



# Course catalogue for doctoral education

## HT23

# Human biology or pathology \* General science courses

- 2348** Functional Fluorescence Microscopy Imaging (fFMI) in Biomedical Research 2023-11-13 -- 2023-11-24 (English)
- 2416** Causal Inference for Epidemiological Research 2023-11-20 -- 2023-11-24 (English)
- 2463** Career Skills for Scientists 2023-08-29 -- 2023-10-19 (English)
- 2522** Mass spectrometry-based proteomics: When and How. 2023-11-06 -- 2023-11-17 (English)
- 2561** Writing Science and Information Literacy \* 2023-10-30 -- 2023-12-08 (English)
- 2601** Epigenetics and its Applications in Clinical Research 2023-10-23 -- 2023-10-27 (English)
- 2609** Basic Course in Medical Statistics - a distance course \* 2023-09-25 -- 2023-10-06 (English)
- 2609** Basic Course in Medical Statistics - a distance course \* 2023-12-04 -- 2023-12-15 (English)
- 2618** Write Your Research Results and Get Them Published \* 2023-08-21 -- 2023-09-01 (English)
- 2618** Write Your Research Results and Get Them Published \* 2023-09-25 -- 2023-10-06 (English)
- 2618** Write Your Research Results and Get Them Published \* 2023-10-23 -- 2023-11-03 (English)
- 2618** Write Your Research Results and Get Them Published \* 2023-11-27 -- 2023-12-08 (English)
- 2624** Brain Circuits 2023-10-02 -- 2023-10-06 (English)
- 2630** Neurodegenerative Disorders II - Cellular and Molecular Mechanisms 2023-10-23 -- 2023-10-27 (English)
- 2644** Human Physiology - an overview # 2023-09-18 -- 2023-09-29 (English)
- 2670** From What to How; Contemporary Narrative Methodology in Health Care Research 2023-11-06 -- 2024-01-19 (English)
- 2674** Practical approaches to qualitative research - based on blended learning 2023-08-21 -- 2023-11-13 (English)
- 2688** Multi-Disciplinary Perspectives on Active Ageing Research 2023-10-02 -- 2023-12-01 (English)
- 2690** Basic Laboratory Safety \* 2023-09-18 -- 2023-09-29 (English)
- 2690** Basic Laboratory Safety \* 2023-12-04 -- 2023-12-15 (English)
- 2738** Intermediate Medical Statistics: Regression Models \* 2023-10-16 -- 2023-10-27 (English)
- 2780** The developing brain 2023-10-16 -- 2023-10-20 (English)
- 2787** Present Your Research! \* 2023-09-04 -- 2023-09-08 (English)
- 2787** Present Your Research! \* 2023-10-09 -- 2023-10-13 (English)
- 2787** Present Your Research! \* 2023-11-13 -- 2023-11-17 (English)
- 2787** Present Your Research! \* 2023-12-11 -- 2023-12-15 (English)
- 2798** Applied longitudinal data analysis 2023-11-29 -- 2023-12-06 (English)
- 2868** Advanced Course in SAS Programming for Health Care Data 2023-11-27 -- 2023-12-01 (English)
- 2893** Design and Analysis of Twin and Family-Based Studies 2023-10-16 -- 2023-10-20 (English)
- 2953** Statistics with R - from Data to Publication Figure 2023-10-16 -- 2023-11-03 (English)
- 2963** Open science and reproducible research 2023-09-18 -- 2023-09-29 (English)
- 2964** Medical Research Ethics \* 2023-09-25 -- 2023-09-29 (English)
- 2964** Medical Research Ethics \* 2023-10-23 -- 2023-10-27 (English)
- 2964** Medical Research Ethics \* 2023-11-20 -- 2023-11-24 (English)
- 2968** Methods for Life Course Epidemiology 2023-09-11 -- 2023-09-15 (English)
- 2971** Introduction to R - Data Management, Analysis and Graphical Presentation 2023-09-13 -- 2023-10-19 (English)
- 2980** Study Design in Clinical Research 2023-11-06 -- 2023-11-23 (English)
- 2981** Rare Disease Genomics 2023-10-23 -- 2023-10-27 (English)
- 2992** Biostatistics III: Survival analysis for epidemiologists \* 2023-11-06 -- 2023-11-15 (English)
- 2996** Anaesthesia, Analgesia and Surgery (mice and rats) 2023-10-24 -- 2023-11-02 (English)
- 3024** Advanced Cancer Biology 2023-08-29 -- 2023-12-19 (English)
- 3028** Grundkurs i SPSS 2023-09-25 -- 2023-09-29 (Swedish)
- 3037** Exploring Entrepreneurial Opportunities in Research 2023-09-18 -- 2023-11-17 (English)
- 3049** Cellular Signalling 2023-10-16 -- 2023-10-20 (English)
- 3072** Tissue-Specific Immunology 2023-11-13 -- 2023-11-17 (English)
- 3073** Philosophy of science and the concept of health \* 2023-10-16 -- 2023-10-27 (English)
- 3076** Cancer Cell Metabolism 2023-11-27 -- 2023-12-01 (English)
- 3077** An Introduction to Genetic and Molecular Epidemiology 2023-10-02 -- 2023-10-11 (English)
- 3080** Gene Regulation in the Early Human Embryo 2023-09-25 -- 2023-09-29 (English)
- 3081** Medical developmental biology 2023-08-21 -- 2023-09-06 (English)
- 3089** Cryobiology in assisted reproductive technology 2023-11-27 -- 2023-12-01 (English)
- 3102** Omics Data Analysis: From Quantitative Data to Biological Information 2023-11-20 -- 2023-12-01 (English)
- 3107** CNS Injuries and Repair 2023-09-07 -- 2023-09-15 (English)
- 3109** Pathology # 2023-10-09 -- 2023-10-20 (English)
- 3110** Tumor Immunology and Immune Therapy of Cancer 2023-11-13 -- 2023-11-17 (English)
- 3112** Basic Course in Tumor Biology and Oncology 2023-09-25 -- 2023-10-06 (English)
- 3114** Molecular Immunology 2023-10-02 -- 2023-10-13 (English)
- 3118** Forskningsetik \* 2023-08-29 -- 2023-09-19 (Swedish)
- 3120** Flow cytometry: from theory to application 2023-10-09 -- 2023-10-13 (English)
- 3121** Experimental techniques in study of metabolic and endocrine disorders 2023-10-09 -- 2023-10-13 (English)
- 3127** Human Cell Culture. Methods and Applications 2023-10-02 -- 2023-10-06 (English)
- 3128** Epidemiology I: Introduction to epidemiology 2023-11-06 -- 2023-11-15 (English)
- 3134** Basic Course in Medical Statistics \* 2023-11-13 -- 2023-11-24 (English)
- 3138** Epidemiology II. Design of Epidemiological Studies 2023-12-07 -- 2023-12-15 (English)

- 3150** Embryology I 2023-11-06 -- 2023-11-10 (English)  
**3157** Mechanisms of Gene Regulation in Metabolism 2023-10-16 -- 2023-10-20 (English)  
**3175** Extracellular Vesicles: Progress Towards Diagnostics and Therapy 2023-10-16 -- 2023-10-20 (English)  
**3187** Basic Immunology 2023-09-04 -- 2023-09-29 (English)  
**3200** Clinical and Experimental Neuroimmunology 2023-10-16 -- 2023-10-20 (English)  
**3214** Function B - to Design Procedures and Projects Involving Research Animals 2023-11-07 -- 2023-12-14 (English)  
**3218** Gene and Cell Therapy Product (ATMP) Drug Development 2023-11-27 -- 2023-12-01 (English)  
**3220** Basic Human Neuroscience # 2023-11-27 -- 2024-01-12 (English)  
**5223** Artificial Intelligence and Machine Learning for Biomedical and Clinical Research 2023-10-02 -- 2023-10-13 (English)  
**5227** Advanced Scientific Writing \* 2023-09-11 -- 2023-09-15 (English)  
**5231** Advanced presentation techniques: Oral Presentation of Own Research \* 2023-11-20 -- 2023-11-24 (English)  
**5232** Tumor Microenvironment 2023-10-09 -- 2023-10-13 (English)  
**5234** Clinical and Molecular Parasitology and Mycology 2023-09-25 -- 2023-09-29 (English)  
**5237** Human Viral Diseases: Mechanisms and Pathogenesis 2023-10-16 -- 2023-10-20 (English)  
**5249** Implementation Science – Implementation Leadership in Healthcare and Social Services 2023-09-20 -- 2023-12-10 (English)  
**5253** Human Physiology - distance course # 2023-11-20 -- 2023-12-01 (English)  
**5274** Introductory Course in Clinical Studies: From Idea to Archiving \* 2023-10-02 -- 2023-10-06 (English)  
**5294** Health Science and Implementation: Conceptual Foundations 2023-09-13 -- 2023-09-21 (English)  
**5300** Get started with R – Programming Basics, Data Analysis and Visualisation 2023-08-21 -- 2023-09-04 (English)  
**5301** Methods for Design and Formative Evaluation of eHealth Interventions 2023-11-06 -- 2023-12-01 (English)  
**5302** Information Literacy, Philosophy of Science and Research Ethics \* 2023-11-06 -- 2023-11-17 (English)  
**5307** Clinical Trials in Heart Failure Research 2023-11-16 -- 2023-11-21 (English)  
**5309** Cancer and Cancer Stem Cells 2023-10-02 -- 2023-10-06 (English)  
**5310** Diabetes and Cardiovascular Disease 2023-10-16 -- 2023-10-20 (English)  
**5314** Biostatistics II: Logistic Regression for Epidemiologists \* 2023-09-25 -- 2023-09-29 (English)  
**5315** Fundamentals of Stata Language 2023-09-11 -- 2023-09-15 (English)  
**5318** Sex and Gender Perspectives in Biomedical Research 2023-10-23 -- 2023-10-27 (English)  
**5320** Global Mental Health 2023-09-04 -- 2023-09-29 (English)  
**5522** Imaging in Neuroscience: with a Focus on Functional Magnetic Resonance Imaging Methods 2023-09-26 -- 2023-11-14 (English)  
**5541** Overview Course in Cancer Drug Discovery 2023-10-16 -- 2023-10-20 (English)  
**5546** Research for Societal Impact 2023-11-06 -- 2023-11-10 (English)  
**5555** Methods for Systematic Review, from Idea to Project Plan 2023-08-28 -- 2023-10-27 (English)  
**5558** Teaching and Learning in Higher Education: An Online Doctoral Course \* 2023-09-04 -- 2023-12-01 (English)  
**5560** Vascular Cell Biology 2023-09-25 -- 2023-10-06 (English)  
**5562** Stem Cells and Organoids Models with Focus on Regenerative Medicine 2023-10-16 -- 2023-10-20 (English)  
**5572** Neurodegenerative Disorders I: Genes, Mechanisms and Clinical Aspects 2023-09-25 -- 2023-09-29 (English)  
**5573** Functional Cognitive Neuroanatomy 2023-10-09 -- 2023-10-13 (English)  
**5580** Quality Assurance of Clinical Research \* 2023-09-04 -- 2023-09-29 (English)  
**5580** Quality Assurance of Clinical Research \* 2023-10-09 -- 2023-11-03 (English)  
**5633** Bioinformatics Analysis and Visualisation of Medical Genomics Data \* 2023-10-04 -- 2023-10-17 (English)  
**5638** Single Case Design (SCD) in Clinical Research and Data Driven Decision Processes for Individualized Health Care 2023-10-02 -- 2023-10-13 (English)  
**5675** Bioengineering for Planetary Health 2023-08-14 -- 2023-08-18 (English)  
**5676** Psychological models of Psilocybin Drug Administration 2023-09-06 -- 2023-10-06 (English)  
**5677** The Interplay Between Neuro-Infections and Neurodegenerative Diseases 2023-09-18 -- 2023-09-29 (English)  
**5678** Current Clinical Applications of Epigenetics in Cardiometabolic Diseases 2023-11-06 -- 2023-11-10 (English)  
**5680** Clinical Oncology for Basic Scientists - A Tailored Clinical Course for Researchers without Clinical Background 2023-08-01 -- 2023-12-31 (English)  
**5684** Sensory Perception in Clinical Practice and Research 2023-12-11 -- 2023-12-15 (English)  
**5685** Introduction to Image Processing using MATLAB: with a Focus on Neuroscience 2023-08-30 -- 2023-09-27 (English)  
**5686** Mastering R - Advanced Data Science and Statistical Analysis 2023-11-20 -- 2023-12-10 (English)  
**5688** Societal and Life-course Perspectives on Inequalities in Aging 2023-09-25 -- 2023-10-20 (English)  
**5690** Age, Ageing and Cardiovascular Health 2023-10-09 -- 2023-10-13 (English)  
**5693** Inequalities in Health – Mechanisms and Measurement 2023-11-20 -- 2023-12-13 (English)  
**5694** Multivariate Prediction Models, Machine Learning and AI with Applications in Precision Medicine 2023-11-13 -- 2023-11-17 (English)  
**5695** Basic Pharmacoepidemiology and Critical Review of Pharmacoepidemiological Scientific Literature In a Global Context 2023-09-25 -- 2023-10-06 (English)  
**5696** Researching the Human Gastrointestinal Tract, Liver and Pancreas – An Overview 2023-11-20 -- 2023-11-24 (English)  
**5697** Network Neuroscience 2023-10-02 -- 2023-10-26 (English)

# Title : Functional Fluorescence Microscopy Imaging (fFMI) in Biomedical Research

**Course number :** 2348

**Credits :** 3.0

**Date :** 2023-11-13 -- 2023-11-24

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :**

**Purpose of the course :** This course is a basic course on advanced fluorescence microscopy imaging and correlation spectroscopy techniques for quantitative characterization of molecular transport and interactions in live cells. The purpose of the course is to give an introduction of the underlying physicochemical principles, hands-on training and an overview of applications of these specialized techniques in biomedical research. At the end of the course, the student will have hands-on experience with live-cell imaging and specialized fluorescence microscopy and correlation spectroscopy techniques. The course is suitable for doctoral students lacking training in mathematics, physics, or optical engineering who want to apply these techniques in their research.

**Intended learning outcomes :** The participant who has successfully finalized all moments of the course is expected to be able to: 1. Use fundamental aspects of molecular structure to describe light-matter interactions and the emission of fluorescence; use this knowledge to discuss fluorescent properties of a fluorophore. 2. Understand the buildup of fluorescence imaging instrumentation, identify different optical elements and describe their function. 3. Describe the theoretical background behind specialized fluorescence based methodologies for studying molecular interactions in live cells. Discuss pros and cons in relation to the biological problem studied. 4. Specify instrumental requirements and design a fluorescence imaging assay for a biological problem of interest. 5. Apply a specific labeling strategy and perform a fluorescence imaging assay. 6. Communicate the results in written and oral form. 7. Discuss the adequateness of the methodology used in the scientific literature concerned.

**Contents of the course :** Fluorescence microscopy and associated techniques are indispensable research tools for investigating molecular mechanisms of biological processes. Versatility of fluorescence microscopy based techniques comes from the possibility to characterize fluorescence emission by spatial position, intensity, wavelength, lifetime and polarization. In addition, fluorescence microscopy and correlation spectroscopy based techniques allow us to quantitatively study the cellular dynamics of molecules and the kinetics of their interaction with high spatio-temporal resolution and ultimate, single-molecule sensitivity. These techniques bring new biological insight at an unprecedented rate and are of crucial importance for the development of life sciences. The course covers the following topics: Luminescence and the nature of light (Fluorescence, Phosphorescence, Light scattering); Fluorescent markers and their photo-physical properties (Organic fluorescent dyes for covalent conjugation (Rhodamine 6G, Alexa dyes, Cyanine dyes); Quantum dots; Intrinsically Fluorescent Proteins (Aequorea victoria (GFP, YFP), Discosoma coral (DsRFP) and Montipora (Keima) families); Selectively binding dyes (DiI, DraQ 5)). Instrumentation for Confocal Laser Scanning Microscopy (CLSM): Light sources, Optical Elements, Objectives, Detectors, Read-out devices; Quantization and Sensitivity in fluorescence imaging (Instrumental sensitivity, Method sensitivity, Absolute sensitivity); Factors affecting quantitative accuracy. Point Spread Function; Spatially resolved fluorescence imaging: Multi-photon excitation, Total Internal Reflection Fluorescence (TIRF) Microscopy, Single Plane Illumination Microscopy (SPIM), Super-resolution techniques (STORM, PALM and STED). Fluorescence based methods for studying molecular diffusion and interactions in live cells (FRAP, FRET, FLIM, FCS, FCCS, ICS). Image analysis techniques for quantitative characterization of cell phenotypes (CellProfiler).

**Teaching and learning activities :** The course includes lectures, laboratory training, demonstrations, discussion sessions, quizzes for self-testing and short written assignments.

**Examination :** The final assignment consists of a project report (5-10 pages presentation in PowerPoint) and an oral presentation of the project report (10 min + 5 min for Q & A).

**Compulsory elements :** All sessions are compulsory. Please report any absence to the course organizers in advance by e-mail. Absence from any part of the course (lectures, laboratory sessions, discussion sessions and exam) is generally not accepted but could in special cases be compensated by an individually tailored additional module and a special written examination organized by the course committee.

**Number of students :** 8 - 12

**Selection of students :** Selection will be based on: 1. The relevance of the course syllabus for the applicant's doctoral project (according to written motivation); 2. Date for registration as a doctoral student (priority given to earlier registration date).

**More information :** This is a two-week course with 10 sessions that include: lectures, laboratory practice, hands-on training, written assignments, discussions, and time for self-study. The first week focuses on underlying physicochemical principles, instrumentation and hands-on training at the microscope. During this week, specialized techniques are introduced and the details are discussed in the context of a broader body of available techniques. The second week is dedicated to expert lectures on advanced applications and hands-on image analysis. The last session is reserved for assessment. Experimental exercises are carried out in the laboratory for Functional Fluorescence Microscopy Imaging (fFMI) at the Center for Molecular Medicine (CMM), Solna, L8:01, 056. Lectures are conducted in the seminar room at the Center for Molecular Medicine (CMM), Solna, L8:01, 021.

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**Course responsible :**

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## Title : Causal Inference for Epidemiological Research

**Course number :** 2416

**Credits :** 1.5

**Date :** 2023-11-20 -- 2023-11-24

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medical Epidemiology and Biostatistics

**Specific entry requirements :** The students are expected to have taken Epidemiology I, Epidemiology II, Biostatistics I, and Biostatistics II. Exceptions can be made if the students have taken other courses with an equivalent content.

**Purpose of the course :** This course aims to present causal theory and introduces how concepts and methods can be understood within a general methodological framework.

**Intended learning outcomes :** After the course the student will: - be able to use counterfactuals to express and interpret causal queries - be able to judge when standard statistical methodology is appropriate for causal inference, and when it is not - be able to use Directed Acyclic Graphs to describe and analyze complex epidemiological scenarios - be able to use Instrumental Variables to analyze observational data, with additional help from a skilled statistician

**Contents of the course :** Causal inference from observational data is a key task of biostatistics and of allied sciences such as sociology, education, behavioral sciences, demography, economics, health services research, etc. These disciplines share a methodological framework for causal inference that has been developed over the last decades. This course presents this unifying causal theory and shows how biostatistical concepts and methods can be understood within this general framework. The course emphasizes conceptualization but also introduces statistical models and methods for causal inference. Specifically, this course strives to a) formally define causal concepts such as causal effect and confounding, b) identify the conditions required to estimate causal effects, and c) use analytical methods that, under those conditions, provide estimates that can be endowed with a causal interpretation. The (causal) methods can be used under less restrictive conditions than the traditional statistical methods. For example, Instrumental Variable methods allow one to estimate the causal effect of an exposure in the presence of unmeasured confounders of the exposure and outcome.

