AALBORG UNIVERSITET

STUDIEORDNING FOR CIVILINGENIØR, CAND.POLYT. I SUNDHEDSTEKNOLOGI 2011

CIVILINGENIØR
AALBORG

MODULER SOM INDGÅR I STUDIEORDNINGEN

INDHOLDSFORTEGNELSE

BIOMEDICAL SIGNALS AND INFORMATION

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The course “Scientific methods and communication”, running in parallel with the project at the latest.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

To learn to use scientific methods to carry out a project related to acquisition, processing, analysis or modeling and interpretation of physiologic / clinical information or signals.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Have knowledge of at least one of the areas: Signal processing, Pattern recognition and decision support, Clinical information systems, Sensory-motor control
- Understand the biological source of the relevant signal or information
- Know methods to acquire and to analyse or model the relevant signal or information,
- Understand the scientific communication processes related to conference presentations and related to publishing in peer-reviewed scientific journals
- Know how to organise a scientific publication

SKILLS

- Are able to apply scientific methods in the chosen area of knowledge
- Are able to reflect on those methods
- Are able to interpret signals and information in terms of clinical relevance
- Are able to plan and to carry out a (minor) research study
- Can explain the process of and criteria for peer reviewed scientific communications
- Can write an abstract for a scientific meeting
- Can prepare an oral presentation for a scientific meeting

COMPETENCES

- can set up a plan for getting an overview of existing knowledge within a scientific/technical topic
- are able to judge and prioritize the validity of various sources of scientific information

TYPE OF INSTRUCTION

Project work

1. A document in the form of a “camera ready” scientific manuscript (“journal paper”, with a length of maximum 10 pages), which communicates the main aspects of the project
2. Edited work sheets
3. Oral presentation

EXAM

EXAMS

Name of exam	Biomedical signals and information

Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Medicotekniske signaler og information
Module code	STIST11K1_1
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	15
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

SCIENTIFIC METHODS AND COMMUNICATION

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

None.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Understand the scientific communication processes related to conference presentations and related to publishing in peer-reviewed scientific journals
- Are able to organize a scientific publication
- Have knowledge of qualitative and quantitative research methods
- Have knowledge of experimental designs
- Have knowledge of validity and reliability of outcome measures
- Understand bias and statistical power in experimental designs
- Understand principles of epidemiological research designs
- Understand evidence-based medicine
- Understand and can reflect on proper conduct in scientific projects
- Understand and can reflect on ethical concerns in biomedical and sports sciences

SKILLS

- Can explain the principles of hypothesis-driven research and descriptive research
- Can critically read and judge experimental protocols in scientific articles
- Can design an experimental protocol in relation to a scientific project
- Can discuss principles for creating new and validated knowledge
- Can explain the process of and criteria for peer reviewed scientific communications
- Can discuss the importance of research ethics
- Can write an abstract for a scientific meeting and can respond to blind peer-review criticism
- Can prepare a poster and an oral presentation for a scientific meeting
- Can apply biostatistics and have practical experience in statistical software

COMPETENCES

- Can set up a plan for getting an overview of existing knowledge within a scientific/technical topic
- Can prioritize the validity of various sources of scientific information
- Can evaluate scientific presentations from a communicative view point
- Can judge the validity of scientific literature

TYPE OF INSTRUCTION

Lectures and exercises The culmination of the course is a conference, to which each student group contributes:

1. An abstract will be submitted online after which the abstract will be reviewed by an anonymous researcher. The group has to respond to the reviewers comments and change the abstract accordingly and resubmit it for publication in the conference program.
2. A poster, to be mounted and presented on the conference day.
3. A short oral presentation.

EXAM

EXAMS

Name of exam	Scientific methods and communication
Type of exam	Active participation/continuous evaluation
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

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All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Videnskabelige metoder og kommunikation
Module code	STIST11K1_2
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

BIOMEDICAL (INFORMATION) SYSTEMS

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Active participation in semester 1.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

To learn to apply and evaluate scientific methods in modelling and/or design of biomedical systems or clinical information systems based on a realistic clinical or scientific problem.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Have gained knowledge of at least one of the areas: Signal processing and image analysis, Pattern recognition and decision support, Clinical information systems, Sensory-motor control and rehabilitation systems, and Physiologic modeling
- Understand knowledge within the selected area(s) and is able to reflect on a scientific basis on this knowledge

SKILLS

- Are able to independently plan and carry out a research study on basis of a given problem
- Are able to apply scientific methods and tools to research within the chosen area of knowledge
- Are able to choose scientific theories and methods within the chosen area of research
- Are able to communicate problems, methods and results within the scientific area, in writing
- Are able to discuss professional and scientific problems with peers

COMPETENCES

- Are able to function in a project with a high level of complexity and which requires new solutions
- Are able to take responsibility for their own professional development

TYPE OF INSTRUCTION

Project work.

