

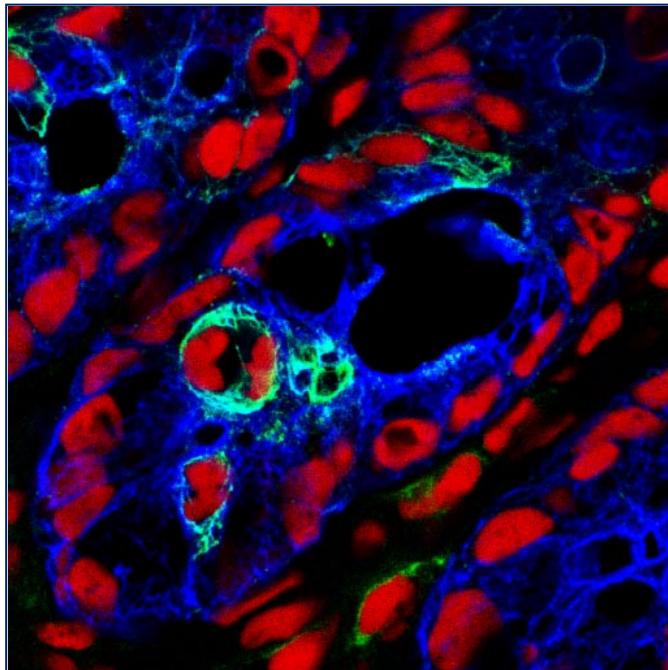


Turun yliopisto
University of Turku



Åbo Akademi University

MASTER'S DEGREE PROGRAMME IN BIOMEDICAL IMAGING



UNIVERSITY OF TURKU (FACULTY OF MEDICINE)
ÅBO AKADEMI UNIVERSITY (DEPARTMENT OF BIOSCIENCES)

I. STRUCTURE OF THE STUDIES

The Master of Science degree in the Master's Degree Programme in Biomedical Imaging has the following structure:

Major subject studies in Biomedical imaging, mandatory courses 45 ECTS	
Master's thesis in Biomedical imaging 45 ECTS thesis plan, seminar and practical laboratory part (25 ECTS) written thesis (20 ECTS)	
Selectable/elective studies on different thematic areas and special themes 25 ECTS	Finnish language studies 5 ECTS

Course structure for studies of Biomedical imaging

Colour codes for thematic areas:

	Advanced cell biology
	Biophysics
	Information technology and image processing
	Advanced microscopy and imaging techniques
	Nanotechnology
	Laboratory animal models and in vivo imaging techniques
	Pathology
	Mathematics
	Other

MANDATORY COURSES		
Course code	Title	Credits
<i>Complementary courses depending on the previous studies</i>		
ÅA_1901	Introduction to Cell Biology ÅAU	3 ECTS
ÅA_1902	Laboratory Basics ÅAU	2 ECTS
OR		
ÅA_1903	Introduction to Biophysics ÅAU	5 ECTS
NOTE: If the student has studied both physics and biology before, he/she can select 5 ECTS other studies.		
<i>Major subject studies</i>		
ANAT5101	Physical Basis of Medical Imaging UTU	4 ECTS
ANAT5103	Biomedical Instrumentation UTU	5 ECTS
ANAT5104	Biomedical Instrumentation Laboratory Course UTU	4 ECTS
ANAT5105	Fluorescence in Bioanalytical Research UTU	4 ECTS
BIMA2101	Digital Image Processing I BTK	5 ECTS
BIMA2106	Making Presentations and Art from Bioimages UTU - FinalCutPro basics	2 ECTS
ÅA_2902	Microscopy and Microtechniques ÅAU	3 ECTS
BIMA2104	Nanosopic Imaging in Biomedical Research- basics UTU	2 ECTS
BKEM1012	Bionano Lecture Course UTU	4 ECTS

Information technology and image processing		
BIMA2103	Mandatory participation in seminar series (20 h) - BioCity Turku seminars (FoS seminars) - Seminar series of Turku Biolmaging - PET Monday Seminars and PET Basics I and II seminars - TCDM Seminar program - CoE seminar program - Other seminar series	1 ECTS
BIMA2105	Biomedical Ethics UTU	1 ECTS
ÅA_2901	Image Perception and Cognition ÅAU	5 ECTS
MASTER'S THESIS		
BIMA2202	Master's Thesis plan, seminar and practical laboratory work	25 ECTS
BIMA2203	Writing the thesis	20 ECTS
<i>Also a possibility to international internships as a part of the Master's thesis.</i>		
Specialization at Thesis Level in one of four topics major themes		
<ul style="list-style-type: none"> o Light Microscopy Imaging o In vivo & Clinical Imaging o Imaging in Nanotechnology and Material Sciences o Microscopy Techniques and Instrument Design 		

SELECTABLE STUDIES ON DIFFERENT THEMATIC AREAS		
Course code	Title	Credits
Advanced cell biology		
283007.0	Cell signaling ÅAU	8 ECTS
223068.0	Structure and function of the cytoskeleton ÅAU	6 ECTS
Biophysics		
233004.0	Electronic properties of organic materials ÅAU	10 ECTS
233035.0	Biophysics ÅAU	10 ECTS
ANAT5102	Medical Imaging Project Work UTU	5 ECTS
Information technology and image processing		
BIMA2107	Making Presentations and Art from Bioimages -Video project UTU	3 ECTS
BIOI2250	Introduction to programming UTU	6 ECTS
BIOI2290	Math and CS for bioinformatics UTU	3 ECTS
TKO_2082	Introduction to Information Technology I UTU	2 ECTS
TKO_2083	Introduction to Information technology II UTU	3 ECTS
TKO_5094	Basics of Digital Image Processing UTU	5 ECTS
TKO_5109	Basics of Digital Video Processing UTU	5 ECTS
TKO_2011	Data Structure and Algorithms UTU	5 ECTS
TKO_5436	Multimedia databases UTU	5 ECTS
TKO_5110	Web programming UTU	5 ECTS
BIOI4290	Tools for intelligent Data Analysis UTU	4 ECTS
TKO_5437	Data mining UTU	5 ECTS
Advanced microscopy and imaging techniques		
223038.0	Advanced Microscopy I ÅAU	5 ECTS
BIMA210X	Nanoscope Imaging in Biomedical Research - advanced UTU	2 ECTS
Laboratory animal models and in vivo imaging techniques		
PGS1024	Laboratory Animal Course UTU	6 ECTS
TCDM3101	Hands-on course including different techniques UTU <i>Optical imaging (TCDM)</i> <i>MicroPET/CT (TCDM)</i> <i>MicroCT - pQCT (TCDM)</i>	3 ECTS

	<i>Radiography (TCDM)</i> <i>Ultrasound (TCDM)</i>	
Pathology		
PATOLXX	Immunohistochemistry – methods and applications UTU	3 ECTS
PATOLXX	In situ hybridization – methods and applications UTU	3 ECTS
PATOLXX	Principles of microscopic diagnostic pathology – basic methods and morphologic alterations in disease (<i>includes www-based virtual microscopy</i>) UTU	5 ECTS
Mathematics		
MATE5258	Image and Video Compression UTU	10 ECTS
SMAT5216	Modelling Project UTU	10 ECTS
MATE5275	Scientific Computing UTU	4 ECTS
MATE5276	Scientific Computing 2 UTU	4 ECTS
Other		
130.023.1	Visuality and visualization of information	5 ECTS