**Teaching and learning activities :** Lectures and group discussions.

**Examination :** There will be a take-home exam handed out at the last day of the course. Students who fail will be given the opportunity to write at a maximum 2 re-exams. Dates for the re-exams will be announced later.

**Compulsory elements :**

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** The course will be held at campus KI.

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### Course responsible :

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### Contact person :

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## Title : Career Skills for Scientists

**Course number :** 2463

**Credits :** 1.5

**Date :** 2023-08-29 -- 2023-10-19

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** This course prepares PhD students for life after the dissertation. You start to explore your transferable skills and how to communicate them. You learn about yourself and the many career paths for PhDs. The course also allows you to expand your contacts and network. This course encourages you to explore your interests, talents, and skills.

**Intended learning outcomes :** After the course, the participants should be able to: - discuss career options and pathways in academic and non-academic settings, covering different organisations in the private and public sectors, - identify transferable skills achieved during doctoral training and explain the value of these skills within and outside academia, - apply what they have learned in the course to communicate their skills in different forms and situations.

**Contents of the course :** The course sessions cover the exploration of your skills and interests and illustrate different academic and non-academic career paths. You will also get information about finding postdoc positions and preparing your CV. Throughout the course, you will get many chances to practice your "networking" through interaction with different presenters and through the course assignment.

**Teaching and learning activities :** The course is planned to take place in person. The course is split up into different sessions, given over five weeks, plus one week of final presentations. The course demands active participation and reflection from the participants. The course will be highly interactive and will consist of lectures and discussions. As part of an individual assignment, you will reach out to and interview two persons: one person working in academia and another person working in a non-academic role.

**Examination :** The examination consists of two parts: Part one - Report about the individual assignment including regarding the two interviews. Part two - Oral presentation of the reflection on the learning experience, including expectations, outcomes, and future application.

**Compulsory elements :** An absence can be compensated with an extra individual assignment. The student needs to reach out and interview a third person working in academia or working in a non-academic role.

**Number of students :** 30 - 40

**Selection of students :** Five spots are reserved for KI postdocs applying for the course. Selection will be based on 1) Time left to defence/postdoc period: priority given to those who have less time left (as long as the defence is after the end of the course). State your expected end date in your motivation. 2) Written motivation. This course has many applicants and limited spots, please only apply if you are sure you want to take the course and will make time for it.

**More information :** The course runs over 8 weeks and is built up as follows: A) August 29th – October 16th: 10 sessions (in-person) in total (five weeks). The time of the course is from 10.00-12.00 every Tue and Thu, including private study (total +- 6h/week). B) October 3rd – October 12th: 2 weeks of individual exam prep (total +- 4h/week) + optional internship info sessions. C) October 17th – October 19th: 1 week of exam presentations in smaller groups (+- 2h). A more detailed schedule will be available to course participants on the course web. For questions about the course content, contact Y. Vladimir Pabón-Martínez (vladimir.pabonmartinez@ki.se). For practical questions about your application, contact Liisa (liisa.olsson@ki.se).

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### Course responsible :

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### Contact person :

Vladimir Pabón-Martínez

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## Title : Mass spectrometry-based proteomics: When and How.

**Course number :** 2522

**Credits :** 3.0

**Date :** 2023-11-06 -- 2023-11-17

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Oncology-Pathology

**Specific entry requirements :**

**Purpose of the course :** The aim of this course is to give an overview of mass spectrometry based proteomics for researchers who would like to be able to apply these techniques in their own research.

**Intended learning outcomes :** After completed the course, the student will be able to -Define and apply common proteomics terminology -Recognize the principles of the most common proteomics techniques -Understand the mass spectrometry based proteomics workflow: Experimental design, sample preparation and selection of techniques -Understand proteomics to such an extent that he/she will be able to utilize proteomics core facilities or collaborate with proteomics researchers. -Evaluate the quality of protein and peptide identifications. -Demonstrate how modern proteomics is applied to clinical research and to evaluate when proteomics research could be beneficial to incorporate in research projects. -Design their own research project by mass spectrometry based proteomics.

**Contents of the course :** Lectures and workshops on -Overview of proteomics -The proteomics workflow -Basic of separation sciences: Protein and peptides -Introduction to Mass spectrometry -Experimental design -Sample preparation, immunoprecipitation and enrichment strategy -Quantitative and qualitative proteomics by mass spectrometry -Global and targeted proteomics -Human protein atlas and Biological validation -Clinical applications A practical laboratory exercise using mass spectrometry based proteomics This course is focusing on proteomics technologies and applications, for proteomics data analysis we recommend our KI doctoral course "'Omics data analysis: From quantitative data to biological information''"

**Teaching and learning activities :** The course contains lectures, seminars, and a practical laboratory exercise using proteomics techniques. The students will plan their own project as a case study as well make an oral laboratory report.

**Examination :** -Students shall describe a proteomics project (beneficially related to their research) including different aspects from the proteomics workflow. This is handed in as a written exam. -The students shall perform an oral laboratory report

**Compulsory elements :** -Attendance at lectures and the practical laboratory exercise. -Attendance at examination seminar and hand in the written examination assignment. -Extra written assignments can be used to compensate absence. The students are recommended to read literatures listed below in advance of the course.

**Number of students :** 12 - 24

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will take place at SciLifeLab and Widerströmska, Karolinska Institutet campus Solna. It is full time, usually between 9 and 16. Required time that students need to be present for lectures and labs will change depending on the activity. This course is included in the doctoral programmes Allergy, immunology and inflammation (Aii) and Biology of Infections and Global Health Programme (BIGH).

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### Course responsible :

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## Title : Writing Science and Information Literacy

**Course number :** 2561

**Credits :** 3.0

**Date :** 2023-10-30 -- 2023-12-08

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Karolinska Institutet University Library

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is to develop the medical scientific writing and information literacy skills of the participant.

**Intended learning outcomes :** After this course, you will be able to demonstrate: -an understanding of how to write an original scientific article and submit it for publication -an understanding of the publication process, including how to use relevant resources to choose a journal in which to publish your research -an ability to write other types of texts required for a scientific career, such as grant applications and popular science texts -an ability to give, take and make use of constructive criticism -an ability to search and manage the medical science literature in a structured way.

**Contents of the course :** Writing an original scientific article, grant applications and popular science texts; searching and managing the literature; and understanding the publication process, including using relevant resources to choose a journal and navigate peer review.

**Teaching and learning activities :** This online course will take place in the learning platform Canvas. Content will be taught using various learning objects, from film to group exercises. Formative feedback will be implemented by teachers, peers and via self-assessment.

**Examination :** The intended learning outcomes are assessed in the summative examination. Participants will write and rewrite a grant application and popular science summary based on teacher and peer feedback. Participants will also complete a number of assignments throughout the course which will aid their ability to search and manage the literature effectively, as well as choose a journal for publication.

**Compulsory elements :** There will be a number of obligatory assignments and assessments to be completed.

**Number of students :** 12 - 22

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This course takes place online via Canvas. While much of the course material may be studied at the participant's own pace, there are five live class sessions which will be held via Zoom. All live sessions take place on Monday mornings. Exact dates and times are as follows: Course Introduction, Oct 30, 10-12 CET Writing in the Sciences Discussion Seminar, Nov 6, 10-12 CET Searching Strategically: Tips and Tricks, Nov 13, 10-11 CET Publication Process Discussion Seminar, Nov 27, 10.30-12 CET Peer Review, Dec 4, 10.30-15.30 CET Participants are encouraged to attend all live sessions. Attendance on Oct 30 and Dec 4 is obligatory. In addition, there are a series of deadlines throughout the course that must be met. Deadlines are as follows: Nov 7, Nov 13, Nov 17, Nov 23, Nov 29 and Dec 8.

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### Course responsible :

Anna Borgström

Karolinska Institutet University Library

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### Contact person :

Jenny Siméus

Karolinska Institutet universitetsbibliotek

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# Title : Epigenetics and its Applications in Clinical Research

**Course number :** 2601

**Credits :** 1.5

**Date :** 2023-10-23 -- 2023-10-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :** -

**Purpose of the course :** The purpose of the course is to give doctoral students a basic understanding of the epigenetic mechanisms and their role in the etiology of common complex diseases. Through examples of cutting edge technologies and their applications in studying complex diseases such as cancer and chronic inflammation, students will be encouraged to think about translation of epigenetic principles and approaches into novel clinical applications. The course will also help students to practice key academic skills such as asking questions, forming hypothesis and designing experiments, and conducting assessment and providing constructive feedback.

**Intended learning outcomes :** After this course the student should be able to: (i) describe the basic epigenetic mechanisms (DNA methylation, histone modifications and non-coding RNAs) and explain how they regulate gene expression, (ii) describe selected methodology used in epigenetic research, compare methods and discuss their advantages and limitations, (iii) evaluate and interpret new findings and recent scientific papers in the field, (iv) speculate on epigenetic mechanisms underlying health and disease, and (v) hypothesize on applications of epigenetic research in prediction, prevention and therapy of common diseases.

**Contents of the course :** The first part of the course includes an overview of basic epigenetic mechanisms (DNA methylation, histone modifications, non-coding RNAs and chromatin organization). The course also covers the main methodology used to study epigenetics (such as methods used to detect and quantify DNA methylation, chromatin immunoprecipitation, next generation sequencing and bioinformatics tools, chromosome conformation capture etc). The second part of the course focuses on key epigenetic mechanisms in cell development, differentiation and disease (cancer, inflammation, metabolic disorders etc). Current applications of epigenetic research in common diseases, and future perspectives will also be discussed.

**Teaching and learning activities :** The course combines traditional lectures, given by internal and international experts in the field, with group discussions and individual assignments performed by the students. Extra time for students' discussions with international speakers will be allocated. The individual assignments will consist of presenting and discussing potential applications of epigenetics in the students' own research questions and projects.

**Examination :** Examination will be based on a successful completion of the individual assignments which will consist of presenting and discussing potential applications of epigenetics in the students' own research questions and projects. The students are expected to present scientifically-sound motivation for their application and to provide a constructive feedback to their peers.

**Compulsory elements :** All lectures, individual assignments and evaluations are compulsory. Compensation for absence in the form of an essay with oral presentation can be discussed with the course directors.

**Number of students :** 10 - 30

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** DATE AND TIME: 23rd-27th of October 2023 (Monday-Friday), 9:00-17:00. LOCATION: Center for Molecular Medicine (CMM), Lecture Hall (at floor 0), Solna (Building L8), Karolinska University Hospital. LAST OCCASIONS (2017, 2019) speakers included Prof. I. Manuy, Switzerland (transgenerational inheritance); Dr B. Heijmans, The Netherlands (environmentally induced epigenetic changes); Dr A. Göndör, KI (3D chromatin organization); Prof S. Lehmann, KI (epigenetics in cancer and treatment); Dr A. Pivarsci and Dr. N. Xu Landen, KI (non-coding RNAs); S. Bartel, The Netherlands (engineering the epigenome); Dr. Å. Johansson, Uppsala University (environmentally induced epigenetic changes); Prof. F. Castelo-Branco, KI (histone modifications); Prof. M. Jagodic (Causality of epigenetic changes); Dr. L. Kular (DNA methylation and hydroxymethylation methods); Dr. I. Gutierrez Perez, KI (ChIP-seq & ATAC-seq); Dr. A Galvao, KI (single-cell approaches to epigenetics); Dr. F Marabita, KI (Project design & bioinformatics analysis).

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## Course responsible :

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## Title : Basic Course in Medical Statistics - a distance course

**Course number :** 2609

**Credits :** 3.0

**Date :** 2023-09-25 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is to introduce the basic statistical methods and the fundamental principles of statistical inference and to offer basic skills that involve hands-on data analysis using statistical software.

**Intended learning outcomes :** The course participants shall after the course be able to: 1) perform and interpret basic descriptive statistics from frequency tables and graphical presentations, 2) perform and interpret results from basic inferential statistical analysis and tests, 3) recognize and critically examine the statistics being presented in articles within the field of medical research.

**Contents of the course :** Concepts being treated are descriptive vs inferential statistics, collection of data and study design, different types of data and level of measurement, independent and dependent samples, correlation and regression, hypothesis testing and different type of statistical errors in relation to the testing and data collection procedure. The major topics for the course are t-test, chi-square test, nonparametric test and regression analysis, and how to evaluate the assumptions for the different techniques.

**Teaching and learning activities :** The course is an online distance course. On the first day of the course there will be an introduction via Zoom. The teaching and learning methods include video lectures, self-study, individual self-assessment tests, computer-based application exercises, an individual examination, and statistical software demonstration videos in SPSS and R. Interaction with other participants or teachers will be possible via the discussion forum in Canvas throughout the course. Participants are welcomed to send e-mails to the teacher or attend open office hours on Zoom. There will be mandatory seminars and group discussions via Zoom the last day of the course.

**Examination :** Assessment of the intended learning outcomes by a passing grade on the individual examination. The participants will have to demonstrate their ability to perform, recognize, critically examine and discuss the statistics presented during the seminars.

**Compulsory elements :** The computer-based exercises and the seminars on the last day of the course are mandatory. The course leader assesses whether and if so, how absence can be compensated. The individual examination must be completed to pass the course.

**Number of students :** 35 - 45

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Mandatory attendance via zoom.

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### Course responsible :

Johan Zetterqvist

Department of Learning, Informatics, Management and Ethics

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### Contact person :

Nora Espahbodi

Institutionen för lärande, informatik, management och etik

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## Title : Basic Course in Medical Statistics - a distance course

**Course number :** 2609

**Credits :** 3.0

**Date :** 2023-12-04 -- 2023-12-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is to introduce the basic statistical methods and the fundamental principles of statistical inference and to offer basic skills that involve hands-on data analysis using statistical software.

**Intended learning outcomes :** The course participants shall after the course be able to: 1) perform and interpret basic descriptive statistics from frequency tables and graphical presentations, 2) perform and interpret results from basic inferential statistical analysis and tests, 3) recognize and critically examine the statistics being presented in articles within the field of medical research.

**Contents of the course :** Concepts being treated are descriptive vs inferential statistics, collection of data and study design, different types of data and level of measurement, independent and dependent samples, correlation and regression, hypothesis testing and different type of statistical errors in relation to the testing and data collection procedure. The major topics for the course are t-test, chi-square test, nonparametric test and regression analysis, and how to evaluate the assumptions for the different techniques.

**Teaching and learning activities :** The course is an online distance course. On the first day of the course there will be an introduction via Zoom. The teaching and learning methods include video lectures, self-study, individual self-assessment tests, computer-based application exercises, an individual examination, and statistical software demonstration videos in SPSS and R. Interaction with other participants or teachers will be possible via the discussion forum in Canvas throughout the course. Participants are welcomed to send e-mails to the teacher or attend open office hours on Zoom. There will be mandatory seminars and group discussions via Zoom the last day of the course.

**Examination :** Assessment of the intended learning outcomes by a passing grade on the individual examination. The participants will have to demonstrate their ability to perform, recognize, critically examine and discuss the statistics presented during the seminars.

**Compulsory elements :** The computer-based exercises and the seminars on the last day of the course are mandatory. The course leader assesses whether and if so, how absence can be compensated. The individual examination must be completed to pass the course.

**Number of students :** 35 - 45

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Mandatory attendance via zoom.

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### Course responsible :

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### Contact person :

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## Title : Write Your Research Results and Get Them Published

**Course number :** 2618

**Credits :** 3.0

**Date :** 2023-08-21 -- 2023-09-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :**

**Purpose of the course :** The purpose of this course is to foster excellence in communicating research results by improving the participants' practical and theoretical skills in academic writing.

**Intended learning outcomes :** After attending the course, the doctoral student should be able to: - Explain the characteristics of different genres in academic writing. - Understand the terminology used in scientific writing. - Compose and revise a scientific paper and an abstract, using the correct structure and language, following the editorial requirements of a journal of their choice. - Design and present a scientific poster using basic rhetoric. - Write with good flow and avoid the most common language pitfalls in academic writing. - Identify and communicate the main scope and significance of their research project. - Communicate their research results outside of the research community (public outreach). - Understand the publication process, ethics in publication, and how to respond to reviewers' comments. - Write a project plan and a cover letter. - Search for and organize references using reference management software. - Reflect upon their own learning process.

**Contents of the course :** During the course, the PhD student will produce a short manuscript draft, an abstract, a scientific poster, and a popular science summary. The following topics will be covered: - Terminology in scientific writing - Characteristics of genres in academic writing - English in scientific writing including common pitfalls and "quick fixes" - Effective poster presentations - The main scope and significance of a research project - Popular science summary for public outreach - The publication process, including ethics, responding to reviewers' comments, and cover letter - Project plan - Reference search and management - Review of own and other students' assignments

**Teaching and learning activities :** Lectures, writing exercises, group assignments including giving feedback to colleagues, individual writing, and individual coaching one-on-one with teacher.

**Examination :** 1) Written assignments reflecting the intended learning outcomes of the course: draft for scientific paper, popular science summary, poster, and abstract. All assignments can (but don't have to) be based on own research. 2) Evaluation sessions, where the course participants give each other constructive feedback on the written assignments as a part of the learning process 3) Individual coaching, where all assignments are discussed and revised together with a teacher.

**Compulsory elements :** All parts of the course are mandatory. Absence can be compensated: a) during next course occasion b) by individual assignments c) by watching recorded lectures

**Number of students :** 18 - 22

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) the date for registration as a doctoral student (priority given to LATER registration date).

**More information :** This course occasion will take place online and in-person (please state your preferences, if any). All lectures will be taught in real-time and according to schedule (no pre-recorded lectures, but recorded lectures will be available to make up for absences). <BR> The scope of the course is scientific writing (manuscript, abstract, and poster), and you have the possibility to use your research for the assignments (although it is not a requirement to bring any data) to maximize the learning experience and also to make actual progress in your studies. The course includes manuscript writing, poster design and poster-presentation, cover letter writing, abstract writing, and popular science writing. The popular science part covers the skills needed to successfully write a popular science summary, e.g., for a project plan, grant applications, or your kappa, and is also helpful for oral presentations. <BR> No prior knowledge or experience of scientific writing is required, and you will benefit equally from the course, whether you have published your research before or not. <BR> Please address ALL questions to: [anna.hildenbrand.michelman@ki.se](mailto:anna.hildenbrand.michelman@ki.se) or phone: 070-7890607

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### Course responsible :

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## Title : Write Your Research Results and Get Them Published

**Course number :** 2618

**Credits :** 3.0

**Date :** 2023-09-25 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :**

**Purpose of the course :** The purpose of this course is to foster excellence in communicating research results by improving the participants' practical and theoretical skills in academic writing.