EXAM

EXAMS

Name of exam	Biomedical (information) systems
Type of exam	Oral exam based on a project
ECTS	15
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the _programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Medicotekniske (informations)systemer
Module code	STIST11K2_1
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	15
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

APPLIED BIOMEDICAL ENGINEERING AND INFORMATICS

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

The students must have participated actively in the first two semesters of this education programme.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

To give the student experience in applying scientific methods or performing scientific experiments related to Biomedical engineering and Informatics at a University Department or in a company in Denmark or abroad.

With this semester the student will be able either to broaden and/or to deepen his or her experience in a specific research area.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- have knowledge of at least one of the areas: Signal processing and image analysis, Pattern recognition and decision support, Clinical information systems, Sensory-motor control and rehabilitation systems, and Physiologic modeling
- are able to reflect on a scientific basis on this knowledge

SKILLS

- are able to apply scientific methods and tools to research within the chosen area of knowledge
- are able to evaluate and to choose scientific theories and methods within the chosen area of research
- are able to communicate problems, methods and results within the scientific area, in both oral and written form

COMPETENCES

- are able to independently initiate or to perform collaboration within the discipline
- are able to take responsibility for their own professional development

TYPE OF INSTRUCTION

Project work.

EXAM

EXAMS

Name of exam	Applied biomedical engineering and informatics
Type of exam	Oral exam based on a project
ECTS	30
Assessment	7-point grading scale
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the _programme student counsellors if you consider applying to the education and you have questions.

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FACTS ABOUT THE MODULE

Danish title	Anvendt sundhedsteknologi og informatik
Module code	STIST11K3_1
Module type	Project
Duration	1 semester
Semester	Autumn
ECTS	30
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

MASTER'S THESIS (2 SEMESTERS - 60 ECTS)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

It is recommended that previous semesters have been followed.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The Master thesis is the last element of the scientific education, and thereby an opportunity to integrate and to deepen previously acquired skills and to display the ability to perform scientific work.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- have knowledge, at the highest international level of research, of at least one of the areas: Signal processing and image analysis, Pattern recognition and decision support, Clinical information systems, Sensory-motor control and rehabilitation systems, and Physiologic modeling
- are able to reflect on a scientific basis on this knowledge

SKILLS

- are able to apply scientific methods and tools to research within the chosen area of knowledge
- are able to evaluate and to choose scientific theories and methods and to identify scientific problems within the chosen area of research
- are able to communicate problems, methods and results within the scientific area, in both oral and written form

COMPETENCES

- are able to control situations that are complex, unpredictable and which require new solutions
- are able to independently initiate and to perform collaboration within the discipline and interdisciplinary as well, and to take professional responsibility
- are able to independently take responsibility for his or her own professional development and specialisation

TYPE OF INSTRUCTION

Project work.

EXAM

EXAMS

Name of exam	Master's thesis (long project)
Type of exam	Oral exam based on a project
ECTS	60
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Speciale projekt (2 semestre - 60 ECTS)
Module code	STIST11K4_2
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	60
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

MASTER'S THESIS

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

It is recommended that previous semesters have been followed.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

The Master thesis is the last element of the scientific education, and thereby an opportunity to integrate and to deepen previously acquired skills and to display the ability to perform scientific work.

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- have knowledge, at the highest international level of research, of at least one of the areas: Signal processing and image analysis, Pattern recognition and decision support, Clinical information systems, Sensory-motor control and rehabilitation systems, and Physiologic modeling
- are able to reflect on a scientific basis on this knowledge

SKILLS

- are able to apply scientific methods and tools to research within the chosen area of knowledge
- are able to evaluate and to choose scientific theories and methods and to identify scientific problems within the chosen area of research
- are able to communicate problems, methods and results within the scientific area, in both oral and written form

COMPETENCES

- are able to control situations that are complex, unpredictable and which require new solutions
- are able to independently initiate and to perform collaboration within the discipline and interdisciplinary as well, and to take professional responsibility
- are able to independently take responsibility for his or her own professional development and specialisation

TYPE OF INSTRUCTION

Project work.