SPECIAL THEMES		
Course code	Title	Credits
Courses given upon interest/by visiting lecturers/by graduate schools.		
Not available every year.		
XXXX	Protein structure and function	
XXXX	Courses on animal physiology, anatomy, immunology, microbiology etc.	
BIMA3111	Imaging as a tool to analyse protein dynamics	
BIMA3112	Interactions and localisation (FRAP, FRET, FLIM...)	
BIMA3113	Ultrahigh resolution microscopy STED	
BIMA3114	Fluorescent speckle microscopy	
BIMA3115	Fluorescence correlation spectroscopy	
BIMA3110	International courses on live cell imaging	
BTKXXX	MS imaging course	
BIMA3101	International lecture course on flow cytometry	
BIMA3103	Flow-cytometry basics	2 ECTS
BIMA3104	Laboratory course on flow-cytometry	2 ECTS
PETC3101	International PET symposium	
PETC3102	International courses on advanced PET imaging	
ÅA_3908	Computational modeling in biology I	5 ECTS
ÅA_3909	Computational modeling in biology II	5 ECTS
ÅA_3910	Molecular computing (synthetic biology) (planned)	5 ECTS
BTK/CIC	Digital Image processing II	2 ECTS
BKEMXXX	A laboratory course on nano-related applications of AFM	
ÅA_3903	Nanoparticulate dyes (short course/integrated)	
ÅA_3904	International course on nanotechnology	
BIMAXXXX	International laboratory courses and visits	

LANGUAGE STUDIES**Course code Title****Credits****Mandatory Language Studies (5 ECTS)**

The studies include a mandatory course in Finnish*/Swedish** (5 ECTS) for the students of the *University of Turku and **Åbo Akademi University.

NOTE: If the student already meets these language requirement he/she is exempted and can select 5ECTS other studies (language or subject related).

KIFF0003	Finnish for Foreigners, Intensive Beginners Course	5 ECTS**
909970.0	Swedish as a Foreign Language (level 1)	5 ECTS**

Optional Language studies

KIEN2022	Basic Academic Writing Skills in English AND	
KIEN3321	Advanced Academic Writing Skills in English	3 ECTS
903840.0	Academic Writing Skills for International Master Students	3 ECTS
902670.0	Finnish as a foreign language, level 1	5 ECTS
SUKI1258	Knowledge about Finland	3 ECTS

III. COURSE INFORMATION (lecture dates and times)

The courses have been given in periods following the ÅAUs period system. Note that the Faculty of Medicine in the University of Turku does not use the period system.

ÅA Period I (5.9-28.10.2011)

Code	Course name	Person in charge	ECTS	Period	Time	Place
221006.0	Introduction to Cell Biology (complementary studies)	John Eriksson	3	I	NOTE: First lecture Fri 14.10 at 13.00 (course schedule will be decided during the 1 st lecture)	ÅA Biochemistry lecture room, Biocity 3 rd floor
221008.0	Laboratory Basics (complementary studies, NOTE: 1 st lecture is mandatory for all students)	Diana Toivola, Tove Johansson	2	I	Weeks 36-39 Wed 7.9 at 8-10 (Lecture I) Fri 9.9 at 13-16 (Lecture II) Quizzes and calculation on week 38 Lab exercise on week 39	Aud. Wikgren (Biocity 1 st floor)
232017	Introduction to Biophysics (complementary studies)	Tom Lönnroth	5	I	Weeks 36-43 Mon 10-12 Wed 13-15 Fri 8-10 (exercises)	Aud. Ekwall (Gadolinia)
BIMA2101	Digital Image Processing I	Rolf Sara & Perttu Terho	5	I	Weeks 36-42 (6.9→) Tue 6.9 at 13-15 (Wikgren) Wed 7.9 at 10-12 (Wikgren) Thu 8.9 at 9-11 (computer room) Fri 9.9 at 10-12 (computer room) Mon 12.9 at 12-14 (computer room) Tue 13.9 at 10-12 (Wikgren) Wed 14.9 at 10-12 (computer room) Thu 15.9 at 10-12 (computer room) Fri 16.9 at 10-12 (computer room) Mon 19.9 at 13-15 (computer room)	Aud. Wikgren, (Biocity 1 st floor) & ÅA Biochemistry Computer room (Biocity 3rd floor)
KIFF0003	Finnish for Foreigners: Intensive Beginners' Course	Pirkko Hölltä	5	I-II	Weeks 37-47 (12.9 ->) Mon, Wed, Thu at 14.15-15.45	Mon, Studio 4, Juslenia Wed, Studio 3, Juslenia Thu, Room 271, Juslenia
130000.0	Image Perception and Cognition	Matti Laine, Lars Berggren, Fred Andersson	5	I	Week 36 Thu 14-15; Weeks 37,39 Thu 14-17 Week 41 Thu 14-16 (Exam)	Week 36 Armfelt(A102) Weeks 37& 39 Helikon(A202)
BIMA2103	Mandatory participation in seminar series		1	I-IV	BioCity Turku seminars, Turku BiImaging seminars, PET seminars, TCDM seminars	Follow the information via e-mail and notice boards

ÅA Period II (31.10-21.12.2011)

Code	Course name	Person in charge	ECTS	Period	Time	Place
BIMA2105	Biomedical Ethics	Veikko Launis	2	II	Weeks 42-49 Mon 17.10 at 10-12 Mon 24.10 at 10-12 Mon 31.10 at 10-12 Mon 7.11 at 10-12	Aud. Wikgren (Biocity 1 st floor)
BIMA2102	Making Presentations and Art from Bioimages (cont. from Period I)	Jussi Arvio (Turku AMK)	5	II-III	<u>Lectures:</u> Fri 9.12. 2011 at 10.15-13.00 Mon 12.12. at 10.15-12.00 Mon 12.12 at 13-16.00 Mon 19.12 at 10.15-13.00 <u>Demonstrations:</u> 16.1.2012 at 12.15-15 (group 1) 17.1.2012 at 12.15-15 (group 2) 18.1. 2012 at 12.15-15 (group 3) 19.1.2012 at 12.15-15 (group 4) 31.1.2012 at 12.15-15 (group 1) 1.2.2012 at 12.15-15 (group 2) 2.2.2012 at 12.15-15 (group 3) 3.2.2012 at 12.15-15 (group 4)	Lecture 9.12./ Turku Centre for Biotechnology 5 th floor seminar room Lectures 12.12 and 19.12/ Wikgren Demonstrations in Mac Lab (ÅA Biochemistry computer classroom, Biocity 3 rd floor)
KIFF0003	Finnish for Foreigners: Intensive Beginners' Course	Pirkko Hölltä	5	I-II	Weeks 37-47 (12.9 ->) Mon, Wed, Thu at 14.15-15.45	Mon, Studio 4, Juslenia Wed, Studio 3, Juslenia Thu, Room 271, Juslenia
BIMA2103	Mandatory participation in seminar series (cont. from Period I)		1	I-IV	BioCity Turku seminars, Turku Bioluminescence seminars, PET seminars, TCDM seminars	Follow the information via e-mail and notice boards