**Intended learning outcomes :** After attending the course, the doctoral student should be able to: - Explain the characteristics of different genres in academic writing. - Understand the terminology used in scientific writing. - Compose and revise a scientific paper and an abstract, using the correct structure and language, following the editorial requirements of a journal of their choice. - Design and present a scientific poster using basic rhetoric. - Write with good flow and avoid the most common language pitfalls in academic writing. - Identify and communicate the main scope and significance of their research project. - Communicate their research results outside of the research community (public outreach). - Understand the publication process, ethics in publication, and how to respond to reviewers' comments. - Write a project plan and a cover letter. - Search for and organize references using reference management software. - Reflect upon their own learning process.

**Contents of the course :** During the course, the PhD student will produce a short manuscript draft, an abstract, a scientific poster, and a popular science summary. The following topics will be covered: - Terminology in scientific writing - Characteristics of genres in academic writing - English in scientific writing including common pitfalls and "quick fixes" - Effective poster presentations - The main scope and significance of a research project - Popular science summary for public outreach - The publication process, including ethics, responding to reviewers' comments, and cover letter - Project plan - Reference search and management - Review of own and other students' assignments

**Teaching and learning activities :** Lectures, writing exercises, group assignments including giving feedback to colleagues, individual writing, and individual coaching one-on-one with teacher.

**Examination :** 1) Written assignments reflecting the intended learning outcomes of the course: draft for scientific paper, popular science summary, poster, and abstract. All assignments can (but don't have to) be based on own research. 2) Evaluation sessions, where the course participants give each other constructive feedback on the written assignments as a part of the learning process 3) Individual coaching, where all assignments are discussed and revised together with a teacher.

**Compulsory elements :** All parts of the course are mandatory. Absence can be compensated: a) during next course occasion b) by individual assignments c) by watching recorded lectures

**Number of students :** 18 - 24

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) the date for registration as a doctoral student (priority given to LATER registration date).

**More information :** This course occasion will take place online and in-person (please state your preferences, if any). All lectures will be taught in real-time and according to schedule (no pre-recorded lectures, but recorded lectures will be available to make up for absences). <BR> The scope of the course is scientific writing (manuscript, abstract, and poster), and you have the possibility to use your research for the assignments (although it is not a requirement to bring any data) to maximize the learning experience and also to make actual progress in your studies. The course includes manuscript writing, poster design and poster-presentation, cover letter writing, abstract writing, and popular science writing. The popular science part covers the skills needed to successfully write a popular science summary, e.g., for a project plan, grant applications, or your kappa, and is also helpful for oral presentations. <BR> No prior knowledge or experience of scientific writing is required, and you will benefit equally from the course, whether you have published your research before or not. <BR> Please address ALL questions to: [anna.hildenbrand.michelman@ki.se](mailto:anna.hildenbrand.michelman@ki.se) or phone: 070-7890607

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## Title : Write Your Research Results and Get Them Published

**Course number :** 2618

**Credits :** 3.0

**Date :** 2023-10-23 -- 2023-11-03

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :**

**Purpose of the course :** The purpose of this course is to foster excellence in communicating research results by improving the participants' practical and theoretical skills in academic writing.

**Intended learning outcomes :** After attending the course, the doctoral student should be able to: - Explain the characteristics of different genres in academic writing. - Understand the terminology used in scientific writing. - Compose and revise a scientific paper and an abstract, using the correct structure and language, following the editorial requirements of a journal of their choice. - Design and present a scientific poster using basic rhetoric. - Write with good flow and avoid the most common language pitfalls in academic writing. - Identify and communicate the main scope and significance of their research project. - Communicate their research results outside of the research community (public outreach). - Understand the publication process, ethics in publication, and how to respond to reviewers' comments. - Write a project plan and a cover letter. - Search for and organize references using reference management software. - Reflect upon their own learning process.

**Contents of the course :** During the course, the PhD student will produce a short manuscript draft, an abstract, a scientific poster, and a popular science summary. The following topics will be covered: - Terminology in scientific writing - Characteristics of genres in academic writing - English in scientific writing including common pitfalls and "quick fixes" - Effective poster presentations - The main scope and significance of a research project - Popular science summary for public outreach - The publication process, including ethics, responding to reviewers' comments, and cover letter - Project plan - Reference search and management - Review of own and other students' assignments

**Teaching and learning activities :** Lectures, writing exercises, group assignments including giving feedback to colleagues, individual writing, and individual coaching one-on-one with teacher.

**Examination :** 1) Written assignments reflecting the intended learning outcomes of the course: draft for scientific paper, popular science summary, poster, and abstract. All assignments can (but don't have to) be based on own research. 2) Evaluation sessions, where the course participants give each other constructive feedback on the written assignments as a part of the learning process 3) Individual coaching, where all assignments are discussed and revised together with a teacher.

**Compulsory elements :** All parts of the course are mandatory. Absence can be compensated: a) during next course occasion b) by individual assignments c) by watching recorded lectures

**Number of students :** 18 - 22

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) the date for registration as a doctoral student (priority given to LATER registration date).

**More information :** This course occasion will take place online and in-person (please state your preferences, if any). All lectures will be taught in real-time and according to schedule (no pre-recorded lectures, but recorded lectures will be available to make up for absences). <BR> The scope of the course is scientific writing (manuscript, abstract, and poster), and you have the possibility to use your research for the assignments (although it is not a requirement to bring any data) to maximize the learning experience and also to make actual progress in your studies. The course includes manuscript writing, poster design and poster-presentation, cover letter writing, abstract writing, and popular science writing. The popular science part covers the skills needed to successfully write a popular science summary, e.g., for a project plan, grant applications, or your kappa, and is also helpful for oral presentations. <BR> No prior knowledge or experience of scientific writing is required, and you will benefit equally from the course, whether you have published your research before or not. <BR> Please address ALL questions to: [anna.hildenbrand.michelman@ki.se](mailto:anna.hildenbrand.michelman@ki.se) or phone: 070-7890607

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## Title : Write Your Research Results and Get Them Published

**Course number :** 2618

**Credits :** 3.0

**Date :** 2023-11-27 -- 2023-12-08

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :**

**Purpose of the course :** The purpose of this course is to foster excellence in communicating research results by improving the participants' practical and theoretical skills in academic writing.

**Intended learning outcomes :** After attending the course, the doctoral student should be able to: - Explain the characteristics of different genres in academic writing. - Understand the terminology used in scientific writing. - Compose and revise a scientific paper and an abstract, using the correct structure and language, following the editorial requirements of a journal of their choice. - Design and present a scientific poster using basic rhetoric. - Write with good flow and avoid the most common language pitfalls in academic writing. - Identify and communicate the main scope and significance of their research project. - Communicate their research results outside of the research community (public outreach). - Understand the publication process, ethics in publication, and how to respond to reviewers' comments. - Write a project plan and a cover letter. - Search for and organize references using reference management software. - Reflect upon their own learning process.

**Contents of the course :** During the course, the PhD student will produce a short manuscript draft, an abstract, a scientific poster, and a popular science summary. The following topics will be covered: - Terminology in scientific writing - Characteristics of genres in academic writing - English in scientific writing including common pitfalls and "quick fixes" - Effective poster presentations - The main scope and significance of a research project - Popular science summary for public outreach - The publication process, including ethics, responding to reviewers' comments, and cover letter - Project plan - Reference search and management - Review of own and other students' assignments

**Teaching and learning activities :** Lectures, writing exercises, group assignments including giving feedback to colleagues, individual writing, and individual coaching one-on-one with teacher.

**Examination :** 1) Written assignments reflecting the intended learning outcomes of the course: draft for scientific paper, popular science summary, poster, and abstract. All assignments can (but don't have to) be based on own research. 2) Evaluation sessions, where the course participants give each other constructive feedback on the written assignments as a part of the learning process 3) Individual coaching, where all assignments are discussed and revised together with a teacher.

**Compulsory elements :** All parts of the course are mandatory. Absence can be compensated: a) during next course occasion b) by individual assignments c) by watching recorded lectures

**Number of students :** 18 - 22

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) the date for registration as a doctoral student (priority given to LATER registration date).

**More information :** This course occasion will take place online and in-person (please state your preferences, if any). All lectures will be taught in real-time and according to schedule (no pre-recorded lectures, but recorded lectures will be available to make up for absences). <BR> The scope of the course is scientific writing (manuscript, abstract, and poster), and you have the possibility to use your research for the assignments (although it is not a requirement to bring any data) to maximize the learning experience and also to make actual progress in your studies. The course includes manuscript writing, poster design and poster-presentation, cover letter writing, abstract writing, and popular science writing. The popular science part covers the skills needed to successfully write a popular science summary, e.g., for a project plan, grant applications, or your kappa, and is also helpful for oral presentations. <BR> No prior knowledge or experience of scientific writing is required, and you will benefit equally from the course, whether you have published your research before or not. <BR> Please address ALL questions to: [anna.hildenbrand.michelman@ki.se](mailto:anna.hildenbrand.michelman@ki.se) or phone: 070-7890607

### Course responsible :

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## Title : Brain Circuits

**Course number :** 2624

**Credits :** 1.5

**Date :** 2023-10-02 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neuroscience

**Specific entry requirements :** Knowledge of neuron function and brain anatomy is required.

**Purpose of the course :** The purpose of the course is to provide doctoral students in the field of neuroscience with an overview of current state-of-the-art approaches, technologies and concepts used for understanding of the brain's circuits and functions in animal models. There is a very strong emphasis on research in mice. All invited speakers have made seminal contributions to how we currently study and understand the brain, and there will be ample opportunities for the students to interact with the speakers, and discuss aspects relevant to their own work.

**Intended learning outcomes :** By the end of the course the student shall be able to: - explain the structure and function of the main brain circuits, - describe the principles for excitatory and inhibitory networks, including receptors and neurotransmitters, as well as the action of different chemical neuromodulators, - describe principles, use and readout of optogenetics and recording technologies, - describe principles and methods to define the structure (neuroanatomy) of brain circuits, - explain how dysfunctions of networks can manifest as neuropsychiatric disorders, - describe animal behavior tests probing specific networks and network functions.

**Contents of the course :** The course will cover the organization and function of main circuits in the brain, including the interaction and participation of different cell types, the interplay between excitation and inhibition, and how circuit output results in behavior. Different techniques for recording, labeling and manipulation of neuronal circuits in animal models will be discussed, including electrophysiology, molecular targeting, optogenetics and viral tracing. The connection between deficient circuit functions and neuropsychiatric disorders will be included, as well as animal behavior tests probing specific circuits and circuit (dys)functions. Specific emphasis will be put into describing the technologies currently used in the neuroscience field.

**Teaching and learning activities :** Lectures by invited experts and group exercises.

**Examination :** The student should in discussions and a seminar presentation demonstrate the ability to critically evaluate original research papers on the topics covered and be able to show that the intended learning outcomes for the course are reached.

**Compulsory elements :** The seminar presentations are obligatory, and so are all lectures. Any absence has to be compensated for in accordance with the instructions of the course director.

**Number of students :** 12 - 24

**Selection of students :** We welcome highly motivated applicants from all areas of neuroscience. Knowledge of neuron function and brain anatomy is required. Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project according to the written motivation in the application, 2) experience of neuroscience research as stated in the written motivation, 3) date for registration as a PhD student (priority given to advanced students).

**More information :** Lectures will be given by international and KI neuroscientists who have made significant contributions to the study of brain and behavior using advanced methods to define the organization and function of circuits. Lectures will cover the development and application of novel technologies (imaging activity, optogenetics, machine learning) with a focus on advances using transgenic rodents. We have a strong emphasis on engaging young neuroscientists and creating a network for future neuroscience leaders. The course will be given at Karolinska Institutet, Campus Solna Time: 9.00-17.00 (Monday to Friday). Updates regarding the course, including confirmed speakers, lecture halls etc will be posted on <https://ki.se/en/neuro/carlenlab>

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### Course responsible :

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### Contact person :

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# Title : Neurodegenerative Disorders II - Cellular and Molecular Mechanisms

**Course number :** 2630

**Credits :** 1.5

**Date :** 2023-10-23 -- 2023-10-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :** The course is a continuation of the course Neurodegenerative disorders I, From molecule to treatment, but it can also be taken as a separate course, provided the participant has in other ways achieved the learning outcomes of that course.

**Purpose of the course :** The purpose of the course is to provide a deeper understanding of neurodegenerative disorders, focusing on molecular mechanisms and techniques used for studying these, as well as treatment strategies.

**Intended learning outcomes :** The student should be able to: - understand and critically evaluate relevant cellular and molecular pathophysiological mechanisms of neurodegenerative disorders such as stroke, Alzheimer disease, frontotemporal dementia, Lewy body disease, Parkinson´s disease, multiple sclerosis, amyotrophic lateral sclerosis, and the mechanisms of current and/or possible future treatments. - understand and perform important methods and assays for studying mechanisms behind neurodegenerative disorders, and discuss the results, taking into account the limitations of the assays. - discuss the present disease models, propose alternative models, and critically evaluate these models from the perspectives of a) clinical picture, b) disease mechanisms, and c) treatment mechanisms.

**Contents of the course :** The course addresses topics in basic and clinical research on neurodegenerative disorders. The focus will be on a deeper understanding of cellular and molecular mechanisms, and the techniques to study them. To this end, the students will learn about some powerful techniques that can be used for studying neurodegeneration, subcellular localization, and elucidation of pathogenic pathways.

**Teaching and learning activities :** The course runs daytime for 1 week full-time with some key lectures by invited scientists, laboratory practicals, and discussions in small groups and the entire class.

**Examination :** Oral examination followed by group discussions on the examination questions, and a general discussion between all participants.

**Compulsory elements :** The student is obliged to attend 80% of the lectures, all laboratory practicals, and the exam (including the group discussion after the exam). Students that are absent from the practicals and/or more than 20% of the lectures will have to submit a written presentation of the subjects missed.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :**

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## Course responsible :

Sophia Schedin Weiss

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## Contact person :

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## Title : Human Physiology - an overview

**Course number :** 2644

**Credits :** 3.0

**Date :** 2023-09-18 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Physiology and Pharmacology

**Specific entry requirements :**

**Purpose of the course :** KI is a medical university with research and education in medicine and health. All PhD students have to obtain basic knowledge regarding the human body in health and disease in case they lack basic higher education knowledge in the field of medicine. The aim of the course is to give PhD students without a medical background a basic overview and introduction to human physiology. The students will gain a basic understanding of how the human organ systems function and interact under normal conditions. The content covered in this course will be useful for further studies where knowledge about human biology is of value.

**Intended learning outcomes :** After completing the course, the student will gain a basic understanding of how the human organ systems function and interact under normal conditions. The content covered in this course will be useful for further studies where knowledge about human biology is of value. More specifically, the student will be able to: - Demonstrate knowledge and understanding of basic functions and interactions between organ systems in the human body. - Demonstrate a critical and scientific approach to literature sources for the different course tasks.

**Contents of the course :** - Overview of cellular and integrative physiology - Basic anatomy - Biochemistry and cell biology - Nervous system - Endocrinology - Digestive system - Cardiovascular physiology - Renal physiology - Respiration - Basic immunology

**Teaching and learning activities :** Different learning methods such as problem based learning, lectures and a hands-on human lab session will be used. Full time during two consecutive weeks.

**Examination :** To pass the course, the student must demonstrate that the learning outcomes have been achieved. Oral and written examinations are used for student assessment.

**Compulsory elements :** Examinations and the hands-on human lab are required. Students that are absent during the quiz or the lab must perform a make-up quiz/lab. Students that are absent from the exam or do not obtain a passing grade in the first examination will be offered a second examination.

**Number of students :** 15 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is held at campus Solna.

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**Course responsible :**

Stefan Reitzner

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**Contact person :**

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# Title : From What to How; Contemporary Narrative Methodology in Health Care Research

**Course number :** 2670

**Credits :** 4.0

**Date :** 2023-11-06 -- 2024-01-19

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is for the doctoral students to develop an overview of theory and application of contemporary narrative and interpretive methods in health-care research and to develop knowledge and skills in applying this knowledge in their own project. Furthermore, the purpose is for the doctoral student to develop knowledge and proficiency in using qualitative methods to study processes and multifaceted phenomena.

**Intended learning outcomes :** - Ability to design relevant narrative and interpretative studies based on own research question. - Ability to perform narrative and interpretative analyses on own data material with supervision. - Ability to analyse and discuss quality and relevance of narrative and interpretative methodology in relation to own question and relevant discourses in health care science.

**Contents of the course :** - Positioning of narrative and interpretative analysis in relation to other qualitative methodology. - Definitions of central concepts used in narrative and interpretative methodologies - Methodological approaches in narrative and interpretative methods that focus on:(1) verbal data, (2) observed action, and (3) processes utilizing multiple data materials. - Design of a study based on own research question that is well suited for narrative and interpretative methodology. - Skill training in use of narrative and interpretative strategies in analyses of data from own project.

**Teaching and learning activities :** The course will be given over one semester with course meetings in the form of workshops. The workshops will consist of lectures, seminars, and study groups with supervision. Students will participate in study groups depending on the form of the narrative analyses they choose to practice. This training format targets the learning needs of each student. Students will use their own data material and be supervised by an expert in the most suitable narrative methodology in the study groups. Between workshops, students will collaborate with help of an IT based platform.

**Examination :** Criteria for pass; Fulfillment of learning outcomes. Students will be given written feedback on assignment in relation to learning outcomes.

**Compulsory elements :** Participation is mandatory at workshops. In case of absence students will be given additional assignments

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This course is based on process writing where the students continuously work with shorter assignments while providing feedback on each other's work The course will have three sessions: <br> The first session will take place on campus on November 23-24. <br> The second session will be conducted on Zoom on December 7-8. <br> The third session will also be held on Zoom on January 11-12. <br> The course begins with a homework assignment that is to be handed in before the first session.

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## Course responsible :

Staffan Josephsson

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## Contact person :

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# Title : Practical approaches to qualitative research - based on blended learning

**Course number :** 2674

**Credits :** 7.5

**Date :** 2023-08-21 -- 2023-11-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Global Public Health

**Specific entry requirements :** None

**Purpose of the course :** Qualitative research is a powerful widely used methodology that allows researchers to understand why and how an event occurs in a given context. However, many health scientists are unfamiliar with theories and methods used in qualitative research. This course will contribute to fill this knowledge gap by providing the participants with practical skills to design, conduct, analyze and report qualitative studies.

**Intended learning outcomes :** - Design a qualitative study including selecting the appropriate sampling procedure and data collection methods. - Develop the data instruments including interview/focus groups discussions guides and observation protocols. - Conduct the fieldwork. - Analyze the data. - Write up the findings. - Critically discuss others' qualitative research, e.g. described in research proposals and manuscripts.

**Contents of the course :** - Background on qualitative methodology. - Theory of qualitative research. - Sampling in qualitative research. - Designing an interview/discussion guide. - Ethical considerations in qualitative research. - Writing a research protocol. - Data collection methods (in-depth interviews, focus groups discussions and observation). - Alternative methods of data collection. - Analysis of qualitative data. - Trustworthiness and validity. - Other approaches to interpretation: Phenomenology, narrative research, oral history. - Qualitative research in evaluation. - Critical review of literature. - Ongoing development as qualitative researcher.

**Teaching and learning activities :** The course will be taught with a blended learning approach, which will combine self-study and face-to-face practical training sessions. Students will be able to access course materials and interact with each other through a common e-learning platform. Practical sessions will be conducted face-to-face where a theoretical and practical training will be provided in the three dominant qualitative data collection methods, including discussion of examples used in studies. In addition, the students will conduct individual assignments that will allow them to improve their skills.