EXAM

EXAMS

Name of exam	Master's thesis
Type of exam	Oral exam based on a project
ECTS	30
Assessment	7-point grading scale
Type of grading	External examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

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All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Speciale projekt
Module code	STIST11K4_1
Module type	Project
Duration	1 semester
Semester	Spring
ECTS	30
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

STOCHASTIC SIGNALS AND PROCESSES (ELECTIVE 1.A)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge of probability theory

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Have knowledge of stochastic processes in general
- Can describe stochastic processes and their application as models for real signals
- Can explain the defining properties of various stochastic process models
- Can identify the analytical tools for studying random phenomena in engineering systems
- Demonstrate understanding of the concepts, theories and techniques for estimating parameters of discrete stochastic processes
- Have knowledge about cross- and auto-correlation of stochastic processes
- Have knowledge about power spectral analysis of stationary stochastic processes and can estimate the power spectral density of discrete stochastic processes and understand the limitations in this estimation

SKILLS

- Can apply the theory of stochastic processes to model real phenomena
- Can analyze and characterize appropriate stochastic process models for a given problem
- Can apply methods for power spectral analysis and filtering to biomedical signals that can be modeled as realizations of stochastic processes
- Can estimate and analyze the power spectrum of biomedical signals that can be modeled as realizations of stochastic processes
- Can solve problems in applied sciences based on the theory for stochastic processes

COMPETENCES

- Are prepared for a wide range of courses in communication, signal processing, control and other areas in which randomness has an important role.

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	Stochastic signals and processes
Type of exam	Written or oral exam
ECTS	5

Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Stokastiske signaler og processer (valgfag 1.a.)
Module code	STIST11K1_3
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

PATTERN RECOGNITION AND DECISION SUPPORT (ELECTIVE 1.B.)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge of probability theory

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Have knowledge of statistical pattern recognition in general
- Have knowledge of methods such as neural networks, Baysian nets and rule-based systems
- Are able to describe the components of a pattern recognition system
- Are able to understand how patterns can be described from characteristic features extracted from one- or multi-dimensional data
- Have knowledge of supervised and unsupervised learning

SKILLS

- Are able to design and test a pattern recognition system
- Are able to apply parametric and non-parametric classification techniques to univariate and multivariate data
- Are able to analyse and describe the underlying density function of a data set
- Are able to apply methods to reduce the dimensionality of the data
- Are able to design and test a decision support system

COMPETENCES

- Are able to demonstrate understanding of concepts, theories and techniques in the area of statistical pattern recognition and decision support
- Are able to apply feature analysis and classification techniques to specific multi-dimensional pattern recognition problems

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	Pattern recognition and decision support
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the _programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Mønstergenkendelse og beslutningsstøtte (valgfag 1.b.)
Module code	STIST11K1_4
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

THE SEMANTICS OF CLINICAL INFORMATION SYSTEMS (ELECTIVE 1.C.)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

IT-System development on bachelor level

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Have knowledge of standards on information and communication models in health care
- Understand classifications and terminology models in health care
- Have knowledge on terminology and semantics in clinical information systems from interface to database level
- Understand use of clinical information for primary and secondary purposes
- Have knowledge on different research approaches related to terminology and models in clinical information systems

SKILLS

- Can analyze the need for terminology and classifications in a given clinical information system
- Can choose appropriate standards for a given clinical information system
- Can discuss issues associated with primary and secondary use of clinical information
- Can design protocols for studies in clinical information systems

COMPETENCES

- Are able to evaluate terminology and models in clinical information systems

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	The semantics of clinical information systems
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Kliniske informationssystemernes semantik (valgfag 1.c.)
Module code	STIST11K1_5
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

SENSORY SYSTEMS AND SENSORY-MOTOR CONTROL (ELECTIVE 1.D.)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Knowledge of basic physiology and neurophysiology

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Understand human sensory and motor control mechanisms
- Understand neuroanatomical and physiological aspects of human sensory and motor control mechanisms
- Have knowledge about methodologies to assess the normal and pathological sensory function
- Have knowledge about methodologies to assess the normal and pathological motor control function
- Have knowledge of quantitative and qualitative methodologies used to analyse neurophysiological data in relation to normal or pathological sensory and motor control mechanisms
- Understand plasticity in sensory and motor pathways in normal and pathological conditions