Period III (9.1.2012 – 9.3.2012)

Code	Course name	Person in charge	ECTS	Year	Period	Time	Place
BKEM1012	Bionano lecture course	Jyrki Heino	4	1.	III	Weeks 3-5 (17.1. – 3.2.2012) Tue 17.1. at 10-12 (Arc3) Wed 18.1. at 8-10 (Arc2) Thu 19.1. at 10-12 (Arc 3) Fri 20.1. at 10-12 (Arc2) Tue 24.1. at 10-12 (Arc3) Wed 25.1. at 10-12 (Arc3) Thu 26.1. at 10-12 (Arc 3) Fri 27.1. at 10-12 (Arc2) Tue 31.1. at 10-12 (Arc 3) Wed 1.2. at 10-12 (Arc3) Thu 2.2. at 10-12 (Arc3) Fri 3.2. at 10-12 (Arc2)	Arc3 and Arc 2 (Arcanum, Dept of Biochemistry and Chemistry)
BIMA2106	Making Presentations and Art from Bioimages-	Turku AMK/Jussi Arvio	2	1.	II-III	Weeks 3-5 <u>Demonstrations:</u> 16.1.2012 at 12.15-15 (group 1) 17.1.2012 at 12.15-15 (group 2)	MacLab, Biocity, ÅA Biology, second floor

	FinalCutPro basics					18.1.2012 at 12.15-15 (group3) 19.1.2012 at 12.15-15 (group 4) 31.1.2012 at 12.15-15 (group 1) 1.2.2012 at 12.15-15 (group 2) 2.2.2012 at 12.15-15 (group 3) 3.2.2012 at 12.15-15 (group 4)	
ANAT5101	Physical Basis of Medical Imaging	Pekka Hänninen	4	1.	III	Weeks 3-7 (20.1. ->) Fri 20.1 at 10-16 Mon 23.1 at 12-18 Mon 30.1 at 12-18 Wed 8.2 at 12-18 (Mon 13.2 at 10-16, in reserve)	Turku Centre for Biotechnology 5 th floor seminar room and PET Centre (NOTE: 20.1 at Wikgren, Biocity 1 st floor)
ANAT5103	Biomedical instrumentation	Pekka Hänninen, Juhani Soini	5	1.	III	January 2012 (will be informed later)	Will be informed later
ANAT5104	Biomedical instrumentation laboratory course	Juhani Soini, Pekka Hänninen	4	1.	III-IV	After ANAT5103	Will be informed during ANAT5103!
ANAT5105	Fluorescence in bioanalytical research	Pekka Hänninen, Juhani Soini	4	1.	III-IV	Weeks 10-12 (7.3. ->) Wed 7.3 at 12-16 Thu 8.3 at 12-16 Fri 9.3 at 12-16 Mon 19.3 at 8-12 Wed 21.3 at 12-16 Fri 23.3 at 8-12	7.3. at 12 - 16 Externum 8.3.at 12 - 16 Externum 9.3. at 12 - 16 Mikro 19.3 at 8 - 12 Externum 21.3 at 12 - 16 Externum 23.3 at 8 - 12 AR1 (C202)
BIMA2104	Nanoscope imaging in biomedical research – basics and advanced (Register by 10.1 to amjohan@utu.fi)	Lauri J. Pelliniemi	2+2	1.	III-IV	Weeks 4-17 (25.1-25.4.) Wednesdays 25.1 at 12.15-13.45 15.2. at 9.15-10.45 22.2. at 10.15-11.45 7.3 at 10.15-11.45 21.3 at 10.15-11.45 28.3 at 10.15-11.45 18.4 at 10.15-11.45 25.4 at 10.15-11.00	Physiology seminar room B611, Medisiina (note 21.3 at Wikgren, Biocity 1 st floor)
PETC2101 (selectable course)	PET Basics I	O. Solin	1	1.	III-IV	Part II 19-20.3 Part II 16.-17.4	PET Centre NB: The detailed programme will be announced soon
BIMA2103	Mandatory participation in seminar series		1	1./2.	I-IV	BioCity Turku seminars, Turku Biolmaging seminars, PET seminars, TCDM seminars	Follow the information via e-mail and notice boards

Period IV (12.3.2012 – 25.5.2012)

Code	Course name	Person in charge	ECTS	Year	Period	Time	Place
221007.0/ÅA_2902	Microscopy and microtechniques	Annika Meinander, Diana Toivola	3	1.	IV	Lectures: 2.4. -> Week 14, Mon, Wed 10-12 Week 15, Wed, Fri 10-12 Laboratory: 16.4.-> Weeks 16-21, Mon-Fri 9-17 in groups	Lectures: ÅAU Biology Lecture room, Biocity 2 nd floor Laboratory: Course laboratory
BIMA2104	Nanoscope imaging in biomedical research – basics and advanced	Lauri J. Pelliniemi	2+2	1.	III-IV	Weeks 4-17 (25.1-25.4.) Wednesdays 25.1 at 12.15-13.45 15.2. at 9.15-10.45 22.2. at 10.15-11.45 29.2 at 10.15-11.45	Physiology seminar room B611, Medisiina (note 21.3 at Wikgren, Biocity 1 st floor)

						21.3 at 10.15-11.45 28.3 at 10.15-11.45 18.4 at 10.15-11.45 25.4 at 10.15-11.00	
ANAT5104	Biomedical instrumentation laboratory course	Juhani Soini, Pekka Hänninen	4	1.	III-IV	After ANAT5103	Will be informed during ANAT5103!
ANAT5105	Fluorescence in bioanalytical research	Pekka Hänninen, Juhani Soini	4	1.	III-IV	Weeks 10-12 (7.3. ->) Wed 7.3 at 12-16 Thu 8.3 at 12-16 Fri 9.3 at 12-16 Mon 19.3 at 8-12 Wed 21.3 at 12-16 Fri 23.3 at 8-12	7.3. at 12 - 16 Externum 8.3.at 12 - 16 Externum 9.3. at 12 - 16 Mikro 19.3 at 8 - 12 Externum 21.3 at 12 - 16 Externum 23.3 at 8 - 12 AR1 (C202)
PETC2101 (selectable course)	PET Basics I	O. Solin	1	1.	III-IV	Part II 19-20.3 Part II 16.-17.4	PET Centre NB: the detailed programme will be informed soon
BIMA2103	Mandatory participation in seminar series		1	1./2.	I-IV	BioCity Turku seminars, Turku Bioluminescence seminars, PET seminars, TCDM seminars	Follow the information via e-mail and notice boards