**Examination :** Four assignments are to be done during the course. The first three assignments will take the students through a full mini research project. The first assignment will be to write a qualitative research protocol, the second to conduct two individual depth interviews and transcribe these and the third to analyze the interview transcripts. The fourth assignment will be to write a critical review of a published qualitative paper. There will be a written examination at the end of the course, which will be emailed to the students to be returned within 48 hours. In order to obtain a pass for the whole course, students must obtain a pass in the four assignments and in the written examination.

**Compulsory elements :** Participation in practical sessions, on-line lectures and discussions is compulsory. Non-participation will result in additional assignments at the discretion of the course tutor.

**Number of students :** 8 - 15

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is a blended-learning course combining face to face and pre-recorded online lectures . We will meet face-to-face at Widerströmska Huset Solna Campus floor 3 on the first day (2023-08-21, full day). We will also meet face-to-face at Widerströmska Huset Solna Campus floor 3 from August 25th to 29th (full days). Participation during this week is mandatory. The rest of the lectures are pre-recorded, and will be available online at the start of the course.

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## Course responsible :

Mariano Salazar

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## Contact person :

Mariano Salazar

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## Title : Multi-Disciplinary Perspectives on Active Ageing Research

**Course number :** 2688

**Credits :** 4.5

**Date :** 2023-10-02 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is to enable the students to develop an in-depth knowledge of theoretical and methodological challenges in ageing research and to analyse research questions within a framework of different ageing theories with a multi-disciplinary perspective.

**Intended learning outcomes :** The students shall be able to: Theorize on complexity of research directed towards older people, and reflect on methodological challenges in ageing research Analyse research on ageing from a multi-disciplinary perspective within the framework of different ageing theories Critically judge and hypothesize on research questions within the field of ageing from different disciplinary viewpoints

**Contents of the course :** To reach the intended learning outcomes, the course will be built on the research projects of the students involved. Definitions and concepts relevant for the focus of those projects will be penetrated to make students aware of their own frame of reference and of the theory that forms a base for their research design. The course will include an overview of current ageing research issues within different professional and scientific domains in health, covering health promotion, prevention of disease and disability, rehabilitation and preservation of function. A focus on a persons resources for developing an active life, and their possible implications in research will be analysed.

**Teaching and learning activities :** The course will be digital. Recorded and live lectures (Zoom), seminars, group work, study of and group discussions on scientific literature and individual work based on each student's research project.

**Examination :** The students will be examined with a written assignment related to the student's research project. The paper will be presented and discussed at a pre-seminar. The paper shall include an ageing theory on the student's research project and reflections of strengths and weaknesses. The paper should include an attempt to apply a multi-disciplinary approach on the project.

**Compulsory elements :** Active participation in the seminars, which are mandatory. Absence from a seminar must be compensated by means of a written task, suggested by the course leader.

**Number of students :** 12 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Mandatory lectures and seminars: October 2 and 3, October 30 and November 27. Group assignment (distance or physical): October 13 and 20. Submission date for written assignment is December 1st.  
<br> Address: Alfred Nobels Allé 23, Campus Flemingsberg

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### Course responsible :

Anna-Karin Welmer

Department of Neurobiology, Care Sciences and Society

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### Contact person :

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## Title : Basic Laboratory Safety

**Course number :** 2690

**Credits :** 1.8

**Date :** 2023-09-18 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Microbiology, Tumor and Cell Biology

**Specific entry requirements :** Experience of and/or education in laboratory work.

**Purpose of the course :** The purpose of the course is to enable the students to obtain an understanding of risks and of principles in safety measures in the medical science laboratory, as well as a consciousness about general and individual responsibilities for the planning and execution of applicable safety measures. The purpose is also to develop skills in performing risk analyses and writing up risk assessments.

**Intended learning outcomes :** After completing the course, you should be able to: • understand the regulatory framework that governs laboratory safety including the chain of responsibilities • apply the KI rules and routines for laboratory work. • apply the KI routines for waste management and transport. • apply appropriate safety measures. • demonstrate risk awareness by assessing the risks associated with experiments involving chemicals, microbiological agents, cell cultures and human blood/tissues in the laboratory.

**Contents of the course :** The course aims at giving theoretical and practical knowledge on chemical and biological aspects of laboratory safety. Topics will deal with writing risk assessments, chemical health risks including allergy, cancer and flammable agents, handling and storage of dangerous chemicals, handling of microorganisms and cell cultures including human blood and tissue samples, laboratory acquired infections, biosafety measures including personal protection devices, ventilated workplaces, genetically modified microorganisms, biosecurity and dual use, transport of dangerous goods and waste management.

**Teaching and learning activities :** The mandatory "KI's Laboratory Safety Introduction for laboratory personnel" is an integral part of this course. In addition, there will be teaching and learning activities such as lectures, group discussions, practical sessions, web-tutorials, quizzes and mentimeter exercises. The course is six days in total.

**Examination :** The examination is based on an individual written examination, a risk assessment assignment and the active participation and contribution in an oral presentation. The student's certificate of "KI's Laboratory Safety Introduction for laboratory personnel" needs to be uploaded in the Canvas platform for the course.

**Compulsory elements :** -Completion with certificate of "KI's Laboratory Safety Introduction for laboratory personnel". -Completion of mandatory self-tests/quizzes -Presence during course activities, marked as mandatory in the schedule. Students cannot compensate for absence during compulsory activities but are referred to coming courses for these activities.

**Number of students :** 30 - 40

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is given part time over two weeks.

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### Course responsible :

Maria Johansson

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### Contact person :

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## Title : Basic Laboratory Safety

**Course number :** 2690

**Credits :** 1.8

**Date :** 2023-12-04 -- 2023-12-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Microbiology, Tumor and Cell Biology

**Specific entry requirements :** Experience of and/or education in laboratory work.

**Purpose of the course :** The purpose of the course is to enable the students to obtain an understanding of risks and of principles in safety measures in the medical science laboratory, as well as a consciousness about general and individual responsibilities for the planning and execution of applicable safety measures. The purpose is also to develop skills in performing risk analyses and writing up risk assessments.

**Intended learning outcomes :** After completing the course, you should be able to: • understand the regulatory framework that governs laboratory safety including the chain of responsibilities • apply the KI rules and routines for laboratory work. • apply the KI routines for waste management and transport. • apply appropriate safety measures. • demonstrate risk awareness by assessing the risks associated with experiments involving chemicals, microbiological agents, cell cultures and human blood/tissues in the laboratory.

**Contents of the course :** The course aims at giving theoretical and practical knowledge on chemical and biological aspects of laboratory safety. Topics will deal with writing risk assessments, chemical health risks including allergy, cancer and flammable agents, handling and storage of dangerous chemicals, handling of microorganisms and cell cultures including human blood and tissue samples, laboratory acquired infections, biosafety measures including personal protection devices, ventilated workplaces, genetically modified microorganisms, biosecurity and dual use, transport of dangerous goods and waste management.

**Teaching and learning activities :** The mandatory "KI's Laboratory Safety Introduction for laboratory personnel" is an integral part of this course. In addition, there will be teaching and learning activities such as lectures, group discussions, practical sessions, web-tutorials, quizzes and mentimeter exercises. The course is six days in total.

**Examination :** The examination is based on an individual written examination, a risk assessment assignment and the active participation and contribution in an oral presentation. The student's certificate of "KI's Laboratory Safety Introduction for laboratory personnel" needs to be uploaded in the Canvas platform for the course.

**Compulsory elements :** -Completion with certificate of "KI's Laboratory Safety Introduction for laboratory personnel". -Completion of mandatory self-tests/quizzes -Presence during course activities, marked as mandatory in the schedule. Students cannot compensate for absence during compulsory activities but are referred to coming courses for these activities.

**Number of students :** 30 - 40

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is given part time over two weeks.

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### Course responsible :

Maria Johansson

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### Contact person :

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## Title : Intermediate Medical Statistics: Regression Models

**Course number :** 2738

**Credits :** 3.0

**Date :** 2023-10-16 -- 2023-10-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :** Basic Medical Statistics (or equivalent)

**Purpose of the course :** The aim of the course is to introduce intermediate statistical methods and to facilitate acquirement of skills that involve hands-on data analysis using statistical software.

**Intended learning outcomes :** After successfully completing this course students are expected to be able to: Understand the basic theory behind the statistical methods introduced in the course and to evaluate their applicability and limitations. Choose a suitable statistical model for assessing a specific research hypothesis using data from a medical science study, evaluate the fit of the model, and interpret the results. Apply the methods discussed in the course on real data.

**Contents of the course :** The course is an introduction to more advanced statistical methods and requires that the student is familiar with the statistical concepts of descriptive and inferential statistics, and has some basic knowledge of linear regression. The course covers intermediate regression analysis, one-way and two-way analysis of variance, repeated measures ANOVA, logistic regression, and introduction to survival analysis. Concepts examined in this course include dummy variables, confounding variables, interaction between variables, influential observations and model selection.

**Teaching and learning activities :** The course consists of lectures, group discussions and assignments solved individually and in groups. Some group discussions and exercises are compulsory.

**Examination :** Assessment of the intended learning outcomes by a passing grade on the computer based exercises, and active participation in the final seminar and article presentations.

**Compulsory elements :** Computer based exercises, seminars, article presentations and some lectures are mandatory. The course leader assesses whether and if so, how absence can be compensated.

**Number of students :** 18 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will consist of three or four scheduled whole days per week for two weeks at Campus in Solna. Course dates are: October 16, 17, 19, 20, 23, 24, 27.

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### Course responsible :

Johan Zetterqvist

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### Contact person :

Nora Espahbodi

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## Title : The developing brain

**Course number :** 2780

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medical Biochemistry and Biophysics

**Specific entry requirements :**

**Purpose of the course :** Developmental biology lies at the heart of an effort to understanding complex biological systems. By studying how neural circuits are assembled we can extrapolate key aspects of their function as well as devise strategies for their repair. This course is given to deepen the understanding of how molecular and cellular mechanisms underlie neurobiological function and to widen the horizon of students within the strong Karolinska neuroscience community.

**Intended learning outcomes :** By the end of the course the student shall be able to describe the major steps contributing to the development of the nervous system and transfer new knowledge acquired in the course into their specific projects or fields of research.

**Contents of the course :** The course will cover the main steps of development from neural stem cells to mature circuits, including the patterning of the neural plate and thus the origin of cell types, the interplay between intrinsic and extrinsic factors, gene regulation including epigenetics, neuro-glia interactions and the role of network activity in shaping the final circuits. Different molecular and tracing technologies, and model organisms will be covered. An important aspect of the course regards molecular technologies for labeling, transcriptional analysis and genetic manipulation of defined neural populations. Connections between aberrant developmental processes and neurological disorders will be discussed.

**Teaching and learning activities :** Lectures by invited international experts, group work and seminar presentations.

**Examination :** The students should demonstrate their knowledge about the intended learning outcomes stated above including reflect on which aspects are relevant for their own research in a seminar presentation and in discussions.

**Compulsory elements :** All lectures and the seminar presentation (examination) are compulsory.

**Number of students :** 16 - 24

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's project (according to written motivation), 2) date for registration as a doctoral student (priority given to earlier registration date)

**More information :** This course is a full-time course and will be held at Campus Solna. The schedule with all details will be sent out after acceptance to the course.

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### Course responsible :

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### Contact person :

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Francois Lallemand

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## Title : Present Your Research!

**Course number :** 2787

**Credits :** 1.5

**Date :** 2023-09-04 -- 2023-09-08

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :** None

**Purpose of the course :** The purpose of the course is to foster excellence in research communication by empowering doctoral students to communicate their research results more effectively and confidently. The overall aim of the course is to improve the participants' practical and theoretical skills in designing and delivering convincing research presentations.

**Intended learning outcomes :** After attending the course, the doctoral student should be able to: 1. Plan, design, and deliver a presentation taking both the topic and audience into consideration. 2. Present their research effectively in front of an audience by utilizing delivery skills like body language, vocal variety, pace of speech, and eye contact. 3. Design and use supportive media, e.g., a scientific poster and presentation slides. 4. Build trust and interact with the audience, including answering questions. 5. Use strategies to manage presentation stress to more confidently present their research. 6. Critically assess their own presentations, both in terms of performance and design, as well as that of others. 7. Reflect on own learning and development during the course.

**Contents of the course :** The following topics will be covered: 1. Creating presentations (e.g., elevator pitch, poster, presentation slides) including goal setting, structure, and design. 2. Giving presentations (using a poster and PowerPoint slides) in front of an audience. 3. Use of supportive media to enhance a presentation. 4. Strategies to manage presentation stress and to present with more confidence and clarity as well as remembering what you want to say. 5. Building trust and interacting with the audience, including answering questions. 6. Effective communication with the audience, including body language, posture, vocal variety, pace of speech, eye contact, and addressing different learning styles. 7. Catching the audience's attention and keeping them engaged. 8. The most common reasons for ineffective presentations and how to avoid them. 9. How to adapt a presentation to different audiences, including language and the choice of illustrations. 10. Keeping the time when presenting. 11. Giving, receiving, and processing constructive feedback on presentations with a focus on personalized guidance.

**Teaching and learning activities :** Lectures, written assignments, workshops, coaching, filming, group work, and practical exercises in groups.

**Examination :** Formative assessment during active participation in all parts of the course Summative assessment of a. Poster presentation including scientific poster, b. Power Point presentation, c. Elevator pitch, d. Filmclip of own presentation

**Compulsory elements :** All parts of the course are mandatory including: a. Poster presentation b. Power Point presentation c. Elevator Pitch d. Giving feedback on the other students' presentations e. Filming of own presentation

**Number of students :** 16 - 22

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is in two parallel formats: in-person (in a venue in central Stockholm) and online. Please state your preferences (if any) in the comments field. All lectures are live, real-time, and according to schedule (no pre-recorded lectures). <BR> The scope of the course is research presentations in different contexts and formats. You will practice presenting your research project (or research of your choice) and other topics to approach presentation skills from different angles. This is a highly interactive course with a multitude of exercises aiming at taking your presentations to the next level while identifying your individual strengths. The focus is on developing each student's authentic and personal style of presenting rather than applying a "one-size-fits-all" template. Furthermore, we will deal with nervousness and other challenges you might face when presenting. The teachers focus on creating a safe environment where the students can practice and try out new presentation approaches and techniques. <BR> Please address ALL questions to: [anna.hildenbrand.michelman@ki.se](mailto:anna.hildenbrand.michelman@ki.se) or phone: 0707890607

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### Course responsible :

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### Contact person :

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## Title : Present Your Research!

**Course number :** 2787

**Credits :** 1.5

**Date :** 2023-10-09 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :** None

**Purpose of the course :** The purpose of the course is to foster excellence in research communication by empowering doctoral students to communicate their research results more effectively and confidently. The overall aim of the course is to improve the participants' practical and theoretical skills in designing and delivering convincing research presentations.

**Intended learning outcomes :** After attending the course, the doctoral student should be able to: 1. Plan, design, and deliver a presentation taking both the topic and audience into consideration. 2. Present their research effectively in front of an audience by utilizing delivery skills like body language, vocal variety, pace of speech, and eye contact. 3. Design and use supportive media, e.g., a scientific poster and presentation slides. 4. Build trust and interact with the audience, including answering questions. 5. Use strategies to manage presentation stress to more confidently present their research. 6. Critically assess their own presentations, both in terms of performance and design, as well as that of others. 7. Reflect on own learning and development during the course.

**Contents of the course :** The following topics will be covered: 1. Creating presentations (e.g., elevator pitch, poster, presentation slides) including goal setting, structure, and design. 2. Giving presentations (using a poster and PowerPoint slides) in front of an audience. 3. Use of supportive media to enhance a presentation. 4. Strategies to manage presentation stress and to present with more confidence and clarity as well as remembering what you want to say. 5. Building trust and interacting with the audience, including answering questions. 6. Effective communication with the audience, including body language, posture, vocal variety, pace of speech, eye contact, and addressing different learning styles. 7. Catching the audience's attention and keeping them engaged. 8. The most common reasons for ineffective presentations and how to avoid them. 9. How to adapt a presentation to different audiences, including language and the choice of illustrations. 10. Keeping the time when presenting. 11. Giving, receiving, and processing constructive feedback on presentations with a focus on personalized guidance.

**Teaching and learning activities :** Lectures, written assignments, workshops, coaching, filming, group work, and practical exercises in groups.

**Examination :** Formative assessment during active participation in all parts of the course Summative assessment of a. Poster presentation including scientific poster, b. Power Point presentation, c. Elevator pitch, d. Filmclip of own presentation

**Compulsory elements :** All parts of the course are mandatory including: a. Poster presentation b. Power Point presentation c. Elevator Pitch d. Giving feedback on the other students' presentations e. Filming of own presentation

**Number of students :** 16 - 22

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is in two parallel formats: in-person (in a venue in central Stockholm) and online. Please state your preferences (if any) in the comments field. All lectures are live, real-time, and according to schedule (no pre-recorded lectures). <BR> The scope of the course is research presentations in different contexts and formats. You will practice presenting your research project (or research of your choice) and other topics to approach presentation skills from different angles. This is a highly interactive course with a multitude of exercises aiming at taking your presentations to the next level while identifying your individual strengths. The focus is on developing each student's authentic and personal style of presenting rather than applying a "one-size-fits-all" template. Furthermore, we will deal with nervousness and other challenges you might face when presenting. The teachers focus on creating a safe environment where the students can practice and try out new presentation approaches and techniques. <BR> Please address ALL questions to: [anna.hildenbrand.michelman@ki.se](mailto:anna.hildenbrand.michelman@ki.se) or phone: 0707890607

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### Course responsible :

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## Title : Present Your Research!

**Course number :** 2787

**Credits :** 1.5

**Date :** 2023-11-13 -- 2023-11-17

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :** None

**Purpose of the course :** The purpose of the course is to foster excellence in research communication by empowering doctoral students to communicate their research results more effectively and confidently. The overall aim of the course is to improve the participants' practical and theoretical skills in designing and delivering convincing research presentations.

**Intended learning outcomes :** After attending the course, the doctoral student should be able to: 1. Plan, design, and deliver a presentation taking both the topic and audience into consideration. 2. Present their research effectively in front of an audience by utilizing delivery skills like body language, vocal variety, pace of speech, and eye contact. 3. Design and use supportive media, e.g., a scientific poster and presentation slides. 4. Build trust and interact with the audience, including answering questions. 5. Use strategies to manage presentation stress to more confidently present their research. 6. Critically assess their own presentations, both in terms of performance and design, as well as that of others. 7. Reflect on own learning and development during the course.

**Contents of the course :** The following topics will be covered: 1. Creating presentations (e.g., elevator pitch, poster, presentation slides) including goal setting, structure, and design. 2. Giving presentations (using a poster and PowerPoint slides) in front of an audience. 3. Use of supportive media to enhance a presentation. 4. Strategies to manage presentation stress and to present with more confidence and clarity as well as remembering what you want to say. 5. Building trust and interacting with the audience, including answering questions. 6. Effective communication with the audience, including body language, posture, vocal variety, pace of speech, eye contact, and addressing different learning styles. 7. Catching the audience's attention and keeping them engaged. 8. The most common reasons for ineffective presentations and how to avoid them. 9. How to adapt a presentation to different audiences, including language and the choice of illustrations. 10. Keeping the time when presenting. 11. Giving, receiving, and processing constructive feedback on presentations with a focus on personalized guidance.