SKILLS

- Are able to interpret neurophysiological data in relation to the normal sensory or motor pathways and underlying disease
- Are able to explain relevant sensory anatomy (e.g. vision, hearing, pain, balance, taste and olfaction, somatosensory cases) and coding of sensory information (e.g. mechanoreception, thermoreception, proprioception, nociception)
- Are able to explain relevant motor neuroanatomy, including neural pathways related to control of movement and peripheral/spinal/supra-spinal control of movement
- Are able to explain relevant movement control mechanisms including postural control, motor reflexes, and sensory-motor integration of afferent and efferent information at spinal, sub-cortical and cortical level
- Are able to identify and select appropriate methodologies to assess sensory and motor control mechanisms
- Are able to identify sensory/motor pathways in selected neurological diseases

COMPETENCES

- Are able to select and motivate appropriate methodologies to assess sensory and motor control mechanisms
- Are able to judge neurophysiological data in scientific literature

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	Sensory systems and sensory-motor control
Type of exam	Written or oral exam

ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

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All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Sensoriske systemer og sensorisk-motorisk kontrol (valgfag 1.d.)
Module code	STIST11K1_6
Module type	Course
Duration	1 semester
Semester	Autumn
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

ADVANCED SIGNAL PROCESSING (ELECTIVE 2.A.)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Elective 1.a. Knowledge of stochastic signals and processes is recommended

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Have knowledge about different tools for joint-time-frequency analysis
- Demonstrate understanding of the trade-off between time and frequency resolution in the analysis of a non-stationary signal
- Can explain the relationships between time-frequency and wavelet analysis
- Have knowledge about adaptive filtering and multivariate signal processing
- Can identify different nonlinear tools that can be applied to analyze biomedical signals
- Have knowledge about methods for estimation of features from biomedical signals

SKILLS

- Can reflect on the choice of appropriate time-frequency distributions suitable to different biomedical problems
- Can design wavelets for multi-resolution analysis of signals with specific biomedical applications such as filtering
- Can evaluate appropriate adaptive filters suitable for the problem to solve
- Can apply multivariate tools for classification and feature space reduction
- Can analyze and describe nonlinear analysis methods
- Can analyze and describe the frequency content of a biomedical signal with respect to time
- Can handle de-noising of biomedical signals using various techniques such as wavelet and adaptive filters

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	Advanced signal processing
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

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All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Avanceret signalbehandling (valgfag 2.a.)
Module code	STIST11K2_2
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

IMAGE ANALYSIS AND COMPUTER VISION (ELECTIVE 2.B.)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Elective 1.b Pattern recognition and decision support is recommended

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Have knowledge of basic and advanced image analysis and computer vision methods and concepts
- Have knowledge of data driven and model based techniques for analysis of 2D or 3D image data
- Have knowledge of optical and tomographic imaging geometry
- Have knowledge of linear and non-linear techniques for solving inter-subject and intra-subject image registration problems
- Have knowledge of geometrical representation of objects in 2D and 3D derived from image data
- Have knowledge of statistical and morphological image processing
- Have knowledge of multi-scale techniques

SKILLS

- Are able to apply image analysis and computer vision methods to extract information from the original image data
- Are able to apply intensity transformations and image filtering in the spatial and frequency domain
- Are able to detect fundamental image features from image data
- Are able to apply basic 2D and 3D image segmentation methods
- Can solve linear image registration problems

COMPETENCES

- Are able to demonstrate understanding of the concepts, theories and techniques in the area of image analysis and computer vision
- Are able to apply methods on medical image data to extract quantitative and qualitative anatomical and physiological information

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	Image analysis and computer vision
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed

Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Billedbehandling og computer vision (valgfag 2.b.)
Module code	STIST11K2_3
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

METHODS AND MODELS IN CLINICAL INFORMATION SYSTEMS (ELECTIVE 2.C.)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Elective 1.c The semantics of clinical information systems is recommended

IT-System development on bachelor level

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Have knowledge of different types of methods for Information System development (i.e., agile development)
- Understand health care system architectures based on message communication and networks
- Have knowledge on alternative types of architectural models with specific focus on models and system integration applied in health care
- Understand different types of databases and the design of relational databases (including local, distributed, heterogeneous or homogenous databases)
- Have knowledge of security, privacy and legislation in health care affecting information system development
- Understand performance in clinical information systems