IV. MSc DEGREE PROGRAMME IN BIOMEDICAL IMAGING – RECOMMENDED SCHEDULE FOR STUDIES, ACADEMIC YEARS 2011-2012

1. STUDY YEAR	Autumn 2011	<p><i>Complementary studies depending on student's background</i></p> <p>ÅA_1901 Introduction to Cell Biology 3 ECTS ÅA_1902 Laboratory Basics OR 2 ECTS ÅA_1903 Introduction to Biophysics 5 ECTS</p> <p><i>Major subject studies in Biomedical Imaging, mandatory courses</i></p> <p>BIMA2101 Digital Image Processing I 5 ECTS BIMA2106 Making Presentations and Art from Bioimages – FinalCutPro basics 2 ECTS ÅA130000.0 Image Perception and Cognition 5 ECTS BIMA2105 Biomedical Ethics 1 ECTS ANAT5101 Physical Basis of Medical Imaging 4 ECTS</p> <p><i>Mandatory Language Studies</i></p> <p>KIFF0003 Finnish for Foreigners, Intensive Beginners Course 5 ECTS</p>
	Spring 2012	<p><i>Major subject studies in Biomedical Imaging, mandatory courses (continues)</i></p> <p>ÅA221007.0 Microscopy and Microtechniques 3 ECTS ANAT5103 Biomedical Instrumentation 5 ECTS ANAT5104 Biomedical Instrumentation Laboratory Course 4 ECTS ANAT5105 Fluorescence in Bioanalytical Research 4 ECTS BIMA2104 Nanoscopic Imaging in Biomedical Research 2 ECTS BKEM1012 Bionano Lecture Course 4 ECTS BIMA2103 Mandatory participation in seminar series (20h) (continues) 1 ECTS</p> <p><i>Selectable/elective studies</i></p>
2. STUDY YEAR	Autumn 2012	<p><i>Selectable/elective studies (continues)</i></p> <p><i>Optional Language studies</i></p> <p><i>Master's Thesis in Biomedical Imaging (thesis plan + seminar)</i> 45 ECTS (Possibility to international internship as part of the MSc thesis)</p>
	Spring 2013	<p><i>Master's Thesis in Biomedical Imaging (continues)</i></p> <p><i>Selectable/elective studies (continues)</i></p>

V. COURSE DESCRIPTIONS 2011-2012

Note that the latest information is available at

<http://www.med.utu.fi/sivustot/bioimaging/studying/curriculum/>

Course descriptions (mandatory courses)

[ÅA 221006.0/ÅA 1901 Introduction to Cell Biology 3 ECTS](#)

Subject: Cell Biology

Persons in Charge: John Eriksson

Objectives: To provide the basics of evolution, structure, and function of cells.

Content: The course will introduce the ultra structure of the cell, the cellular organelles, the relationship between structure and function, the basics of cellular metabolism, the basics of cell signaling. The course will also describe the principles of cell division and differentiation.

Modes of Study: Lectures, demonstrations, exam

Evaluation:

Previous Studies: -

Recommended Year of Study: 1. Year, period I-II.

Study Materials:

[ÅA221008.0/ÅA 1902: Laboratory Basics 2 ECTS](#)

Subject: Cell Biology

Persons in Charge: Diana Toivola, Annika Meinander

Objectives: The course is a bridging course for students in MSc programme in Biomedical imaging. The course will teach students basic laboratory techniques, including pipetting, weighing, pH measurements and good laboratory practice. Students will also learn basic laboratory safety issues.

Content:

Modes of Study: Lectures, demonstrations, laboratory work. The course will have exam(s), and reports on the laboratory work.

Evaluation:

Previous Studies: BSc in bio-field and accepted to the MSc programme in biomedical imaging

Recommended Year of Study: 1. Year, period I (*The next course will start in autumn 2012, weeks 37-41*)

Study Materials:

[ÅA232017.0/ÅA 1903 Introduction to Biophysics 5 ECTS](#)

Subject: Biophysics

Persons in Charge: Tom Lönroth

Objectives: To teach physics foundations, especially applications in the biophysical sciences.

Content: Energy, wave motion, electric phenomena, radiation, interaction of photons and molecules.

Modes of Study: Lectures (40h), exercises (20h) (50% of given exercises must be solved), exam

Evaluation:

Previous Studies: -

Recommended Year of Study: 1. Year, period I

Study Materials:

[ANAT5101 Physical Basis of Medical Imaging 4 ECTS](#)

Persons in Charge: Pekka Hänninen

Objectives: Starting from the physical principles of clinical and pre-clinical imaging, the students are introduced to various imaging modalities available at the Turku University Hospital and at the Turku Center for Disease Modelling. Along with the lectures, demonstrations will be arranged to give students a closer look at a functioning medical imaging center.

Content: Atomic and Nuclear Physics and Radiation Protection, X-Ray radiography, Tomography, Gamma imaging, MRI, Ultrasound imaging, PET-imaging

Modes of Study: Lectures, demonstrations, written exam

Evaluation: 1-5

Recommended Year of Study: 1. Year, period III

Study Materials: Chris Guy "Introduction to the Principles of Medical Imaging", Imperial College Press

[ANAT5103 Biomedical Instrumentation 5 ECTS](#)

Persons in Charge: Juhani Soini, Pekka Hänninen

Objectives: The students are introduced to the physical basics of the different instrumental and physical measurement tools and methods in biosciences. The goal is to build a basis in understanding of the function of different instrumental methods and their use in biosciences. Some examples of instrumental implementations are given.

Content: Biomedical instrumentation and physical measurement tools and methods in biosciences

Modes of Study: Lectures, demonstrations, written exam

Evaluation: 1-5

Recommended Year of Study: 1. Year, period II-III

Study Materials: Lecture handout

ANAT5104 Biomedical Instrumentation Laboratory Course 4 ECTS

Persons in Charge: Juhani Soini, Pekka Hänninen

Objectives: Students will be familiarized with biomedical instrumentation with practical exercises.

Content: Biomedical instrumentation.

Modes of Study: Demonstrations, exercises, project work.

Evaluation: 1-5

Recommended Year of Study: 1. Year, period III-IV

Previous studies: ANAT5103

Study Materials: ANAT5103 lecture handout, www material.

ANAT5105 Fluorescence in Bioanalytical Research 4 ECTS

Persons in Charge: Pekka Hänninen, Juhani Soini

Objectives: Starting from the basics of fluorescence the students are familiarized with fluorescence measurement techniques, instrumentation, related chemistry and biochemistry and applications of fluorescence in bioanalytical research.

Content: Fluorescence basics, Instrumentation and optical components, Spectroscopy, Light detectors and light sources, Labels and label chemistry, Fluorescence applications: FRET, FCS, FRAP, microscopy, cytometry, immunoassays.

Modes of Study: Lectures, written essay.

Evaluation: 1-5

Recommended Year of Study: 1. Year, period III-IV.

Previous studies: ANAT5103

Study Materials: Alexander P. Demchenko "Introduction to Fluorescence Sensing", Springer

BIMA2101 Digital Image Processing I 5 ECTS

Persons in Charge: Rolf Sara, Perttu Terho

Content: Methods for digital image processing (principles of digital images, formats, editing, modifications), Kernel methods, Segmenting, Particle tracking.

Modes of Study: Lectures, demonstrations, exercises.

Evaluation: 1-5

Recommended Year of Study: 1. Year, period I.

Previous studies:

Study Materials: Lecture handout, Gonzalez & Woods: Digital Image Processing, 3rd edition, 2008 (Prentice Hall)

BIMA2106 Making Art and Presentations from Bioimages –FinalCutPro basics 2 ECTS

Persons in Charge: Jussi Arvio

Objectives: To familiarize the students with the basics of multimedia tools and editing.