**Teaching and learning activities :** Lectures, written assignments, workshops, coaching, filming, group work, and practical exercises in groups.

**Examination :** Formative assessment during active participation in all parts of the course Summative assessment of a. Poster presentation including scientific poster, b. Power Point presentation, c. Elevator pitch, d. Filmclip of own presentation

**Compulsory elements :** All parts of the course are mandatory including: a. Poster presentation b. Power Point presentation c. Elevator Pitch d. Giving feedback on the other students' presentations e. Filming of own presentation

**Number of students :** 16 - 22

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is in two parallel formats: in-person (in a venue in central Stockholm) and online. Please state your preferences (if any) in the comments field. All lectures are live, real-time, and according to schedule (no pre-recorded lectures). <BR> The scope of the course is research presentations in different contexts and formats. You will practice presenting your research project (or research of your choice) and other topics to approach presentation skills from different angles. This is a highly interactive course with a multitude of exercises aiming at taking your presentations to the next level while identifying your individual strengths. The focus is on developing each student's authentic and personal style of presenting rather than applying a "one-size-fits-all" template. Furthermore, we will deal with nervousness and other challenges you might face when presenting. The teachers focus on creating a safe environment where the students can practice and try out new presentation approaches and techniques. <BR> Please address ALL questions to: [anna.hildenbrand.michelman@ki.se](mailto:anna.hildenbrand.michelman@ki.se) or phone: 0707890607

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## Title : Present Your Research!

**Course number :** 2787

**Credits :** 1.5

**Date :** 2023-12-11 -- 2023-12-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :** None

**Purpose of the course :** The purpose of the course is to foster excellence in research communication by empowering doctoral students to communicate their research results more effectively and confidently. The overall aim of the course is to improve the participants' practical and theoretical skills in designing and delivering convincing research presentations.

**Intended learning outcomes :** After attending the course, the doctoral student should be able to: 1. Plan, design, and deliver a presentation taking both the topic and audience into consideration. 2. Present their research effectively in front of an audience by utilizing delivery skills like body language, vocal variety, pace of speech, and eye contact. 3. Design and use supportive media, e.g., a scientific poster and presentation slides. 4. Build trust and interact with the audience, including answering questions. 5. Use strategies to manage presentation stress to more confidently present their research. 6. Critically assess their own presentations, both in terms of performance and design, as well as that of others. 7. Reflect on own learning and development during the course.

**Contents of the course :** The following topics will be covered: 1. Creating presentations (e.g., elevator pitch, poster, presentation slides) including goal setting, structure, and design. 2. Giving presentations (using a poster and PowerPoint slides) in front of an audience. 3. Use of supportive media to enhance a presentation. 4. Strategies to manage presentation stress and to present with more confidence and clarity as well as remembering what you want to say. 5. Building trust and interacting with the audience, including answering questions. 6. Effective communication with the audience, including body language, posture, vocal variety, pace of speech, eye contact, and addressing different learning styles. 7. Catching the audience's attention and keeping them engaged. 8. The most common reasons for ineffective presentations and how to avoid them. 9. How to adapt a presentation to different audiences, including language and the choice of illustrations. 10. Keeping the time when presenting. 11. Giving, receiving, and processing constructive feedback on presentations with a focus on personalized guidance.

**Teaching and learning activities :** Lectures, written assignments, workshops, coaching, filming, group work, and practical exercises in groups.

**Examination :** Formative assessment during active participation in all parts of the course Summative assessment of a. Poster presentation including scientific poster, b. Power Point presentation, c. Elevator pitch, d. Filmclip of own presentation

**Compulsory elements :** All parts of the course are mandatory including: a. Poster presentation b. Power Point presentation c. Elevator Pitch d. Giving feedback on the other students' presentations e. Filming of own presentation

**Number of students :** 16 - 22

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is in two parallel formats: in-person (in a venue in central Stockholm) and online. Please state your preferences (if any) in the comments field. All lectures are live, real-time, and according to schedule (no pre-recorded lectures). <BR> The scope of the course is research presentations in different contexts and formats. You will practice presenting your research project (or research of your choice) and other topics to approach presentation skills from different angles. This is a highly interactive course with a multitude of exercises aiming at taking your presentations to the next level while identifying your individual strengths. The focus is on developing each student's authentic and personal style of presenting rather than applying a "one-size-fits-all" template. Furthermore, we will deal with nervousness and other challenges you might face when presenting. The teachers focus on creating a safe environment where the students can practice and try out new presentation approaches and techniques. <BR> Please address ALL questions to: [anna.hildenbrand.michelman@ki.se](mailto:anna.hildenbrand.michelman@ki.se) or phone: 0707890607

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## Title : Applied longitudinal data analysis

**Course number :** 2798

**Credits :** 2.5

**Date :** 2023-11-29 -- 2023-12-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medical Epidemiology and Biostatistics

**Specific entry requirements :** Knowledge in epidemiology and biostatistics equivalent to "Epidemiology I: Introduction to epidemiology", "Biostatistics I: Introduction for epidemiologists" and "Biostatistics II: Logistic regression for epidemiologists" or corresponding courses.

**Purpose of the course :** The course gives an introduction to modern methods for the analysis of longitudinal and repeated measures studies which are commonly used in epidemiological studies and in clinical trials.

**Intended learning outcomes :** After successfully completing this course you as a student are expected to be able to: - Describe the statistical methods utilized to analyze longitudinal data in a variety of settings and with a variety of types of outcome variables. - Analyze a scientific problem that requires repeated measurements, identify an appropriate design, and identify the statistical methods required to analyze the data. - Utilize statistical software (e.g., Stata) to perform longitudinal analyses of data generated from randomized and observational studies with repeated measures designs. - Apply modern methods for the analysis of longitudinal data to a range of settings encountered in biomedical and public health research. - Interpret and communicate the clinical/scientific meaning of the results of a longitudinal analysis. Intended learning outcomes are classified according to Bloom's taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956, extended by Anderson and Krathwohl, 2001).

**Contents of the course :** The course gives an introduction to modern methods for the analysis of longitudinal and repeated measures studies which are commonly used in epidemiological studies and in clinical trials. The defining feature of a longitudinal study is that measurements of the response are taken repeatedly through time on the same individuals. The primary goal of a longitudinal study is to characterize an outcome (and potentially change in that outcome over time) and the factors that influence the outcome (and its change). A feature of longitudinal data that complicates analysis is the positive correlation (i.e., lack of independence) among repeated observations and possible heterogeneity of variability across measurement occasions. The course covers the following topics:

Introduction to longitudinal data, notation for correlated data, modeling the mean response (analysis of response profiles, parametric and semi-parametric trends), modeling the covariance, growth curves (trajectories), fixed effects models, and mixed effects models (that include random effects). This course is focused on general regression models for longitudinal data when the response variable is either continuous (linear models) or discrete (e.g., binary or count data that require logistic and Poisson models). Topics covered in the course will include: introduction to generalized linear models (e.g., linear, logistic, and Poisson regression), extensions of generalized linear models to longitudinal data, marginal models and generalized estimating equations (GEE), random effects models for continuous and categorical data (generalized linear mixed models), and contrasting marginal and mixed effects models. The course is intended for all students interested in epidemiology, biostatistics and public health.

**Teaching and learning activities :** Lectures, computer lab with exercises focusing on analysis of real data sets using statistical software (Stata), group discussions, literature review.

**Examination :** To pass the course, the student has to show that the learning outcomes have been achieved. Assessments methods used are group assignments (formative assessments) and an individual written take-home examination (summative assessment). The focus will be on understanding concepts and their application to analysis of epidemiological studies, rather than mathematical detail. The examination is viewed as a contributing to the development of knowledge, rather than as a test of knowledge. Students who do not obtain a passing grade in the first examination will be offered a second examination within two months of the final day of the course. Students who do not obtain a passing grade at the first two examinations will be given top priority for admission the next time the course is offered. If the course is not offered during the following two academic terms, a third examination will be scheduled within 12 months of the final day of the course.

**Compulsory elements :** The individual written examination (summative assessment).

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** Course dates are: November 29 and 30, December 1, 4, 5 and 6. A written individual take-home examination will be carried out after the last on-site course day. Course literature will be distributed prior to the onsite course days.

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### Course responsible :

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**Contact person :**

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## Title : Advanced Course in SAS Programming for Health Care Data

**Course number :** 2868

**Credits :** 1.5

**Date :** 2023-11-27 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Solna

**Specific entry requirements :** Knowledge corresponding to the intended learning outcomes of the KI doctoral courses Introductory course in SAS programming, Epidemiology I: Introduction to Epidemiology, Biostatistics I: Introduction for epidemiologists and Biostatistics II: Logistic regression for epidemiologists.

**Purpose of the course :** The purpose of this course is to give students with prior experience in SAS the foundation needed to work independently with large data bases in SAS, performing the data management needed for observational studies from for instance a register linkage.

**Intended learning outcomes :** After this course the student should be able to - independently use a wide range of SAS functions and procedures for data management - manage data using Proc SQL, and in a given situation decide whether to use SQL or SAS Base - develop basic SAS macros - use core statistical procedures, and export results to other software Intended learning outcomes are classified according to Bloom's taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956, extended by Anderson and Krathwohl, 2001).

**Contents of the course :** Students will develop their skills in processing data using built-in functions and procedures, including loops, learn how to merge data sets and perform operations with SAS Base and SQL coding, and the benefits and tricks of transposition, where one moves between "long" and "wide" data sets. Students will also learn how to write user written functions (macros) in SAS, and work through examples of how to analyse data with core statistical techniques, and export relevant results to edited tables. Although exercises during the course will use health care data, the same skills would be useful for studies in e.g., demography, sociology, and economics.

**Teaching and learning activities :** Different strategies for teaching and learning, such as interactive lectures, laboratory exercises and small group discussions, will be used. Daily, formative assessments are used to support the students' learning processes.

**Examination :** A computerized individual take-home examination with realistic assignments, corresponding to the learning outcomes of the course. Students will be allowed to use any literature during the exam, including access to the Internet. Students who do not pass the examination will be offered a second examination within two months.

**Compulsory elements :** The individual examination (summative assessment) is compulsory.

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** Please note the specific entry requirements for the course. The course will be held at campus Solna.

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### Course responsible :

Thomas Frisell

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### Contact person :

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# Title : Design and Analysis of Twin and Family-Based Studies

**Course number :** 2893

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medical Epidemiology and Biostatistics

**Specific entry requirements :** Epidemiology I: Introduction to Epidemiology, Biostatistics I: Introduction for epidemiologists, Epidemiology II: Design of epidemiological studies, Biostatistics II: Logistic regression for epidemiologists and Biostatistics III: Survival analysis for epidemiologists or corresponding courses

**Purpose of the course :** This course focuses on potential designs and analyses using twin- and family-data. Methods to estimate within-family associations and heritability are covered.

**Intended learning outcomes :** After successfully completing this course you as a participant are expected to be able to: - discuss the difference between a within-family analysis and a more standard (e.g. between-family) statistical analysis, - select an appropriate within-family/heritability analysis for a given dataset, based on a specific research question, - discuss how to perform within-family/heritability analyses using the statistical software R, - interpret the output from a within-family/heritability analysis, and compare with a more standard statistical analysis, - discuss assumptions made in heritability analysis, and how violations may affect the results.

**Contents of the course :** 1. In this course we will focus on the theory and practice of within-family analyses. The aim of empirical research is often to estimate the causal effect of a particular exposure on a particular outcome. A complicating feature of observational studies is that the exposure-outcome association is typically confounded, and cannot be given a causal interpretation. The standard approach to deal with confounding is to control for confounders in the analysis, e.g. by regression modelling. However, many confounders may be difficult to measure, or unknown to the investigator. An appealing solution is to study within-family associations, which are automatically controlled for all factors that are shared within the family (e.g. socioeconomic status, genetic factors). 2. In this course we will cover the concept of heritability, its underlying assumptions, and applications in the classic twin method. In many studies, the research question is to what extent a phenotype is caused by genetic factors. Frequently though, there may be no obvious candidate gene, and financial limitations may prohibit a genome wide scan. An appealing solution is to study whether the phenotype tends to run in families; the stronger genetic influence, the larger familial heredity. A commonly used design to estimate the fraction of variation in an outcome which may be attributable to genes and environment is the classic twin methodology. 3. In this course we will also compare and contrast within-family and bivariate heritability analysis (i.e., quantitative genetic analysis of two phenotypes), two methods that complement each other. Although within-family analyses require fewer assumptions, bivariate heritability analyses may yield additional information.

**Teaching and learning activities :** Different strategies for teaching and learning, such as interactive lectures, small group discussions and exercises on selected topics, will be used.

**Examination :** The individual examination will be a written take-home exam. Students who do not obtain a passing grade in the first examination will be offered a second examination within two months of the final day of the course. Students who do not obtain a passing grade at the first two examinations will be given top priority for admission the next time the course is offered. If the course is not offered during the following two academic semesters, then a third examination will be scheduled within 12 months of the final day of the course.

**Compulsory elements :** The individual examination.

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :**

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## Course responsible :

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## Contact person :

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## Title : Statistics with R - from Data to Publication Figure

**Course number :** 2953

**Credits :** 3.0

**Date :** 2023-10-16 -- 2023-11-03

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Laboratory Medicine

**Specific entry requirements :**

**Purpose of the course :** Do you need to turn data into a publication figure? We offer tools and confidence for the student to independently select a statistical method for research questions in their field. The course is practical and includes implementing a basic statistical analysis in R, the leading statistical programming language in bioinformatics and medical science. Furthermore, we give a brief introduction to visualization in R, with a focus on R/ggplot2. Students can bring data from their own research project, or work on data from the course.

**Intended learning outcomes :** By the end of the course the student should be able to: \*download and install the latest versions of R and Rstudio. \*know where to look for help when working in R. \*know how to import data into R. \*use R for basic analysis and presentation of data in their field. \*select statistical method and motivate the choice using a structured approach. \*communicate efficiently with a statistician about their choice of statistical method.

**Contents of the course :** Basics of R. Download, install, import data, basic analysis, how to get help. Visualization of data. Learn to speak statistics. A structured approach to selecting statistical method and communicating with a statistician. Practice how to go from data to publication figure using data from your project or more or less friendly data offered by the course.

**Teaching and learning activities :** Distance learning with online lectures, quizzes and interaction with other students. Lectures at campus or online via ZOOM. Individual project work using your own computer. Digital poster presentation of individual work.

**Examination :** Poster presentation and peer review.

**Compulsory elements :** Online quizzes and tasks. Participation during Poster Presentation day.

**Number of students :** 15 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The first two weeks of the course are online-based consisting of a general introduction to programming in R, followed with a voluntary workshops. Week three focuses on your own project, from data to figure, interspersed with lectures and workshops. The course concludes with a presentation day. The third week is conducted entirely online, using the ZOOM platform.

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### Course responsible :

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## Title : Open science and reproducible research

**Course number :** 2963

**Credits :** 3.0

**Date :** 2023-09-18 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is to provide an overview of current challenges in reproducibility and to provide tools and skills for students wishing to practice science openly.

**Intended learning outcomes :** After the course, students should be able to: - Analyse reproducibility problems in science, including the impact of analysis flexibility and questionable research practices, and identify practices contributing to improved reproducibility - Account for principles of replication research - Preregister research protocols and assess others' preregistered research protocols - Openly publish scientific works including data and code, and find and make use of scientific works, including data and code, published by others.

**Contents of the course :** - The "reproducibility crisis" in biomedical sciences: what is it? - Research fraud and questionable research practices - Impact of bias due to analysis flexibility - Observed statistical power and implications for inference - Comprehensive methods reporting and field-specific guidelines - Preregistration of protocols - Replication research - Open access publishing - Open materials, open data, and open code - Introduction to principles of data re-use in secondary analyses and meta-analyses

**Teaching and learning activities :** The course will contain lectures, seminars, workshops, and a final assignment. The purpose of the lectures is to introduce the concepts covered by the course and to situate them in context. The seminars will cover the course literature, which the students will be expected to critically appraise. Computer-assisted workshops will be used as interactive learning activities to cover some parts of the course, e.g. statistical power.

**Examination :** Examination consists of an assignment where students will be able to choose a topic related to the course content, and write a short report. For example, they may compare a preregistered protocol to the published scientific paper, or they may attempt to replicate results from a published paper using openly published data. This assignment will be presented before the class and students will give comments on each others' presentations.

**Compulsory elements :** Participation in the seminars and labs is mandatory. Absence from a seminar may be compensated by writing a short reflection paper on the literature for that seminar. Participation in the final assignment presentation session is also mandatory.

**Number of students :** 15 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be given fully online.

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### Course responsible :

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### Contact person :

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## Title : Medical Research Ethics

**Course number :** 2964

**Credits :** 1.5

**Date :** 2023-09-25 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The objective of this course is for the doctoral student to: - understand central research ethical theories, principles and guidelines, to gain the possibility to reflect over ethical aspects of his or her own research - understand what is good research and the boundaries for what is ethically unacceptable research with regards to humans and animals, and to the researcher's own academic integrity - develop a research ethical approach within his or her own research, to others' research and to society

**Intended learning outcomes :** After having completed the course, the doctoral student should be able to: - give an account of research ethical theories, principles, and, to some extent, guidelines - account for common problems that arise in the area of research ethics - identify, analyze, and discuss research ethical issues and conflicts - conduct a research ethical argumentation for or against a matter

**Contents of the course :** - Central research ethical principles, theories and arguments - Central philosophy of science - concepts and positions, and its relevance to research ethics - Research on humans, including informed consent and its components - Animal research ethics, including arguments for and against using animals for research purposes, and the three R's. - Ethical reviews and research ethical guidelines, such as the Helsinki Declaration - Good research practice and deviations from good research practice within research, for example issues concerning fabricated data, fraud and plagiarism, and handling of authorship in scientific writing - Conflicts of interest in research, such as bias and sponsorship

**Teaching and learning activities :** Lectures, group work and general discussions. The course takes place on campus, but can be arranged digitally.

**Examination :** The doctoral student writes an essay on a research ethical theme, in relation to all intended learning outcomes, preferably related to his or her own research. A small number of students get the opportunity to orally present an ethical reflection concerning their research in front of the whole group. When the course is arranged digitally, the students' examination will be in written form only.

**Compulsory elements :** Attendance is mandatory for the group work and general discussions. If the student is absent, he or she can to some extent compensate by handing in written answers concerning the cases that have been discussed.

**Number of students :** 30 - 35

**Selection of students :** Selection will be based on 1) date for registration as a doctoral student (priority given to earlier registration date), 2) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation).

**More information :** This course contains mandatory elements on each course day. The students are therefore expected to be present during each course day. This course takes place on site on Campus Solna.