SKILLS

- Can apply appropriate methods in information system development
- Can select appropriate architecture for a given context
- Can analyse performance issues arising from chosen architectures, databases, and security in health care
- Can design a relational database based on a given context and be able to generate queries

COMPETENCES

- Can evaluate the most appropriate methods and models to design an information system in a given health context

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	Methods and models in clinical information systems
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the _programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Metoder og modeller i kliniske informationssystemer (valgfag 2.c.)
Module code	STIST11K2_4
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

REHABILITATION AND ASSISTIVE TECHNOLOGY (ELECTIVE 2.D.)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

Elective 1.d Sensory-motor control is recommended

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

- Know how disease in the sensorimotor system affects normal movement patterns and other functions of vital importance
- Know the effect of aging on the human body (cognitive and sensorimotor aspects)
- Know how mental diseases related to aging or injury influence the functionality of the sensory-motor system
- Know ergonomics and rehabilitation in relation to the optimization of human performance and for the prevention/rehabilitation of neuro-musculoskeletal injuries and diseases
- Know existing devices and methods for rehabilitation and aid, e.g. functional electrical stimulation, robots, computer technologies (e.g. biofeedback, virtual reality, augmented reality), smart house technologies, tele-rehabilitation technologies, sensory rehabilitation technologies for hearing and vision
- Know cognitive rehabilitation technologies, e.g. rehabilitation of dementia, neglect related to apoplexy, aids for communication
- Know technologies for communication between the patient and equipment/tools/surroundings, this includes brain-, tongue-, and eye-computer interfaces
- Know the integration of assistive technologies in homes/institutions
- Know ethical aspects in relation to assistive technologies

SKILLS

- Are able to apply knowledge about the functional effects of diseases for the choice of optimal rehabilitation and assistive technologies
- Are able to apply knowledge about the effects of aging/injury in order to identify relevant assistive technologies

COMPETENCES

- Are able to evaluate ergonomics and rehabilitation perspectives using relevant technologies
- Are able to evaluate the potential of (new) technologies for their relevance as rehabilitation and assistive devices
- Are able to advice people in the health care systems about possibilities in rehabilitation and assistive technologies

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	Rehabilitation and Assistive Technology

Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination
Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Rehabilitering og velfærdsteknologi (valgfag 2.d.)
Module code	STIST11K2_5
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine

PHYSIOLOGIC MODELING (ELECTIVE 2.E.)

2020/2021

PREREQUISITE/RECOMMENDED PREREQUISITE FOR PARTICIPATION IN THE MODULE

None.

CONTENT, PROGRESS AND PEDAGOGY OF THE MODULE

LEARNING OBJECTIVES

KNOWLEDGE

Students who complete the module:

have knowledge about

- bioelectric models
- biochemical models
- biomechanical models

with the course both highlighting the similarity of mathematical representation across these type of models, and exemplifying these models with examples from various physiologic subsystems and therapeutic interventions including pharmacokinetics

SKILLS

have obtained skills in relation to model construction, simulation, fitting and validation which includes:

- building of compartmental models
- a basic understanding of other model types including finite element modeling.
- parameter estimation and numerical optimization
- identifiability and the appropriateness of model complexity.
- evaluating the goodness of model fitting – model fitting statistics

COMPETENCES

- are able to integrate skills and knowledge from different scientific fields

TYPE OF INSTRUCTION

Lectures and exercises.

EXAM

EXAMS

Name of exam	Physiologic modeling
Type of exam	Written or oral exam
ECTS	5
Assessment	Passed/Not Passed
Type of grading	Internal examination

Criteria of assessment	The criteria of assessment are stated in the Examination Policies and Procedures

ADDITIONAL INFORMATION

Please contact the _programme student counsellors if you consider applying to the education and you have questions.

Please consult the Moodle page for your semester and contact the semester coordinator if you have academic questions, or the study secretary if you have administrative questions.

All other enquiries may be directed to Malene Møller Knudsen, secretary of the Study Board.

FACTS ABOUT THE MODULE

Danish title	Fysiologisk modellering (valgfag 2.e.)
Module code	STIST11K2_6
Module type	Course
Duration	1 semester
Semester	Spring
ECTS	5
Language of instruction	Danish and English
Empty-place Scheme	Yes
Location of the lecture	Campus Aalborg
Responsible for the module	Berit Lund Sørensen

ORGANISATION

Study Board	Board of studies of Sports Science and Public Health
Department	Department of Health Science and Technology
Faculty	The Faculty of Medicine