Content: Basics about making videos with FinalCutPro.

Modes of Study: Lectures, demonstrations, hands-on -training.

Evaluation: 1-5

Recommended Year of Study: 1. Year, period II/III

Previous studies: -

Study Materials:

ÅA130000.0 Image perception and cognition 5 ECTS

Persons in Charge: Matti Laine, Lars Berggren

Objectives:

The aim of the course is to familiarize the students with the basic issues in the structure and function of the human visual system. Special emphasis is put on current research findings in visual neuroscience.

Content:

Following the completion of course, the students are expected to be able to:

- describe the basic neural structure and function of the human visual system from retina to the visual cortex
- understand the active nature of human vision and how incoming visual information is compressed in the system
- describe major behavioral phenomena in spatial and color vision, movement perception, object recognition, and visual attention
- describe some major higher-order visual deficits that have informed us about the structure and function of visual perception

Modes of Study: reading of the course book, introductory lectures. Final written exam based on the course book.

Evaluation:

Recommended Year of Study: 1. Year, period I.

Previous studies: -

Study Materials: Snowden, Robert & al. 2006 Basic vision: an introduction to visual perception (320p)

BIMA2104 Nanoscopic Imaging in Biomedical Research 2 ECTS

Persons in Charge: Lauri Pelliniemi

Objectives:

Content: You will learn methods for imaging nanostructures in biomedical and biomaterial research using transmission electron microscopy, scanning transmission electron microscopy, and scanning electron microscopy. Special emphasis is on principles of electron optics, image formation, planning of experiment, specimen preparation, image recording, interpretation, and reporting of the results.

Modes of Study: 12 hours lectures (6x 2h), elective practical hands-on project.

Evaluation:

Recommended Year of Study: 1. Year, period III.

Previous studies: -

Study Materials: Lecture handouts

ÅA221007.0 Basics in Microscopy and Microscopy Techniques 3 ECTS

Persons in Charge: Annika Meinander

Objectives:

Content: Light microscopy and digital microphotography - history and basics. Fixation techniques, sectioning techniques, staining and analysis of microscopical samples. Presentations as posters.

Modes of Study: Lectures, demonstrations, laboratory work. The course will have exam(s), reports/posters on the laboratory work done.

Evaluation:

Recommended Year of Study: 1. Year, period IV

Previous studies: BSc in bio-field and accepted to master's programme in biomedical imaging

Study Materials: Laboratory booklet, moodle

BIMA2105 Biomedical Ethics 1 ECTS

Persons in Charge: Veikko Launis

Objectives:

Content: Principles of Biomedical Ethics, Risk and Uncertainty in Modern Bioethics, Natural and Unnatural in Biomedicine, Case studies

Modes of Study: Lectures 8h (4x 2h), mini essays

Evaluation:

Previous Studies: -

Recommended Year of Study: 1. Year, period II

Study Materials: Lectures

BKEM1012 Bionano Lecture Course 4 ECTS

Persons in Charge: Jyrki Heino

Objectives: To learn the basics of nanoscience and nanotechnology, with special reference to facts relevant to life science. To understand the opportunities, challenges and putative hazards of nanotechnology.

Content: The lectures cover the basic ideas behind nanoscience and nanotechnology. There is a special focus on the cellular nanomachines, the chemistry of nanoparticles, and the use of nanotechnology in medicine, diagnostics, materials science and imaging (e.g. electron microscopy and atomic force microscopy).

Modes of Study: Lectures, several lecturers. Written exam

Evaluation: accepted/fail

Previous Studies: -

Recommended Year of Study: 1./2. Year, period III

Study Materials: The lectures and extra material will be in the Workmates.

BIMA2103 Mandatory participation in seminar series (20h) 1 ECTS

o BioCity Turku seminars <http://www.biocity.turku.fi/>

o Seminar series of Turku Bioimaging <http://www.bioimaging.fi/courses.htm>

o PET Monday Seminars

http://www.pet.fi/index.php?option=com_content&view=article&id=59&Itemid=41&lang=en

- o TCDM Seminar program <http://www.tcdm.fi/?id=seminarseries&pm=main|education>
- o CoE seminar program
- o Other seminar series <http://www.biocity.turku.fi/index.php?id=860>

OBLIGATORY LANGUAGE STUDIES

KIFF0003 Finnish for Foreigners, Intensive Beginners Course 5 ECTS

Persons in Charge: Pirkko Hölttä (autumn semester), Päivi Paukku (spring semester)

General description: This course is intended only for degree students of the University of Turku. The course is integrated in nature and covers all the different areas of linguistic skills. In addition to pronunciation and grammar, the course offers tuition in speaking, written work, and listening and reading comprehension. Special emphasis will be placed on active communicational skills. In addition to attending the classes, participants must also be prepared to study a lot independently.

Objectives: After the course the student can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. He/she can e.g. briefly describe events and activities. The student understands the main points in short messages, announcements and stories. He/she can follow speech which is slow and carefully articulated. The student can write short and simple texts on topics which are familiar or of personal interest. He/she can understand short texts that consist of frequent everyday or job-related language.

Contents:

Themes: greetings, introducing oneself, countries, languages and nationalities; the seasons, months and days of the week; some measures, the points of the compass, time and weather; clothes, colours and other adjectives; home and living; family and relatives; food and eating; shopping: buying and paying; animals; travelling and vehicles; professions and leisure-time activities; parts of the body; visiting a doctor; telling, how do you feel.

Structures: vowel harmony; the most common noun types; the genitive stems and consonant graduation; possessive structure; the verb types and conjugation in the present tense; asking questions and responding to them; the use of auxiliary verbs with the main verbs; partitive singular; possessive suffixes; the local cases in the singular form; the simple past tense.

Modes of Study: English: Participation in classroom work

Finnish: Participation in classroom work *and* Exercise(s) *and* Midterm Examination *and* Written exam

Evaluation and evaluation criteria: *Numeric 1-5.* Participation, classroom work, exercises, midterm examination and written exam.

Previous Studies: -

Recommended Year of Study: 1. year autumn/1. year spring

Study Materials: Heikkilä, S. & Majakangas, P. *Hyvin menee! 1* (Keuruu 2008)

Selectable courses

(Note: the course information will be updated later)

Courses given by Åbo Akademi University (The student must apply for JOO Flexible Study Right)

223038.0 Advanced microscopy 5 ECTS

Subject: Cell Biology

Persons in Charge: Annika Meinander

Objectives & content: Learn basics, usability and differences in advanced microscopy techniques systems related to fluorescence microscopy and light microscopy, such as confocal microscopy, TIRF, AFM, STED, spinning disc microscopy. Acquire hands on skills in confocal microscopy.

Modes of Study: Lectures, laboratory work in groups. Practical training in confocal microscopy.

Evaluation:

Previous Studies: -

Recommended Year of Study: 1./2. Year (the next course will start in autumn 2012, weeks 36-53)

Study Materials:

223038.0 Advanced microscopy, 2012-2013

Lectures and laboratory work: weeks 36-43, in groups

233035.0 Biophysics 10 ECTS

Subject: Physics

Persons in Charge: Markus Lindberg

Objectives: The purpose of the course is to provide the student an overview of the physical background of biological phenomena from molecular and cellular level up to structural and dynamical properties of biological species. The relevant theoretical methods are presented together with the topics.

