents:
The history and evolution of affective computing; psychological study about emotion theory and modeling; emotion recognition from different modalities: facial expression, speech, fusion of multi-modalities; crowdsourcing study; synthesis of emotional behaviors; emotion applications.
Mode of delivery:
Online teaching in Moodle/Zoom.
Moodle: https://moodle.oulu.fi/course/view.php?id=325&section=0
Learning activities and teaching methods:
The course consists of lectures and exercises. The final grade is based on the points from exam while there are several mandatory exercises.
Target group:
Computer Science and Engineering students and other Students of the University of Oulu.
Prerequisites and co-requisites:
A prior programming knowledge with Python, possibly the bachelor level mathematical studies and/or some lower level intermediate studies (e.g. computer engineering or artificial intelligence courses). The recommended optional studies include the advanced level studies e.g. the pattern recognition and neural networks and/or computer vision courses.
Recommended optional programme components:
-
Recommended or required reading:
All necessary material will be provided by the instructor.
Assessment methods and criteria:
The assessment of the course is based on the exam (100%) with mandatory exercises.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
The course unit utilizes a numerical grading scale 1-5, zero stands for fail.
Person responsible:
Guoying Zhao, Henglin Shi, Yante Li
Working life cooperation:
No
Other information:
Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi.

521282S: Biosignal Processing II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kortelainen

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS cr
Language of instruction:
Lectures and laboratory works are given in English. The examination can be taken in Finnish or English.
Timing:
Period 4
Learning outcomes:
After completing the course, student
1. knows the special characteristics of neural signals and the typical signal processing methods related to them
2. can solve advanced problems related to the neural signal analysis
Contents:
Introduction to neural signals, artifact removal, anesthesia and natural sleep, topographic analysis and source localization, epilepsy, evoked potentials.
Mode of delivery:

Online teaching / Moodle
Learning activities and teaching methods:
Lectures (8 h) and laboratory work (20 h), written exam.
Target group:
Engineering students, medical and wellness technology students, and other students interested in biomedical engineering. Students of the University of Oulu.
Prerequisites and co-requisites:
The basic engineering math courses, digital filtering, programming skills, Biosignal Processing I.
Recommended optional programme components:
-
Recommended or required reading:
The course is based on selected parts from books "EEG Signal Processing", S. Sanei and J. A. Chambers, "Bioelectrical Signal Processing in Cardiac and Neurological Applications", L. Sörnmo and P. Laguna, and "Neural Engineering", B. He (ed.) as well as lecture slides and task assignment specific material.
Assessment methods and criteria:
Laboratory work is supervised by the assistants who will 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:
Numerical grading of the accepted exam is in the range 1-5.
Person responsible:
Jukka Kortelainen
Working life cooperation:
-
Other information:
Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi.

521289S: Machine Learning, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

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 ECTS credits.
Language of instruction:
English.
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, student
1. can design simple optimal classifiers from the basic theory and assess their performance.
2. can explain the Bayesian decision theory and apply it to derive minimum error classifiers and minimum cost classifiers.
3. can apply regression techniques to practical machine learning problems.
Contents:
Introduction. Bayesian decision theory. Parametric and non-parametric classification. Feature extraction. Classifier design and optimization. Example classifiers. Statistical regression methods.
Mode of delivery:
Online teaching, guided laboratory work and independent assignment. The laboratory works are done on an online system (Mathworks Grader). Student can do the lab works remotely or in the lab using the same online system.

The course is implemented as remote education via the Moodle work space https://moodle.oulu.fi/course/view.php?id=5729

This work space opens to students before the course begins. The student must register to the course in WebOodi in order to participate the course.

Learning activities and teaching methods:
Lectures 16 h, Laboratory work 16 h, and Self-study the rest (Independent task assignment).

Target group:
Students who are interested in machine learning and pattern recognition theory and methods.

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:
Will be informed when the course starts.

Assessment methods and criteria:
Laboratory work is supervised by assistants who also verify that the task assignments are completed properly. The Matworks Grader online system also verifies the completed tasks. The independent task assignment is graded which establishes the grade for the course.

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 the independent task assignment.

Person responsible:
Tapio Seppänen

Working life cooperation:
No

521466S: Machine Vision, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Heikkilä, Janne Tapani

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS cr

Language of instruction:
English

Timing:
Spring, period 3.

Learning outcomes:
Upon completion of the course the student
1. understands the fundamentals of image acquisition, representation and modeling
2. can utilize elementary methods of machine vision for image recognition problems
3. can use 2D transformations in model fitting and image registration
4. can explain the basics of 3D imaging and reconstruction

Contents:
1. Introduction, 2. Imaging and image representations, 3. Light and color, 4. Binary image analysis, 5. Texture, 6. Local features, 7. Recognition, 8. Motion, 9. 2D models and transformations, 10. Perceiving 3D from 2D images, 11. 3D transformations and reconstruction.

Mode of delivery:
Online lectures and exercises, homework assignments.

Learning activities and teaching methods:
Lectures (24 h), exercises (16 h) and programming assignments (32 h), self-studying (61 h)

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

Prerequisites and co-requisites:

521467A Digital Image Processing or an equivalent course, basic Python programming skills.
Recommended optional programme components:
521289S Machine Learning. This course provides complementary knowledge on machine learning methods needed in machine vision.
Recommended or required reading:
Lecture slides and exercise material. The following books are recommended for further information: 1) Shapiro, L.G. & Stockman, G.C.: Computer Vision, Prentice Hall, 2001. 2) Szeliski, R.: Computer Vision: Algorithms and Applications, Springer, 2011. 3) Forsyth, D.A. & Ponce, J.: Computer Vision: A Modern Approach, Prentice Hall, 2002.
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:
Numerical grading scale 1-5. Zero stands for a fail.
Person responsible:
Janne Heikkilä
Working life cooperation:
No.
Other information:
Course is in Moodle: https://moodle.oulu.fi/course/view.php?id=4317

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

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5-8
Language of instruction:
English
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:
Professor of CSE
Working life cooperation:
-
Other information:
Course work space can be found from University of Oulu Moodle platform moodle.oulu.fi.