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### Course responsible :

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### Contact person :

Annelie Jonsson

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## Title : Medical Research Ethics

**Course number :** 2964

**Credits :** 1.5

**Date :** 2023-10-23 -- 2023-10-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The objective of this course is for the doctoral student to: - understand central research ethical theories, principles and guidelines, to gain the possibility to reflect over ethical aspects of his or her own research - understand what is good research and the boundaries for what is ethically unacceptable research with regards to humans and animals, and to the researcher's own academic integrity - develop a research ethical approach within his or her own research, to others' research and to society

**Intended learning outcomes :** After having completed the course, the doctoral student should be able to: - give an account of research ethical theories, principles, and, to some extent, guidelines - account for common problems that arise in the area of research ethics - identify, analyze, and discuss research ethical issues and conflicts - conduct a research ethical argumentation for or against a matter

**Contents of the course :** - Central research ethical principles, theories and arguments - Central philosophy of science - concepts and positions, and its relevance to research ethics - Research on humans, including informed consent and its components - Animal research ethics, including arguments for and against using animals for research purposes, and the three R's. - Ethical reviews and research ethical guidelines, such as the Helsinki Declaration - Good research practice and deviations from good research practice within research, for example issues concerning fabricated data, fraud and plagiarism, and handling of authorship in scientific writing - Conflicts of interest in research, such as bias and sponsorship

**Teaching and learning activities :** Lectures, group work and general discussions. The course takes place on campus, but can be arranged digitally.

**Examination :** The doctoral student writes an essay on a research ethical theme, in relation to all intended learning outcomes, preferably related to his or her own research. A small number of students get the opportunity to orally present an ethical reflection concerning their research in front of the whole group. When the course is arranged digitally, the students' examination will be in written form only.

**Compulsory elements :** Attendance is mandatory for the group work and general discussions. If the student is absent, he or she can to some extent compensate by handing in written answers concerning the cases that have been discussed.

**Number of students :** 30 - 35

**Selection of students :** Selection will be based on 1) date for registration as a doctoral student (priority given to earlier registration date), 2) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation).

**More information :** This course contains mandatory elements on each course day. The students are therefore expected to participate during each course day. This course is given online in its' entirety.

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### Course responsible :

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## Title : Medical Research Ethics

**Course number :** 2964

**Credits :** 1.5

**Date :** 2023-11-20 -- 2023-11-24

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The objective of this course is for the doctoral student to: - understand central research ethical theories, principles and guidelines, to gain the possibility to reflect over ethical aspects of his or her own research - understand what is good research and the boundaries for what is ethically unacceptable research with regards to humans and animals, and to the researcher's own academic integrity - develop a research ethical approach within his or her own research, to others' research and to society

**Intended learning outcomes :** After having completed the course, the doctoral student should be able to: - give an account of research ethical theories, principles, and, to some extent, guidelines - account for common problems that arise in the area of research ethics - identify, analyze, and discuss research ethical issues and conflicts - conduct a research ethical argumentation for or against a matter

**Contents of the course :** - Central research ethical principles, theories and arguments - Central philosophy of science - concepts and positions, and its relevance to research ethics - Research on humans, including informed consent and its components - Animal research ethics, including arguments for and against using animals for research purposes, and the three R's. - Ethical reviews and research ethical guidelines, such as the Helsinki Declaration - Good research practice and deviations from good research practice within research, for example issues concerning fabricated data, fraud and plagiarism, and handling of authorship in scientific writing - Conflicts of interest in research, such as bias and sponsorship

**Teaching and learning activities :** Lectures, group work and general discussions. The course takes place on campus, but can be arranged digitally.

**Examination :** The doctoral student writes an essay on a research ethical theme, in relation to all intended learning outcomes, preferably related to his or her own research. A small number of students get the opportunity to orally present an ethical reflection concerning their research in front of the whole group. When the course is arranged digitally, the students' examination will be in written form only.

**Compulsory elements :** Attendance is mandatory for the group work and general discussions. If the student is absent, he or she can to some extent compensate by handing in written answers concerning the cases that have been discussed.

**Number of students :** 30 - 35

**Selection of students :** Selection will be based on 1) date for registration as a doctoral student (priority given to earlier registration date), 2) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation).

**More information :** This course contains mandatory elements on each course day. The students are therefore expected to be present during each course day. This course takes place on site on Campus Solna.

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### Course responsible :

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## Title : Methods for Life Course Epidemiology

**Course number :** 2968

**Credits :** 1.5

**Date :** 2023-09-11 -- 2023-09-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** The institute of Environmental Medicine

**Specific entry requirements :** Knowledge equivalent to "Epidemiology I: Introduction to epidemiology", "Biostatistics I: Introduction for epidemiologists", "Epidemiology II: Design of epidemiological studies", "Biostatistics II: Logistic regression for epidemiologists" and "Biostatistics III: survival analysis for epidemiologists" or corresponding courses.

**Purpose of the course :** The course critically reviews life course theory and methods for analysis of longitudinal data with applications to life course epidemiology. A special focus is put on discussing and applying methods for mediation analysis.

**Intended learning outcomes :** After successfully completing this course, the student is expected to be able to: - Discuss the most common life course models and their implications for health policy - Evaluate strengths and limitations in using register data for research in life course epidemiology - Explain the applicability of visualization techniques for research in life course epidemiology - Identify and apply appropriate methods for mediation analysis - Perform mediation analysis, and interpret and communicate the derived results - Critically appraise evidence from life course epidemiological studies.

**Contents of the course :** This course focuses on an overview and critical discussion of life course theory and methods for analysis of longitudinal data with applications to life course epidemiology. We shall review, discuss and apply different approaches to addressing common challenges in register-based, life course and intergenerational research through both methodological innovations and adaptation of existing statistical methods. Examples of techniques to be discussed and applied include methods for visualizing and modeling changes in categorical variables, modeling the effects of binary exposure variables over the life course, and techniques for mediation analyses. We shall also discuss and apply concepts and methods from the field of causal inference to life course studies. The statistical software used in the lectures and computer labs is Stata.

**Teaching and learning activities :** Lectures, computer labs and individual and group work involving analysis of real-life research problems using longitudinal data and a statistical software (Stata).

**Examination :** To pass the course, the student has to show that the intended learning outcomes have been achieved. The assessment methods used in this course are individual and group assignments (formative assessment) and an individual take-home examination (summative assessment). The focus will be on application of methods to research problems and interpretation of results, rather than mathematical detail. The examination is viewed as contributing to the development of knowledge, rather than a test of that knowledge. Students who do not obtain a passing grade in the first examination will be offered a second examination within two months of the final day of the course.

**Compulsory elements :** Individual written examination (summative assessment).

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :**

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### Course responsible :

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### Contact person :

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# Title : Introduction to R - Data Management, Analysis and Graphical Presentation

**Course number :** 2971

**Credits :** 2.5

**Date :** 2023-09-13 -- 2023-10-19

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Laboratory Medicine

**Specific entry requirements :** Basic statistical knowledge (e.g. taken ""Basic course in medical statistics"" or similar course)

**Purpose of the course :** To increase the doctoral student's skills in data analysis and data presentation.

**Intended learning outcomes :** After attending the course, the student will be able to use R for data management, statistical analysis and graphical data presentation. The student will be able to install new functions in R.

**Contents of the course :** R is a powerful software/programming language for data analysis and graphical presentation. R is free-of-charge, and in most cases a useful alternative to commercial statistical software. The programming language is completely text-based, making it challenging compared to software with a graphical user interface. However, it offers greater flexibility, better control over analyses and an automatic documentation of performed analyses. The course focuses on structure and basic functions of the R programming language . A selection of functions for data management, statistical analysis and graphics is presented. The methods included are commonly used methods in clinical medical science (e.g. t-test, ANOVA, chi2-test, regression and survival analysis, box, line scatter, and bar plots). The course focuses mainly on how the various methods are applied in R and not their theoretical background, underlying assumptions or the theoretical interpretation of the results.

**Teaching and learning activities :** Online video lectures, web-based seminars and web-based practical exercises (individual and group assignments), peer assessment of other students' solutions. The examination takes place on KI campus.

**Examination :** Written examination.

**Compulsory elements :** The practical exercises and the peer assessments of these are compulsory. Students unable to complete the exercises in time due to e.g. illness can get an extension of the deadline.

**Number of students :** 15 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is web-based, with course dates 13/9 (self-studies), 15/9, 22/9, 29/9, 6/10, 13/10. The examination is in Huddinge 19/10. Between these course dates, there will be deadlines for mandatory home assignments. Laptop required for the examination.

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## Course responsible :

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## Contact person :

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## Title : Study Design in Clinical Research

**Course number :** 2980

**Credits :** 3.0

**Date :** 2023-11-06 -- 2023-11-23

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Molecular Medicine and Surgery

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is to present an overview over study designs employed in clinical research, to explain why and how to write a study protocol, and to critically reflect on protocols' content. The course is ideal for doctoral students that are going to conduct clinical research.

**Intended learning outcomes :** At the end of the course the students should be able to: 1) Independently plan and produce a study protocol, including a thorough methodological evaluation and choice of appropriate study design; 2) Critically reflect on other students' individual project work in a scientifically constructive way; 3) Interpret and critically evaluate scientific studies relevant to the course content.

**Contents of the course :** 1) Basic terms in epidemiology and clinical study design; 2) Measures of disease occurrence; 3) Observational studies, including cohort and case-control studies; 4) Systematic and random errors; 5) Experimental studies, including randomised clinical trials; 6) Quality of life in clinical research; 7) Screening and diagnosis in relation to clinical research. Throughout the course the students will work on an individual project (examination 1) for peer-review (examination 2) and the students will critically review and discuss relevant scientific articles (examination 3).

**Teaching and learning activities :** Lectures, individual article review, group discussions, and homework tasks. The course focuses on active learning, i.e., putting knowledge into practice and critically reflecting upon the knowledge, rather than memorising facts. Therefore, much of the focus of the course is on the individual project where students are required to develop a full study protocol including several important aspects covered in the lectures, article reviews and group discussions. Students will peer-review each other's projects during the examination.

**Examination :** 1) Individual project work: Develop a written comprehensive yet concise study protocol including several important aspects of study design discussed during the course; 2) Peer-review of other students' projects followed by oral presentation of their project and opposition of other students projects during the group examination; 3) Critically review scientific articles relevant to the course content and participate actively to the discussions. To pass the course the student should show that all intended learning outcomes have been reached.

**Compulsory elements :** Compulsory attendance includes the scheduled lectures and seminars all held during the first week of the course. Absence will need to be replaced by individual assignments following discussion with the course co-ordinator, e.g., article reviews, with written or oral follow-up.

**Number of students :** 20 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) date for registration as a doctoral student (priority given to earlier registration date)

**More information :** The course will take place during a 3-week period, at Karolinska Institutet, Solna unless restriction due to the Covid-19 pandemic requires the course to be held online. Lectures and group works are scheduled during the first 4 days of the first course week. The oral exam will take place at the end of the third week (Thursday). The course entails 3 credits, requiring two weeks of fulltime work, which in addition to the lectures and group works includes individual work on the study protocol. The lecturers are active clinical researchers and/or professors.

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### Course responsible :

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### Contact person :

Kalle Mälberg

Institutionen för molekylär medicin och kirurgi

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## Title : Rare Disease Genomics

**Course number :** 2981

**Credits :** 1.5

**Date :** 2023-10-23 -- 2023-10-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Molecular Medicine and Surgery

**Specific entry requirements :**

**Purpose of the course :** This is a course aimed at students actively involved or planning genetic analysis of rare diseases. The course is also appropriate for those working with complex diseases and cancer whose projects involve high throughput DNA sequencing. The purpose of this course is to provide the participants with knowledge and practical experience about current research strategies and tools for analysis of DNA-sequencing data in the field of rare disease genomics. The participants will also be made aware of ethical issues in relation to rare disease genomics.

**Intended learning outcomes :** After the course, the participants should be able: 1. To select adequate genomic technologies and data analysis strategies to answer research questions in the field of rare disease genetics or in their field of research; 2. To evaluate candidate variants and genes using publicly available databases and tools; 3. To discuss suitable approaches for functional validation of candidate variants and genes; 4. To identify and discuss on ethical issues arising from large-scale sequencing studies.

**Contents of the course :** The focus of the course is the use of current DNA-sequencing methods and bioinformatics tools to understand the genetic basis of rare genetic diseases. Within the overall theme of clinical and experimental approaches to diagnostics of rare genetic diseases, particular attention will be paid to annotation and classification of different types of genetic variants (single nucleotide variants and structural variants). The course will cover the use of different in-silico pathogenicity scores, phenotype ontology terms, and population and family data for variant and gene interpretation. The course will cover selected experimental strategies to validate genetic findings. The course will also cover current clinical best practice guidelines concerning ethical issues such as report of incidental findings and acquisition of informed consent.

**Teaching and learning activities :** The course consists of lectures, seminars, hands-on computer-based exercises, and self-studies. Students are required to bring their laptops with working internet connection.

**Examination :** The examination consists of a take-home examination and a group reflection exercise. To pass the whole course the grade "Pass" must have been obtained for both assessments. Antiplagiarism tools will be used according to KI guidelines.

**Compulsory elements :** All teaching and learning activities are compulsory. Absence from compulsory parts is compensated according to the instructions from the course leader.

**Number of students :** 15 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date).

**More information :** The course will take place at Solna Campus.

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### Course responsible :

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### Contact person :

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## Title : Biostatistics III: Survival analysis for epidemiologists

**Course number :** 2992

**Credits :** 1.5

**Date :** 2023-11-06 -- 2023-11-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medical Epidemiology and Biostatistics

**Specific entry requirements :** Epidemiology I, Introduction to epidemiology; Biostatistics I, Introduction for epidemiologists; Biostatistics II, Logistic regression for epidemiologists or equivalent courses.

**Purpose of the course :** This course focuses on the application of survival analysis methods to epidemiological studies.

**Intended learning outcomes :** After successfully completing this course students should be able to: - propose a suitable statistical model for assessing a specific research hypothesis using data from a cohort study, fit the model using standard statistical software, evaluate the fit of the model, and interpret the results. - explain the similarities and differences between Cox regression and Poisson regression. - discuss the concept of timescales in statistical models for time-to-event data, be able to control for different timescales using standard statistical software, and argue for an appropriate timescale for a given research hypothesis. - discuss the concept of confounding in epidemiological studies and be able to control/adjust for confounding using statistical models. - apply and interpret appropriate statistical models for studying effect modification and be able to reparameterise a statistical model to estimate appropriate contrasts. - critically evaluate the methodological aspects (design and analysis) of a scientific article reporting a cohort study.

**Contents of the course :** This course introduces statistical methods for survival analysis with emphasis on the application of such methods to the analysis of epidemiological cohort studies. Topics covered include methods for estimating survival (life table and Kaplan-Meier methods), comparing survival between subgroups (log-rank test), and modelling survival (primarily Poisson regression and the Cox proportional hazards model). The course addresses the concept of 'time' as a potential confounder or effect modifier and approaches to defining 'time' (e.g., time since entry, attained age, calendar time). The course will emphasise the basic concepts of statistical modelling in epidemiology, such as controlling for confounding and assessing effect modification.

**Teaching and learning activities :** Lectures, exercises focusing on analysis of real data using the free statistical software R, exercises not requiring statistical software, group discussions, literature review.

**Examination :** The course grade is based solely on a take-home examination. The focus of the exam will be on understanding concepts and their application to analysis of epidemiological studies rather than mathematical detail. The course examination will be held within two weeks of the final day of the course. Students who do not obtain a passing grade in the first examination will be offered a second examination within 2 months of the final day of the course. Students who do not obtain a passing grade at the first two examinations will be given top priority for admission the next time the course is offered. If the course is not offered during the following two academic terms then a third examination will be scheduled within 12 months of the final day of the course.

**Compulsory elements :** The individual examination

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** The course will be held November 6, 8, 10, 13 and 15 at KI campus. The statistical software R will be used throughout the course. It is strongly recommended to have taken an introductory course in R or to have equivalent experience prior to taking this course. We have provided a self assessment test (<http://biostat3.net>) for you to confirm that you have understood the central concepts. We advise all potential applicants to take the test prior to applying to Biostatistics III. If you attempt the test under examination conditions (i.e., without referring to the answers) we would recommend: 1. if you score 70% or more then you possess the required prerequisite knowledge 2. if you score 40% to 70% you should revise the areas where you lost marks 3. if you score less than 40% you should, at minimum, undertake an extensive review of central concepts in statistical modelling and possibly consider studying intermediate level courses (e.g., Biostatistics II) before taking Biostatistics III.

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### Course responsible :

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### Contact person :

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## Title : Anaesthesia, Analgesia and Surgery (mice and rats)

**Course number :** 2996

**Credits :** 1.5

**Date :** 2023-10-24 -- 2023-11-02

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Comparative medicine

**Specific entry requirements :** Students need to complete the "Function A" laboratory animal science course ("to carry out scientific procedures on animals"), or must have completed an equivalent course.

**Purpose of the course :** The course is designed to meet the learning outcomes specified by the education and training recommendations supplied as an annex to EU Directive 2010/63/EU, which has been endorsed by the Swedish legislation L150 (SJVFS 2019:9). Modules included are EU 3.2, 5-7, and EU20-22. Education and training in anaesthesia, analgesia and surgery is both essential, and a legal requirement, for all those who need to undertake such procedures on laboratory animals. Applying appropriate anaesthetic, analgesic and surgical techniques to in vivo studies enhances outcomes from research studies, reduces experimental variability, and is perceived as ethically acceptable.

**Intended learning outcomes :** After completion of this course, the students should be able to meet the defined learning outcomes as set out in the EU Education and Training Framework, with emphasis on modules 20, 21 and 22. Each module requires both theoretical knowledge, and acquisition and demonstration of practical skills. The list of suggested learning outcomes by such guidelines is comprehensive, but in summary, participants will acquire the knowledge and skills to anaesthetize animals safely and humanely, assess and alleviate post-surgical pain, and be able to conduct surgical procedures competently, using appropriate aseptic technique. Recognition of pain, suffering and distress, appropriate methods of euthanasia, and minor procedures in mice and rats (EU modules 3.2, 5-7) will also be included.

**Contents of the course :** The course provides guidance and information to individuals who, during their research work with animals, will need to apply sedation or anaesthesia and who will undertake surgical or other painful procedures. It includes details of methods of assessing, preventing and alleviating animal pain. The use of appropriate killing methods of rodents will also be included. The course will include training in the most recently developed behavioural measures of pain, including use of grimace scales. Monitoring of animals during anaesthesia and coping with problems and emergencies are explained and demonstrated. Potential interactions between anaesthetic and analgesic agents and specific research protocols are also explained and discussed. Training is given in the principles of pre-operative animal assessment and care, preparations for surgery, aseptic technique and the principles of successful surgery. The course provides information about possible complications, post-operative care and monitoring along with details of the healing process. It also covers more practical elements for example the demonstration of commonly used instruments and provides an opportunity for trainees to practice some of the practical aspects of basic surgical technique, such as methods of suturing, using appropriate non-animal models.

**Teaching and learning activities :** The course will adopt a blended learning approach that combines e-learning, live sessions (in-person and digital), discussions, interactive sessions and practical components in the laboratory. Lecture notes and video materials to introduce practical skills will be provided as well. Discussion and problem-solving sessions will be provided, which will encourage students to reflect on the application of the course content in their own research area, and discuss and explain their work to other participants. Laboratory practical sessions (4-5 hours) on introductory anaesthesia and surgical skills will be provided.

**Examination :** Practical skills are formatively assessed during the laboratory sessions using direct observation of practical skills. A short answer/multiple choice question final examination is held at the end of the course. A pass/fail criteria will be used as a global rate for this course.