Content: Physical properties of atoms and molecules. Physical properties of small and large molecules in biology. Cell membranes and cellular machines. Light harvesting systems. Propagation of neural impulses. Principles of sensory processes and their relation to environment and biological materials. Support structures and motion of biological bodies.

Modes of Study: Lectures, exercises, written exam

Evaluation:

Previous Studies: -

Recommended Year of Study: 1./2. Year, period III-IV

Study Materials:

BIMA2107 Making Art and Presentations from Bioimages –Advanced course 3 ECTS

Persons in Charge: Jussi Arvio

Objectives: To familiarize the students with the basics of multimedia tools and editing.

Content: Basics about making videos with FinalCutPro.

Modes of Study: Lectures, demonstrations.

Evaluation: 1-5

Recommended Year of Study: 1. Year, period III-IV (next course will start in February/March 2012)

Previous studies: BIMA2106

Study Materials:

283007.0 Cell signaling 8 ECTS

Subject: Cell biology

Persons in Charge: John Eriksson

Objectives: Deepening the knowledge in cell signaling

Content: The course focuses on intracellular signal pathways. Techniques used to measure these are presented as well as studies on targeting signaling pathways as drugs are also discussed. The course is composed of lectures (~20 h), subject-related seminars representing current research projects in Turku/Åbo science community, self-studies and web material.

Modes of Study:

Evaluation:

Previous Studies: -

Recommended Year of Study: 1./2. Year, period I-II

Study Materials:

223068.0/ÅA_3905 Structure and function of the cytoskeleton 8 ECTS

Subject: Cell biology

Persons in Charge: John Eriksson

Objectives: To provide a thorough insight to different aspect of the cytoskeleton.

Content: The course will provide the student with detailed characteristics of the different cytoskeletal systems, their structure and dynamics, and their role in cellular functions, in signal transduction, and their roles in normal homeostasis, development, and pathologies.

Modes of Study: The course will be arranged as a collaboration between Åbo Akademi Univ., Univ. of Helsinki, and Univ. of Turku. The course is comprised of lectures, seminars, and problem-based learning.

Evaluation:

Previous Studies: -

Recommended Year of Study: 1./2. Year, period II (**NB: the course will be organized next time in autumn 2012**)

Study Materials:

130023.1/ÅA_3906 Visuality and visualization of information 5 ECTS

Subject:

Persons in Charge: Lars Berggren/Fred Andersson

Objectives: The course aims at an historical and interdisciplinary understanding of the emerging field of data visualization, especially as regards medicine and the natural sciences. In the course it is demonstrated how data is transmitted with the aid of different techniques and devices of visualization. It is also shown how certain findings of modern psychology and vision science can be practically applied in order to improve the efficiency and accessibility of visualization. Concepts and notions such as visuality, information, cognition, object recognition and text/image interaction are defined and discussed. The course also includes a basic historical orientation in the history of the scientific image in the West from the Middle ages and onwards.

Content: The student will acquire knowledge of how certain findings of modern psychology and vision science can be practically applied in order to improve the efficiency and accessibility of information visualization. The examination is connected to activities in which students from various disciplines can test their ability to visualize data with which they are familiar. In addition, the student also acquires background knowledge of the historical development of techniques for visualization in the West.

After the course the participants will have acquired skills and cognitive tools that improve their ability to visualize data within their specific disciplines

Modes of Study: Lectures, workshop exercises, learning portfolio

Evaluation:

Previous Studies: Passing the course Image Perception and Cognition (130000.0)

Recommended Year of Study: 1./2. Year

Study Materials:

903840.0/ÅA_4902 Academic Writing Skills for International Masters Students

Persons in Charge: Tom Björkfors

Objectives: To enable these students to cope successfully when writing their master's thesis by developing competence in academic writing, and raising awareness of appropriate grammatical structures, vocabulary and conventions.

Analysis of appropriate academic literature provided by the teacher, together with articles brought by the participants from their own field for structural and linguistic analysis. Development and improvement of the language and structure of participants' own texts in English.

At the end of the course the learners are expected to be able to:

- evaluate and analyse a wide range of authentic academic texts
- locate, evaluate and make use of a wide range of authentic academic skills literature on the web and from other sources
- compose a well-structured and well-written academic text related to their field
- effectively present and explain aspects of their own work both in oral and written form
- respond orally and in written form to authentic academic texts according to the conventions of academic discourse
- better cope with the demands of research in an international environment.

Modes of Study: No written exam. Submission of a piece of recent academic work. Active participation and full attendance are requested.

Recommended Year of Study: 1./2. Year, Period II

[902670.0/ÅA_4903 Finnish as a Foreign Language, level 1](#)

Content: To give students basic knowledge of the Finnish language in order to help to cope with various everyday situations in Finnish. The students learn to understand and use both spoken and written Finnish. The course also gives a solid start with the grammar. During the lectures, basic grammar will be taught and various tasks will be practised both in pairs and as group work. Pronunciation exercises, listening comprehension exercises, communication exercises and small number of writing tasks are included.

Aim: Level A1 according to the Common European Framework of References for Language

Upon completion of the course, students are expected to be able to do the following:

- read and understand simple texts and other written material dealing with everyday and familiar topics
- read and understand the main content of simple instructions and directions
- understand common, everyday words and simple expressions as well as simple, slow and distinct conversation pertaining to oneself, family and specific areas of interest
- understand simple instructions and directions in everyday situations when spoken slowly and clearly
- produce basic written information about oneself, complete simple forms and questionnaires

- produce short, very simple texts which comprehensively describe a familiar situation, (e.g. write a short letter or message)
- participate in basic conversation about everyday situations and general areas of interest, (e.g. family, housing, studies or equivalent) in which other participants speak slowly and clearly, and are prepared to assist
- use simple vocabulary and phrases, ask and answer basic questions about known topics of conversation and situations, (e.g. greetings, shopping terminology, asking for assistance and help)

Evaluation: 1- 5

Modes of Study: Active participation (75%)

Recommended Year of Study: 1./2. Year, Periods I-IV

Courses given by the University of Turku

TCDM3101 Practical Training in *In vivo* Imaging Techniques 2 ECTS

Persons in Charge: Pirjo Pakarinen

Objectives: To get acquainted with the use of various imaging techniques in preclinical research, e.g. to identify disease pathways, to evaluate drug compounds and monitor their effects on disease, to investigate mechanisms of action in a living animal, and to characterize phenotypic properties of genetically modified animals.

Content: Relevant mouse/rat models are exploited as examples. The techniques with potential models include:

- Optical imaging with fluorescence (a tumor model) and with bioluminescence (reporter mice)
- MicroPET/CT (an inflammation model)
- MicroCT (*ex vivo*; bone phenotype, osteoporosis, bone metastases)
- pQCT (*ex vivo* and *in vivo*; osteoporosis, regulation of bone)
- Radiography (osteoporosis, osteopetrosis, bone dimensions)
- Ultrasound (an atherosclerosis model)

Modes of Study: Demonstrations/hands-on training

Evaluation: A written report on each session

Previous studies: Basic theory of imaging methods, animal laboratory course recommended

Recommended Year of Study: 1./2. Year, period I/II (The course will be organized 1-2 times/year).

Study Material: Handouts

ANAT5102 Medical Imaging Project Work 5 ECTS

Persons in Charge: Pekka Hänninen

Objectives: The students will familiarize themselves with the imaging modalities used by the University hospital and hospital district by performing a given project work. The goal is to gain deeper understanding into the use of different imaging modalities in patient diagnostics.

Content: X-Ray radiography, Tomography, Gamma imaging, MRI, Ultrasound imaging, PET imaging

Modes of Study: Self-study Project work (Instructions are given during the course ANAT5101)

Evaluation: 1-5

Recommended Year of Study: 1. Year, period III

Previous studies: ANAT5101 (discuss with the responsible teacher)

Study Materials: Chris Guy "Introduction to the Principles of Medical Imaging", Imperial College Press, www material, specific given literature

PETC2101 PET Basics Course: Part I 1 ECTS

Persons in Charge: Heikki Minn, Pirjo Nuutila, O. Solin

Content: Introduction to PET and its Clinical Applications

- PET Physics, radiochemistry and preclinical imaging

Modes of Study: Lectures, PET Centre site visits

Evaluation: pass/fail

Recommended Year of Study: 1./2 Year, period IV (Next course 19-20.3. 2012)

Previous studies: -

Study Materials: Lecture handout

PETC2102 PET Basics Course: Part II 1 ECTS**Persons in Charge:** Heikki Minn, Pirjo Nuutila, O. Solin**Content:** Introduction to Research & Medical Applications of PET

- PET in research and diagnostics

Modes of Study: Lectures**Evaluation:** pass/fail**Recommended Year of Study:** 1./2. Year, period IV (Next course 16.-17.4. 2012)**Previous studies:** -**Study Materials:** Lecture handout**BIMA2107 Making Art and Presentations from Bioimages – Video Project 3 ECTS****Persons in Charge:** Jussi Arvio**Objectives:** To give the students the required media skills to be able to create coordinated video material from their scientific field of expertise.**Content:** Concept and terminology, media forms, brainstorming, evaluating the idea, storyboard, editing with FCP**Modes of Study:** Lectures, demonstrations, hands-on-training**Evaluation:** 1-5**Recommended Year of Study:** 1. Year, period III-IV**Previous studies:** BIMA2102**Study Materials:****KIEN2022 Basic Academic Writing Skills in English 2 ECTS****Persons in Charge:** Henno Parks/ Brett Dellinger**Objectives:** Academic writing course designed for Masters' level students to cover the core elements of academic grammar and style.**Recommended Year of Study:** 1./2. year, periods I/III**KIEN3321 Advanced Academic Writing Skills in English 3 ECTS****Persons in Charge:** Michael Nelson**Objectives:** This course is intended for those who need to write scientific articles for publication in international journals or their doctoral thesis in English. Subjects will include an explanation of the key features of academic writing, the structure of scientific articles, aspects of text linguistics related to writing and common grammar problems. Students also get a chance to have their own work reviewed and checked. Much of the course is internet-based.**Recommended Year of Study:** 1./2. Year<https://nettiopsu.utu.fi/opas/teaching/course.htm?id=172><http://users.utu.fi/micnel/advancedacademic.htm>**SUKI1258 Knowledge about Finland 3 ECTS****Persons in Charge:** Leena Maria Heikkola**Aim and contents:** This course will give students an insight into social, economic and cultural life in Finland. This course will demand an individual or group work with reference books.**Modes of Study:** lectures, required reading, essays, classroom presentation and examination.**Recommended Year of Study:** 1./2. Year**BIOI2250 Introduction to Programming 6 ECTS****Subject:** Bioinformatics**Person in Charge:** Erkki Kaila**Objectives:** The course targets students with no prior programming experience. The students will acquire basic skills in algorithm design and programming, learning to write simple, practical programs in the Python programming language. The course is not suitable for students who do have prior programming experience and want to learn Python as an additional language.**Content:** Fundamental concepts such as variables, values, types, expressions, control structures, data structures, modularity and classes. Model problems and their typical algorithmic solutions with particular focus on bioinformatics.**Teaching Methods:** Lectures (40h).

Modes of Study: Exercises, written exam. One half of the exercises time is devoted to in-class programming assignments.

Evaluation: 1-5

Organization Responsible: Turku IT

Previous Studies: -

Recommended Year of Study: 1./2. year, periods I-II

Study Materials: Lecture notes; Python documentation.

BIOI2290 Math and CS for bioinformatics 3 ECTS

Subject: Bioinformatics

Person in Charge: Tapio Salakoski

Objectives: Mastering basics of probability theory (probability, probability axioms, conditional probability, probability density function, cumulative distribution function, expectation, variance, discrete random variable, continuous random variable) and statistics (statistical experiment, descriptive statistics, inference statistics). Ability to calculate with complex numbers and matrices (also determinant, eigenvalues and eigenvectors), and define extremum values of a given function. Capability to analyze and solve differential equations.

Content: Essential math and CS methods with applications to bioinformatics. The course content includes probability theory, statistics, complex numbers, matrices, ordinary differential equations, extremum values.

Modes of Study: Lectures (12h), exercises (8h), participation in classroom work (50% of home exercises must be completed) and Moodle activity (at least 4 participations at the course discussion forum in Moodle), written exam.

Evaluation: 1-5

Organization Responsible: Turku IT

Previous Studies: Supplementary Math and CS Foundations or equivalent.

Recommended Year of Study: 1./2. year, period II

TKO 2082 Introduction to Information Technology I 2 ECTS

Subject: Computer Science

Person in Charge: Jouni Järvinen

Objectives: The course gives an introductory survey of some key fields of computer science. It gives the fundamentals of information encoding, data storage, and computer architecture. Also operating systems and computer networks are discussed.

Content: Data representation and the storage of data within a computer: the types of data that are considered include text, numeric values, images, audio, and video. Computer architecture: how computer are programmed by means of encoded instructions, called machine language instructions. Operating systems: what operating systems do and how they do it. Networking: construction and operation of networks, applications of networks, and security issues.

Teaching Methods: Self-study course. The course is designated only for non-Finnish speaking students of "International Master's Program for Bioimaging".

Modes of Study: Exam

Evaluation: 0-5

Organization Responsible: University of Turku, Department of Information Technology.

Recommended Year of Study: 1./2., period I

Study Material: J. Glenn Brookshear, Computer Science: An Overview (10th Edition), Pearson Education (2009), Chapters 1-4.

TKO 5094 Basics of Digital Image Processing 5 ECTS

Subject: Computer Science

Person in Charge: Jukka Teuhola

Objectives: The students learn the main techniques of representing and manipulating digital images, both in theory and in practice.

Content: Imaging and printing technologies, image coding, color systems, image enhancement, various kinds of filters, edge detection, sharpening, spectral analysis, geometric transformations, morphological operations, and image compression. Practical part: introduction to some image editing software, and a related project.