**Compulsory elements :** All components must be completed and active student participation in the discussion and problem solving sessions is required if the student is to be provided with certification of the successful completion of the course. Missed parts of the course as a consequence of a well-justified absence will need to be compensated after agreement with the course director e.g. with a written assignment or in future course editions.

**Number of students :** 8 - 14

**Selection of students :** Selection will be based on the relevance of the course syllabus for the applicant's doctoral project (need to use anaesthetic or surgical techniques in rodent models), which will be according to written motivation. If necessary, additional selection criterium will be used based on the date for registration as a doctoral student (priority given to earlier registration date).

**More information :** The e-learning teaching materials will be made available to students the week before the course starts. This will enable students to complete them in advance of the discussion sessions, or alternatively, they can complete the content during the scheduled course dates. This added flexibility should enable them to integrate course participation with their other work commitments. The live sessions (face-to-face and webinar) components of the course will be held on weekdays ca. 9 am and 5 pm.

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### Course responsible :

Rafael Frias

Comparative medicine

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**Contact person :**

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## Title : Advanced Cancer Biology

**Course number :** 3024

**Credits :** 3.0

**Date :** 2023-08-29 -- 2023-12-19

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Microbiology, Tumor and Cell Biology

**Specific entry requirements :** Basic course in tumour biology and oncology.

**Purpose of the course :** The course aims to provide advanced, cutting edge pre-clinical and clinical knowledge in the field of cancer biology.

**Intended learning outcomes :** At the end of the course the students should: - Have acquired an updated overview of the cutting edge research activities within the fields of cell- and tumor biology. - Be able to show analytical and critical thinking when discussing advanced problems in cell- and tumor biology, beyond what is found in text books, and evaluate the relevance of the topics presented in the context of their own research activities and PhD studies. - Be able to discuss important aspects of tumor biology, including apoptosis, cell cycle, cancer stem cells, differentiation, virus and bacteria-associated cancer, tumor immunology and effects of chronic inflammation in carcinogenesis, cancer genetics and epigenetics, transcriptomics, proteomics and metabolomics of cancer, tumor microenvironment, angiogenesis, metastasis, tumor heterogeneity and development of new treatments as well as key issues in clinical cancer research.

**Contents of the course :** The lecturers will give a comprehensive and pedagogical overview of the research area as well as an in-depth discussion of their own research, related, but not limited, to the following topics: apoptosis, cell cycle, cancer stem cells, differentiation, virus and bacteria-associated cancer, tumor immunology and effects of chronic inflammation in carcinogenesis, cancer genetics and epigenetics, transcriptomics, proteomics and metabolomics of cancer, tumor microenvironment, angiogenesis, metastasis, tumor heterogeneity and development of new treatments as well as key issues in clinical cancer research.

**Teaching and learning activities :** The course will consist of about 20 lectures, with approximately 45 minutes per lecture, at least once a week during one semester. Each lecture will be followed by an open discussion between the students and the invited speaker led by one of the course organizers: this format will provide time for highlighting key issues within the specific topic and will enhance the possibility for the students to expand their networking activities due to direct contact with experts in the field. To increase the learning process and to stimulate the reflection on the course topic, the students will be required to study the most recent literature, still not present in the text books within the presented fields, prior to each seminar. Throughout the course period, the course organizers will have regular meetings with the students to follow up the learning process of each individual participant as well as to receive feedback from the students.

**Examination :** The students have to show that the intended learning outcomes of the course are reached. This will be individually assessed during the participation in the informal discussions after the seminars and on the basis of an individual written assessment, in form of a project description where one or more topics presented during the course should be integrated within the student's own research project (Max one and half A4 page, stating: the objective of the project, a brief description of the research plan, and the significance). The project description should be handed in maximum three weeks after the completion of the course to the organizers.

**Compulsory elements :** Attending the lectures and the written essay are compulsory. Missed seminars can be compensated by other activities after discussion with the course leader.

**Number of students :** 8 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is organized to contain approximately 20 lectures of 45 min plus 15 min discussion, held once per week during the semester by invited national and international prominent researchers. All lectures are held at the Biomedicum, Solnavägen 9, in seminar rooms at the 3rd (entrance) floor, KI Solna Campus Tuesdays at 1 pm, unless else stated.

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### Course responsible :

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Galina Selivanova

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## Title : Grundkurs i SPSS

**Course number :** 3028

**Credits :** 1.5

**Date :** 2023-09-25 -- 2023-09-29

**Language :** Swedish

**Level :** Forskarnivå

**Responsible KI department :** Department of Clinical Sciences, Danderyd Hospital

**Specific entry requirements :**

**Purpose of the course :** Kursen kommer att ge dig solida grundkunskaper i statistikprogrammet SPSS inklusive kunskaper i SPSS syntax (programmeringsspråk). Du lär dig bl a hur man lägger upp och strukturerar ett dataset, och hur man kan importera material från andra applikationer till statistikprogrammet SPSS och att tvätta data så att dessa blir i analyserbart skick. En av de viktigaste delarna i analysen är att beskriva det datamaterial som har samlats in samt att hur man dokumenterar sina steg med hjälp av syntax. Vi går grundligt igenom olika procedurer för att bekanta sig med olika typer av variabler. Detta inkluderar även omkodning av variabler, skapa nya variabler från befintliga och selektera ut individer som uppfyller vissa givna villkor. Ändamålet är att hjälpa dig att effektivisera ditt arbete, dokumentera dina analyser med hjälp av syntax och snabbt komma igång med SPSS

**Intended learning outcomes :** Efter kursen skall kursdeltagaren: - Ha grundläggande kunskaper om statistikprogrammet SPSS för att skapa strukturerade datafiler, modifiera data, samt skapa grafer och tabeller med hjälp av syntax. - Ha kunskap om de vanligaste syntax kommandona för att hantera statistiska data i SPSS. - Självständigt med hjälp av syntax kunna se om modellantaganden är uppfyllda som t.ex. normalfördelningsantagande - Självständigt med hjälp av syntax kunna utföra enklare tester och analyser - Ha ett förhållningssätt till datahantering som visar på grundläggande förståelse för vikten av dokumentation via syntax.

**Contents of the course :** Olika procedurer för att lära känna olika typer av variabler. Detta inkluderar även omkodning av variabler, skapa nya variabler från befintliga och selektera ut individer som uppfyller vissa givna villkor, samt att med hjälp av syntax utföra grundläggande variabelkommandon. Den beskrivande analysen omfattar både produktion av olika tabeller såväl som val av diagram. Du lär dig vilka typer av tabeller och diagram som är lämpliga beroende på de variabler du studerar. För att erhålla så presentationsfärdiga rapporter som möjligt lär vi oss även att redigera resultatet av analysen.

**Teaching and learning activities :** Denna kurs som sträcker sig över 5 dagar (3 dagar workshop + en övningsuppgift med avslutande seminarium). Doktoranden får under kursens gång självständigt arbeta med ett datamaterial som innehåller vanliga typer av problem med datahantering före en statistisk analys är möjlig.

**Examination :** Examination av kursen består av en hemuppgift som redovisas skriftligt. Varje doktorand lämnar enskilt in en lösning där de dokumenterar hur problemen har lösts. Denna uppgift redovisas sedan via en peer-review vid ett slutseminarium. Egen tillgång till SPSS är nödvändig för att göra examinationen.

**Compulsory elements :** Vid frånvaro från någon workshop får doktoranden göra kompletterande övningsuppgift/-er. Vid frånvaro från redovisning och genomgång av uppgift får doktoranden göra kompletterande övningsuppgift/-er.

**Number of students :** 8 - 15

**Selection of students :** Urvalet baseras på 1) kursplanens relevans för den sökandes doktorandprojekt (enligt motivering), 2) startdatum för doktorandstudier

**More information :** Kursen hålls måndag till fredag. Måndag-onsdag kl 9-12 är obligatoriska tillfällen, medan det ges möjlighet för att arbeta med kursens övningar på eftermiddagen samma dagar. Torsdag är det eget arbete med en inlämningsuppgift som redovisas fredag em.

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**Course responsible :**

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**Contact person :**

Marzieh Javadzadeh

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## Title : Exploring Entrepreneurial Opportunities in Research

**Course number :** 3037

**Credits :** 4.5

**Date :** 2023-09-18 -- 2023-11-17

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** This course will enhance your career opportunities inside and outside academia by facilitating and teaching discovery and identification of intellectual assets in the daily work of a researcher/PhD student, and how to apply it today and in the future. As a participant, identifying opportunities for entrepreneurship in connection to research will increase the awareness of the potential of innovation and entrepreneurship and its practical application and help you to expand the impact of your work. In order to develop a business idea - whether in an economic or social context, you need to apply a number of business concepts. Relevant business tools will be introduced in order to develop a business idea stemming from research. The final step when exploring opportunities of entrepreneurship is to communicate and test your business idea on the market. For that purpose you will learn how to package an already developed business idea for introduction into the start-up world.

**Intended learning outcomes :** After the course, a doctoral student shall be able to; - demonstrate an understanding of the opportunities of innovation and entrepreneurship for utilisation of research and how to apply entrepreneurial tools in the research context - assess their new skills and reflect on possible future effects, from ones individual, organisational & societal perspective - use design tools to gain an understanding for the user experience to develop solutions to user needs - use business tools such as business modelling to develop a potential business idea stemming from research, - communicate ("pitch") the business plan to people within the start-up world, such as potential investors

**Contents of the course :** "Exploring entrepreneurial opportunities in research" is a course divided into three modules. The first module begins with an introduction to entrepreneurship, what it is and how it can be used in the doctoral education. The doctoral students are then given a number of practical tools to identify intellectual assets within daily work to use in a minor innovation projects based on their own research. The second module begins with an introduction to prototyping using the design thinking approach. The doctoral students are then given a number of business tools to develop a business opportunity, stemming from their research, into a business model. The last module begins with an introduction to product roadmaps followed by a comprehensive business plan. The doctoral students are then given a number of practical business tools to write and test a complete business plan of the developed idea.

**Teaching and learning activities :** Each of the three modules includes three mandatory days on KI Campus and two days for own work. The course days are usually Monday, Wednesday and Friday. The modules are separated with 2 week intervals. This course lays the foundation for development of an already identified business idea. It begins with an introduction to prototyping using the design thinking approach. The doctoral students are then given a number of business tools to develop a business opportunity, stemming from their research, into a business model. With the individual assignments the doctoral students are given the opportunity to take a closer look at the actual benefits of the new knowledge and put it into a larger context, with value for their own research and society. Learning activities consist of seminars and workshops as well as group and individual work.

**Examination :** The doctoral student is examined individually, on a written report, the design of a poster, the development of a prototype, business model and completion of a business plan.

**Compulsory elements :** Attendance is mandatory for all participants. The course director assesses if and in that case how absence can be compensated.

**Number of students :** 10 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Course days are 9 days in total. September 18, 20 and 22 - Identify. October 9, 11 and 13 - Develop. November 13, 15 and 17 - Test. Mondays 09:00 to 17:00, Wednesdays 09:00 to 12:00, Fridays 12:00 to 17:00.

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### Course responsible :

Samer Yammine

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### Contact person :

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## Title : Cellular Signalling

**Course number :** 3049

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department for Clinical Science, Intervention and Technology

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is to enable the student to acquire a broad view of various signalling pathways and to identify common themes on protein-protein and protein-lipid interactions in human disease. The students shall learn how signal transduction occurs through a highly regulated cascade of events inside cells. The student will be given the opportunity to learn to identify and reflect on the knowledge (general methodology and theoretical concepts) gained with the benefit for the student's own research.

**Intended learning outcomes :** After completed course, the student should be able to: - show adequate knowledge on general concepts in the field of signal transduction - discuss common methods and techniques in the field of signal transduction - apply some of the conceptual knowledge in his/her own research project(s) - choose relevant scientific questions, analysis methods and design a general plan to study this

**Contents of the course :** The course brings up current aspects in cellular signalling and the developments in methodology that has cultivated the understanding of the function of the different signalling pathways in various model systems and diseases. The course will cover major aspects of protein and lipid kinases, heterotrimeric G-proteins, small GTPases, cytokine and growth hormone receptors, secondary messengers, transcriptional regulation and signal transduction in cell-specific responses to stimuli. The course will cover the molecular basis of certain diseases related to the abrogation of signalling pathways.

**Teaching and learning activities :** On-campus lectures or live webinars by invited lecturers within the field. Student-focused activities to facilitate interaction and discussions on additional new topics and resources to retrieve information about a particular issue within the field of signal transduction. Self-studies and home assignment to prepare for oral examination.

**Examination :** Oral presentation on how concepts and methods/techniques in the field of signal transduction is, or could be, integrated into own research project. The presentation should clearly represent the knowledge gained during the course. One peer will be assigned as a critical friend to review the proposal. Oral presentation is compulsory, and it is essential to be an active participant in the follow-up discussions. It must be shown that all the intended learning outcomes of the course are achieved.

**Compulsory elements :** All lectures and activity moments are compulsory, missing lectures must be compensated by written résumé, while activity moments should be taken again in the next course occasion.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be given as on-site lectures at Campus Flemingsberg or interactive webinar lectures on Monday 16th of October to Thursday 19th of October 2023, between approximately 9 am to 4 pm. Time for self-studies and mandatory assignments will be scheduled. The examination seminar will be on Friday 20th of October.

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### Course responsible :

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### Contact person :

Thomas Ebert

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## Title : Tissue-Specific Immunology

**Course number :** 3072

**Credits :** 1.5

**Date :** 2023-11-13 -- 2023-11-17

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Huddinge

**Specific entry requirements :** Basic knowledge in immunology corresponding to the KI doctoral education course Basic Immunology (3 hp) is required.

**Purpose of the course :** This course will introduce the students into the emerging research field of immunology in the context of tissues. This includes a focus on distinct human fetal and adult organs, tissue models, as well as immune cells with features of tissue-residency and/or relevance in tissue-specific pathological conditions. The clinical and biological importance of each topic will be emphasized and discussed.

**Intended learning outcomes :** After the course, the students should be able to describe certain differences of the innate and adaptive immune system in blood and various tissues. Furthermore, the students should be able to identify and discuss specific roles of the immune system in human fetal and adult tissues in health and disease but also discuss possibilities and caveats in today's research in tissue-specific immunology, e.g. ways to collect material and ethical considerations.

**Contents of the course :** The course will be given over one week (full time). Examples of topics that will be covered during the course: Development of the fetal immune system; immune system concepts in airways, skin, intestines, lymphatics, and at the fetal-maternal interface; tissue-resident immune cell types (e.g. MAIT cells, ILCs); tissue models; and tissue-associated pathologies (e.g. HIV, LCH, brain tumors).

**Teaching and learning activities :** At the first course day, the course organizers will provide a basic introduction to the course followed by student presentations. Each student is expected to give a brief presentation (10-15min) of their own (doctoral/post-doc) research project(s), which should indicate relevance for the course. During the other course days, invited lecturers will present an overview over a specific tissue/cell-type/etc in combination with their own research results concerning tissue-specific immunology. Each student is expected to ask questions to the lecturers every course day in order to ensure active participation by all participants throughout the course. At the end of each course day, there will be an interactive Question & Answer session to summarize the main points and to provide feedback both from the course leaders and from the course participants. These sessions may also include quizzes and group discussions. Finally, the students will be asked to study one specific topic of tissue immunology in a group project work. The topic will be provided by the course leaders at the beginning of the course. An oral presentation is expected from all students at the end of the course.

**Examination :** The course examination will be in the form of a group assignment that is presented orally on the last course day, with each student presenting. Every student will be evaluated and assessed individually. The group presentations are peer-reviewed by the course leaders and the other students. Each student has to show that all intended learning outcomes have been reached.

**Compulsory elements :** Students are required to attend all course days, to actively participate during the course and in the group work, and to present 1) their own research project that indicates relevance for the course, and 2) a given topic in an oral presentation in order to pass the course. Absence can be compensated with an individually written report (topic to be decided by the course organizers).

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), (2) date of registration as a doctoral student (priority given to earlier registration date).

**More information :** The first and last course day will take place at Flemingsberg campus, the other course days will take place online via Zoom. For the last course day, a hybrid setup can be arranged in agreement with the organizers, but only specifically for attending students from outside Stockholm/Sweden. Additionally, the course will include usage of the online-platform Canvas, where the course leaders will provide material relevant for the course, e.g. literature, slides, or additional information.

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### Course responsible :

Nicole Marquardt

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### Contact person :

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Magdalini Lourda

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## Title : Philosophy of science and the concept of health

**Course number :** 3073

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The course aim is that the doctoral student develops a theory of science approach by enabling the doctoral student to understand, employ, reflect upon and critically assess concepts and ideas of theories of science as well as their implications for in particular medical scientific practice. A further aim is to enable the doctoral student to understand, reflect upon and critically assess views on and implications of definitions of health and disease.

**Intended learning outcomes :** Upon completion of the course, the doctoral student should be able to: - understand central concepts and problems of the theory of science, in particular those of relevance for the medical sciences - identify, analyse and critically assess scientific problems, approaches and arguments from a theory of science perspective, in particular in the field of medical sciences

**Contents of the course :** The course contains the following parts: 1. Theory of knowledge Concepts such as knowledge, truth, and science, as well as the relations between them, are discussed and problematised. Verification/falsification, logical positivism, falsificationism and demarcation are other concepts and theoretical strands to be treated. 2. Theory of science Central concepts, theories and themes within this area are paradigm, the clinical-medical paradigm, the placebo effect, scientific anomalies, and the nature of and view on knowledge within the medical sciences (e.g. randomised clinical trials). The difference and relation between science and values are also dealt with. 3. Science, pseudo-science and scientific argumentation Demarcation in practice, the difference between science and pseudo-science, and argumentation within the sciences (in particular within the medical sciences) are in focus. 4. The concept of health The concept of health is critically assessed, for example based on notions of objectivity/subjectivity. The consequences of using different types of definitions of health are analysed. Furthermore, the concept of disease is discussed, e.g. in relation to normality.

**Teaching and learning activities :** The course is given online. The teaching and learning activities used are web lectures, written examination, individual writing exercises, an individual written assignment, and reading of course literature and other distributed materials.

**Examination :** Course examination consists of three parts: - Written examination - Individual writing exercises - One written individual assignment

**Compulsory elements :** All parts of the course examination are mandatory.

**Number of students :** 10 - 16

**Selection of students :** Selection will be based on 1) the written motivation explaining why the course would benefit the doctoral studies, 2) start date of doctoral studies (priority given to earlier start date).

**More information :** The course is an online course and will be arranged over two weeks' time, 1.5 credits.

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### Course responsible :

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### Contact person :

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## Title : Cancer Cell Metabolism

**Course number :** 3076

**Credits :** 1.5

**Date :** 2023-11-27 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Microbiology, Tumor and Cell Biology

**Specific entry requirements :** Basic knowledge in Tumor Cell Biology

**Purpose of the course :** The course provides an introduction to cancer cell metabolism. Focus is on the roles of oncogenic signaling and tumor microenvironment as drivers of tumor development and progression. Therapeutic and diagnostic perspectives exploiting the altered cancer metabolism are discussed.

**Intended learning outcomes :** After the course, the student should be able to: - describe and explain the role of altered cellular metabolism in cancer development and cancer progression; - reflect upon the interaction between oncogenic signaling and tumor metabolism; - discuss how tumor metabolism may be exploited in anticancer therapies and diagnosis/prognosis.