Teaching Methods: Self-study course. The course is designated only for non-Finnish speaking students of "International Master's Program for Bioimaging".

Modes of Study: Project work, written exam.

Evaluation: 1-5

Organization Responsible: Dept. of IT

Previous Studies: Basics of algorithms and programming.

Recommended Year of Study: 1./2. year, period I.

Study Materials: Nick Efford: Digital Image Processing – A Practical Introduction Using Java, Addison-Wesley 2000.

TKO 5109 Basics of Digital Video Processing 5 ECTS

Subject: Computer Science

Person in Charge: Jukka Teuhola

Objectives: The students learn the main technologies and methods of representing, processing, and delivering of digital video.

Content: Analog vs. digital video, video capture, video signals, video+audio, storage systems and formats, cutting, filtering, transitions and effects, keyframing and animation, text and graphics, resizing, de-interlacing, streaming, transfer protocols, compression, and basics of video processing in Java. Practical part: introduction to video editing software, and a related project.

Teaching Methods: Self-study course. The course is designated only for non-Finnish speaking students of "International Master's Program for Bioimaging".

Modes of Study: Project work, written exam.

Evaluation: 1-5

Organization Responsible: Dept. of IT

Previous Studies: Basics of algorithms and programming.

Recommended Year of Study: 1./2. year, period I.

Study Materials: To be announced.

TKO 2083 Introduction to Information Technology II 3 ECTS

Subject: Computer Science

Person in Charge: Jouni Järvinen

Objectives: The course is a continuation for the course Introduction to Information Technology I. It describes the topics of algorithms, programming languages, and software development. Basics of data structures and database systems are also presented.

Content: Algorithms: algorithm, pseudocode, problem solving, iterative structures, recursive structures, efficiency and correctness. Programming languages: variables and data types, constants, statements, control statements, comments, procedural units, object-oriented programming. Software engineering: issues related the development of large and complex software systems are considered. Data structures: some basic data structures and their implementations. Database systems: database fundamentals, relational model, data mining.

Teaching Methods: Self-study course. The course is designated only for non-Finnish speaking students of "International Master's Program for Bioimaging".

Modes of Study: Exam

Evaluation: 0-5

Organization Responsible: University of Turku, Department of Information Technology.

Previous Studies: Introduction to Information Technology I

Recommended Year of Study: 1./2., period II

Study Material: J. Glenn Brookshear, Computer Science: An Overview (10th Edition), Pearson Education (2009), Chapters 5-9.

TKO 2011 Data Structures and Algorithms I 5 ECTS

Subject: Computer Science

Person in Charge: Jouni Järvinen

Objectives: The course considers the most essential sorting and selection algorithms. It gives basic tools for the evaluation of the effectiveness of algorithms. The end of the course is devoted to some basic data structures for dynamic collections and directories.

Content: Asymptotic analysis of algorithms, important sorting and selection algorithms. stacks, queues, priority queues, linked lists, hash tables and binary search trees.

Teaching Methods: Self-study course. The course is designated only for non-Finnish speaking students of "International Master's Program for Bioimaging".

Modes of Study: Exam

Evaluation: 0-5

Organization Responsible: University of Turku, Department of Information Technology.

Previous Studies: Basic Course on Algorithms and Programming

Recommended Year of Study: Second/third year

Study Material: Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein: Introduction to Algorithms (3rd Edition), The MIT Press (2009), Chapters 1-12.

TKO 5436 Multimedia Databases 5 ECTS

Subject: Computer Science

Person in Charge: Jukka Teuhola

Objectives: The student learns the storage and indexing structures, as well as retrieval methods of different media types.

Content: Multimedia data types, management of large objects, text and document databases, multidimensional data structures, spatial databases, image databases, video and audio databases, feature extraction, content-based retrieval, and multimedia standards.

Teaching Methods: Lectures (28 h, in English, every second year).

Modes of Study: Written exam.

Evaluation: 1-5

Organization Responsible: Dept. of IT

Previous Studies: Databases I-II, Data Structures and Algorithms I.

Recommended Year of Study: 2. year, period not fixed.

Study Materials: Lecture notes & miscellaneous sources (to be announced).

TKO 5110 Web Programming 5 ECTS

Subject: Computer Science

Persons in Charge: Pentti Riikonen

Objectives: Students learn to use common frameworks and techniques, their weaknesses and strengths. In web programming project students can focus on certain frameworks and thus achieve deeper knowledge on some methods.

Contents: Modern important methods and frameworks in the field. For example XHTML, CSS, JavaScript, DHTML, Ajax, PHP ASP.NET, Servlet/JSP, Ruby on Rails, Silverlight and Flash.

Modes of study: Self study of books and web material, exercises, exam and web programming project.

Study materials: Literature and course material on the Internet

Teaching Methods: Independent work.

Evaluation: 0-5

Previous studies: Object Oriented Programming

BIOI4290 Tools for Intelligent Data Analysis 4 ECTS

Subject: Bioinformatics

Person in Charge: Pentti Riikonen

Objectives: The course aims at delivering an intuitive understanding of the fundamentals and thus the power and limitations of various methods like Artificial Neural Network, SOM, genetic and evolutionary algorithms, simulated annealing.

Content: Common algorithmic and AI methods used in data analysis in many fields of research, including but not restricted to bio and medical informatics. Different data analysis methods and applications are included.

Teaching Methods: Independent work.

Modes of Study: Exercises, oral exam.

Study Materials: Course material on the Internet.

Period of Teaching: Period IV.

Evaluation: 0-5

TKO 5437 Data mining 5 ECTS

Subject: Computer Science

Person in Charge: Timo Knuutila

Objectives: This course offers a grounding in machine learning concepts as well as practical advice on applying machine learning tools and techniques in real-world data mining situations. You will learn how to prepare inputs, interpret outputs, evaluate results, and the algorithmic methods at the heart of successful data mining, including both tried-and-true techniques of the past and methods at the leading edge of contemporary research.

Content: We first discuss what kind of input a data mining application assumes and what kind of different outputs it may produce. After this, we represent some basic data mining methods and show how the credibility of their results can be evaluated statistically. Basic algorithms are then extended to state-of-the-art real data mining methods. Finally, we discuss the engineering of the input and output.

Teaching methods: Lectures (52 h).

Modes of study: Exam

Study Materials: Literature: Eibe Frank, Ian Witten: Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan-Kaufmann Publishers, 2005.

Period of Teaching: The course is given irregularly.

Evaluation: 0-5

Previous studies: Introduction to Artificial Intelligence

MATE5258 Image and Video Compression 10 ECTS (Image and Video Compression)

Subject: Mathematics

Objectives: See content

Content: The course introduces the mathematical background of image compression. Different approaches to image compression are discussed and various algorithms are presented and analysed.

Topics include entropy and information, symbol coding, lossless image compression, lossy compression and rate-distortion theory, scalar and vector quantization, image transformations including discrete cosine transform and wavelet transforms, motion estimation and compensation and image and video compression standards.

Previous Studies: Linear algebra

Modes of Study: exercises, midterms or a final exam

Evaluation: 0–5

Teaching Methods: lectures 56 h, exercises 28 h

Period of Teaching: period III-IV