**Contents of the course :** Overview about cell metabolism The major metabolic pathways The mitochondrion Signalling pathways and metabolic control Cancer cell metabolism Methods to study cell metabolism Targeting metabolism for cancer treatment

**Teaching and learning activities :** The course consists of lectures with invited national and international scientists with focus on Cancer cell Metabolism. The students will actively talk to the scientists in the "Meet the Scientists" format and discuss the topics during beehive discussions. The course is given full-time during 1 week. The teaching is mainly in lecture/seminar form and also includes project work. This project is presented orally on the last day of the course. The project work requires studies of a specific topic in Cancer Cell Metabolism.

**Examination :** Examination is divided into two parts: Firstly, during active participation in the "Meet the scientists" seminar and in connection with the beehive group discussion. Secondly, the students will be given an assignment to be presented on the last day of the course. This assignment is a short project proposal within one topic chosen from a list of 10. The proposal will contain an overview of the field which motivates a specific research question identified by the student/s and a brief work plan that explains how the question/hypothesis can be solved/investigated.

**Compulsory elements :** Attendance at lectures is strongly advised. Participation in the beehive and "Meet the scientists" session is mandatory. To compensate for absence due to e.g. illness the student may be required to write a report and/or discuss the missed subject with the course leaders.

**Number of students :** 8 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** There will be sessions covering the main aspects of cancer cell metabolism, given by specialists from Karolinska Institutet and international speakers.

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### Course responsible :

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### Contact person :

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## Title : An Introduction to Genetic and Molecular Epidemiology

**Course number :** 3077

**Credits :** 1.5

**Date :** 2023-10-02 -- 2023-10-11

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medical Epidemiology and Biostatistics

**Specific entry requirements :** Knowledge in epidemiology equivalent to the course Epidemiology I: Introduction to Epidemiology or corresponding courses

**Purpose of the course :** The course focuses on basic concepts, methods, and study design in genetic and molecular epidemiology research.

**Intended learning outcomes :** After successfully completing this course you are expected to be able to: - Describe the basic organization of the human genome, familial inheritance, and how genetic variation can influence complex traits. - Explain specific genetic methods and argue for how these methods can be used in epidemiological studies. - Explain different types of molecular omics techniques and argue for how these methods can be used in epidemiological studies. - Describe the fundamentals of study design, sample randomization, and common biases in analyses of genetic and molecular epidemiological data to draw conclusions on how new sample collections should be conducted. - Critically reflect upon how genetic methods can be beneficial for research and for individuals, and of ethical issues that may arise in genetic research. Intended learning outcomes are classified according to Bloom's taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956, extended by Anderson and Krathwohl, 2001).

**Contents of the course :** The course is about concepts and methods used in genetic and molecular epidemiology research. It will cover basic genetic inheritance and how genetic variation influences disease and other phenotypes. The course will introduce genetic methods such as twin studies and genome-wide association analyses, and methods based on results from genome-wide association studies (e.g. Mendelian randomization and polygenic score analyses). It will also cover common molecular methods applied in large-scale settings in epidemiology (epigenetics, transcriptomics, metabolomics, etc.).

**Teaching and learning activities :** Blended learning approach with reading sessions, lectures, and group discussions with invited experts.

**Examination :** The student has to show that all the intended learning outcomes have been achieved. An individual assessment of the learning outcomes will be a written home examination. Students who do not obtain a passing grade in the first examination will be offered a second chance of submission of home examination within two months of the final day of the course. Students who do not obtain a passing grade at the first two examinations will be given top priority for admission the next time the course is offered.

**Compulsory elements :** The individual examination (summative assessment) is compulsory.

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** The course is extended over time in order to promote reflection and reinforce learning. Course dates are October 2, 4, 6, 9 och 11. The course will be held at KI campus.

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### Course responsible :

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### Contact person :

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## Title : Gene Regulation in the Early Human Embryo

**Course number :** 3080

**Credits :** 1.5

**Date :** 2023-09-25 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Biosciences and Nutrition

**Specific entry requirements :** Knowledge in pre-implantation embryology corresponding to the course Embryology I.

**Purpose of the course :** The aim of the course is to instruct the participants in human reproductive biology with focus on gene regulation and pathways that control the early embryo formation. To provide understanding in complexity of the molecular mechanisms that involve the successful development of the early cleavage embryo, so that the student can evaluate, troubleshoot and improve existing assisted reproductive technology (ART) systems.

**Intended learning outcomes :** At the conclusion of this course students should be able to: 1. Show a good understanding of the genetic and epigenetic aspects of the preimplantation period of mammalian development that is crucial for reproductive success. 2. Show a good understanding of the dynamic changes in gene expression during human early embryo development involving differentiation, survival, fragmentation, zygotic genome activation, cell determination, embryo patterning and apoptosis, gene profiling from oocyte development to blastocyst formation. 3. Explain the general epigenetic influence of the laboratory and clinical environment on embryo culture and physical-chemical properties of the specific culture systems. 4. Produce coherent, logical and concise explanations of data and concepts in the field of gene regulation in the early human embryo - both in writing and orally, through consideration of the course material. 5. Discuss scientific literature related to ART and reproduction physiology in a constructive and informed fashion.

**Contents of the course :** 1. Genetics in oocyte maturation and embryo development 2. Importance of epigenetics in embryo development 3. Cell-cell (blastomere) interactions and receptor signaling 4. Gamete interaction 5. Zygotic genome activation 6. Embryo morphology, euploidy, aneuploidy and mosaicism 7. Implantation and post-implantation genetics 8. Genetic aspects of prenatal diagnostics, preimplantation genetic diagnosis and preimplantation genetic screening. 9. General ethical aspects 10. Literature work and discussion in reproductive genetics

**Teaching and learning activities :** The course runs for one week with lectures, and literature work as part of the course examination.

**Examination :** The examination will consist of an individual or group oral presentation on a course topic, followed by a questions and answers session and an individual written exam.

**Compulsory elements :** Attendance during the lectures and active part in the literature work.

**Number of students :** 8 - 14

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held at Karolinska Institutet, Department of Bioscience and Nutrition, NEO Huddinge.

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### Course responsible :

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### Contact person :

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## Title : Medical developmental biology

**Course number :** 3081

**Credits :** 1.5

**Date :** 2023-08-21 -- 2023-09-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department for Clinical Science, Intervention and Technology

**Specific entry requirements :**

**Purpose of the course :** The main purpose of the course is to acquire a better understanding of issues, including ethical ones, in developmental and stem cell biology with direct implications for human development and disease. Furthermore, the course will expose the students to international collaboration and provide an opportunity to build an international network.

**Intended learning outcomes :** After the course the doctoral student is expected to be able: - To fully understand and review the basic biology and definitions of embryonic and fetal stem cells, - To understand and review the most fundamental genetic and epigenetic/transcriptional regulatory mechanisms guiding the development of the essential organs, - To understand and review the basic principles of regenerative medicine and perinatal physiology.

**Contents of the course :** To achieve a better understanding of embryonic and fetal development, and to provide better healthcare for newborns and children, it is necessary to understand the development in basic research to be able to more rapidly apply such knowledge in clinical care. In this course, world-leading scientists in the fields of developmental biology, stem cell research, and regenerative medicine, will discuss the molecular mechanisms, cell biology, genetics and epigenetics of development in general and more specifically in a wide variety of organs, with a particular bias towards human development and disease. The nature of the course is translational and provide a wide range of knowledge from transcriptional mechanisms to basic physiology, ethics and patient care.

**Teaching and learning activities :** The course is based on lectures from morning to lunch by prominent lecturers. There are practical workshops and clinical visits in the afternoons. The course is considered demanding and requires full-time presence and attention.

**Examination :** Every student needs to make either a fifteen minute individual presentation or to present their projects by poster presentation. The oral and poster presentations are examined by at least four course leaders and the participants receive immediate feedback directly from the course leaders/examiners. Further feedback is given continuously throughout the course. Every student will in addition write a report that is handed in for evaluation at the end of the course. All students are also required to peer-review another student's examination report. The individual performance of each student will be evaluated separately.

**Compulsory elements :** Full presence is absolutely required. Necessary absence will be regulated with the course leader and given as extra tasks.

**Number of students :** 8 - 15

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This is a full time course during the first week (21-25 of August) with lectures from morning to lunch by prominent lecturers. There are practical workshops and clinical visits in the afternoons. The course is considered demanding and requires full-time presence and attention. During the subsequent time (26 of August to 1st of September), each student will write a short essay as part of the course examination. In addition we have a rich social program in the evenings to maximise networking with students and faculty from University of Toronto and Hong Kong Universities. Large focus of the course is international scientific exchange. Equal number of students will join from University of Toronto and one evening we will be invited to a reception at the Embassy of Canada in Stockholm. In addition, the course is open for 4 selected students based in Hong Kong Universities and Karolinska Institutet MWLC Hong Kong node. Student will get the opportunity to present their research in an evaluated poster session.

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### Course responsible :

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### Contact person :

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## Title : Cryobiology in assisted reproductive technology

**Course number :** 3089

**Credits :** 1.5

**Date :** 2023-11-27 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Biosciences and Nutrition

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is to instruct the participants in human and mouse reproductive biology with focus on cryopreservation technology and embryo banking, as well as to give them practical experience through practical demonstrations in cryopreservation of gametes and embryos in IVF technology. To provide understanding of principles of cryobiology and components of culture systems used in assisted reproduction technology (ART). Thus the student can evaluate, troubleshoot and improve existing technology.

**Intended learning outcomes :** The objectives of this course are that at the conclusion of this course students should have a good understanding of: Folliculogenesis and Fertilization; Preimplantation Embryology; sperm and oocytes retrieval; criteria of selected or scoring the gametes and zygotes for cryopreservation; liquid nitrogen handling; principles of cryobiology. Students should be aware of the general aspects and implication of the cryobiology research and the potentiality that this represents for clinical application; The principles of cryobiology; The Cryoprotectants additives and how they protect the cells by stabilizing intracellular proteins; The factors that affect cellular response to freezing; The different cryopreservation protocols and what is ongoing in this field; The cross-contamination of samples in liquid nitrogen; problems in achieving a good result of cryopreservation procedure; The possible epigenetic effects of the cryopreservation procedure; testicular and ovarian tissue cryopreservation procedures; Storage of the cryopreserved samples, the advantages of the cryopreservation and embryo bank. Finally the students will improve their capacity to produce coherent, logical and concise explanations of data and concepts - both written and oral, through consideration of the course material. Students will also develop their ability to criticize scientific literature related with cryopreservations technology and reproduction physiology in a constructive and informed fashion; Be aware of potential development of cryobiology and IVF in the future.

**Contents of the course :** Contents . Sperm-and ovogenesis and Hormonal function . Main components of the culture system . Physical-chemical properties of culture system . Functional characteristics of different tissue culture incubators . The influence of the laboratory and clinic environment on embryo culture . The morphology of oocytes, zygotes and cleavage stage embryos as well as morulae and blastocysts . Developmental milestones . Biochemical tests for predicting developmental potential . Possible effects of culture and frozen condition on epigenetics events . Clinical aspects of frozen embryo transfer . The potential of the different cryopreservation techniques in clinic application with focus on IVF . General aspects and implication of the cryobiology in research

**Teaching and learning activities :** Divided in lectures and laboratory demonstrations: 1. Embryology theory (lectures) 2. Culture system (lectures) 3. cryobiology (lectures) 4. Gametes and embryos quality evaluation (lectures) Lab.1. Laboratory demonstration in gametes and embryo retrieval; In-vitro fertilization and cryoprotectants additive; Handling with liquid nitrogen (lab). Lab.2. Evaluation of the quality of the fertilize oocytes and selection for freezing; performed cryopreservation on the selected samples (lab). Lab.3. Thawing frozen samples and quality assessment (lab). 6. Genetics and epigenetics aspects (lectures) 7. Introduction to the different cryopreservation procedures (lectures) 8. New trends in gametes and embryo cryopreservation (lectures) 9. Fertility preservation and challenge (lecture) 10. Future in human cryobiology and ethical aspects (lecture). Course test, evaluation, discussions, examination and closing of course.

**Examination :** Examination on day 5, with individual or group presentations of the literature work related to the contents of the course, discussions and feedback. Every student will be individually assessed and the students has to show that all learning outcomes have been reached.

**Compulsory elements :** The laboratory demonstrations are obligatory; there will be lectures combined with laboratory demo, but if the student will be absent of one laboratory section, the student should present a literature work related to the subject of the missing activity.

**Number of students :** 8 - 14

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held at Karolinska Institutet, Department of Bioscience and Nutrition, NEO Huddinge.

**Course responsible :**

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**Contact person :**

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# Title : Omics Data Analysis: From Quantitative Data to Biological Information

**Course number :** 3102

**Credits :** 3.0

**Date :** 2023-11-20 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Oncology-Pathology

**Specific entry requirements :** Prior knowledge of the statistical programming language R is not a requirement, but may prove useful.

**Purpose of the course :** During recent years omics data has become an integral part of many biomedical and clinical research projects. This broad introductory course aims at bridging the gap between classical biomedical research, omics technologies and bioinformatics. The course will enable students to get an introduction to omics technologies and basic knowledge of omics data analysis workflows.

**Intended learning outcomes :** After completed course, the student will be able to: \* Understand the principles and perform the basics of high-throughput technologies (genomics, transcriptomics, proteomics) and the omics data analysis workflow \* Understand the principle aspects of study design, experimental planning and sample selection \* Perform basic quality control of data by use of boxplots, principal component analysis (PCA) etc \* Explain what normalization and other forms of data transformation means and what it does to your data \* Understand the principles of, and be able to apply, basic statistics such as t-test and false discovery rate \* Understand the principles and applications of, and be able to apply, dimensionality reduction methods such as PCA and t-distributed stochastic neighbor embedding (t-SNE) / uniform manifold approximation and projection (UMAP) to omics data \* Use tools for hierarchical clustering, functional enrichment and pathway analysis \* Use tools for gene ontology (GO) annotation/enrichment \* Create informative and clear visualizations of omics data

**Contents of the course :** \* The omics data analysis workflow: from quantitative data to biological information (emphasis on analysis of quantitative Omics-data (e.g. proteomics, transcriptomics)) \* Introduction to omics technologies and data structures \* Omics experimental design and sample selection \* Introduction to data transformation and normalisation \* Introduction to basic statistics in omics data analysis: significance test/p-values/multiple testing correction/false discovery rate \* Introduction to dimensionality reduction PCA/t-SNE/UMAP \* Introduction to GO and enrichment analysis \* Introduction to correlation analysis and hierarchical clustering \* Introduction to network and pathway analysis \* Introduction to online bioinformatics resources and analysis tools \* Introduction to the R statistical programming language \* Introduction to data visualization \* Literature study with a critical view on how omics data is analyzed in clinical research. \* Current state of the art in omics data analysis is highlighted through case studies, literature studies and demonstrations

**Teaching and learning activities :** The teaching activities for the course will be based on lectures, workshops and data analysis cases. The students will participate in a literature study with discussions in seminar groups as well as an independent data analysis exam project. The students will also be able to download and use some of the software in workshops during the course. For the final data analysis workshop students may be able to work on their own datasets, or datasets will be provided for them. The R statistical programming language will be used extensively in the course.

**Examination :** The course assessment is based on two types of assignments: a literature study with a critical view on an omics data analysis subject performed in groups and an individual written omics data analysis project illustrating the different topics covered during the course.

**Compulsory elements :** \* Attendance on lectures and data analysis demonstrations. \* Attendance to literature study discussion seminar. \* Attendance to examination seminar and hand in the written examination assignments. \* Extra written literature study can be used to compensate absence.

**Number of students :** 12 - 24

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is given jointly by the doctoral programmes Allergy, immunology and inflammation (Aii), Tumor Biology and Oncology (FoTO), Biology of Infections and Global Health (BIGH) and Development and Regeneration (DEVREG). See: <https://staff.ki.se/doctoral-programmes> . The course is full time (Mon-Fri, 9-16) during two weeks and will be given on Campus Solna, KI.

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## Course responsible :

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## Contact person :

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## Title : CNS Injuries and Repair

**Course number :** 3107

**Credits :** 2.0

**Date :** 2023-09-07 -- 2023-09-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Cell and Molecular Biology

**Specific entry requirements :** The course targets PhD students and postdocs interested in regenerative medicine applied to the central nervous system (CNS).

**Purpose of the course :** To enable doctoral students and postdocs to increase their understanding of the cellular mechanisms following lesions to the central nervous system, the state-of-the-art approaches to study them and the development of regenerative therapies.

**Intended learning outcomes :** Upon successful completion of the course, the doctoral students can describe molecular and cellular mechanisms of injury response and the limitations of endogenous regenerative responses in the adult mammalian central nervous system. The participants will be familiar with the novel approaches to study CNS development, injury response and regeneration, with a focus on neural stem cells, molecular regulation of cell identity and injury response, single cell and spatial genomics and strategies to manipulate the regenerative response of resident cell populations. The participants can relate injury responses to their potential use in regenerative medicine. The participants will be able to discuss and critically evaluate different regenerative strategies to repair central nervous system lesions, from basic research to potential clinical applications.

**Contents of the course :** The lectures will include the following topics. Molecular and cellular mechanisms of injury response, following lesions to the central nervous system. Scientific approaches and technologies taken in the study of injury responses, including presentations by leaders in the field about state of the art experimental models. Experimental strategies in regenerative medicine: stem cells and reprogramming. Potential for development of regenerative therapies.

**Teaching and learning activities :** Each team will receive a specific central nervous system lesion topic (medical problem case) and will be assigned specific mandatory literature some weeks before the start of the course. Initial self-study and work in the team (corresponding to 2 days), interactive lectures of international experts in the field of central nervous system regenerative medicine, small group discussions, poster presentations and discussions (5 days on site). The initial self-study work in teams will consist of an assigned reading task regarding the course literature and discussion of an injury-regenerative strategy case. During the course the students will discuss their questions, the implications of the case and they will work on their presentations.

**Examination :** Students are examined on the outcomes of the course based on the project work in teams, individual poster presentations and active participation in discussions during the lectures. Using this specific lesion and model system as example, the students will use the recommended literature, and the new knowledge acquired during the course lectures to evaluate the known endogenous repair and regeneration mechanisms and their differences and limitations. The students will present the specific medical and experimental problems and solutions, approaches how to study central nervous system repair as well as potential approaches for regenerative medicine. This presentation will be in form of a scientific poster of which each student will present a specific part at the end of the course. All poster presentations will be held as scientific discussions with the entire group during the last day of the course.

**Compulsory elements :** Active participation in the initial project work in an assigned team, the group discussions and presentations is mandatory. Compensation is according to the instructions of the course director.

**Number of students :** 8 - 17

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held in Biomedicum on the Karolinska Institutet's Solna campus.

Designated time is 9:00 to 17:00 Monday to Friday from 2023-09-11 to 2023-09-15, including one day symposium. The course includes initial self-study and work in the team (corresponding to 2 days) before the on site part (5 days on site).

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### Course responsible :

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Solnavägen 9



## Title : Pathology

**Course number :** 3109

**Credits :** 3.0

**Date :** 2023-10-09 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Laboratory Medicine

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is to enable doctoral students lacking basic higher education knowledge in medicine to understand basic pathological events, such as tissue injury, repair and inflammation and their relation to the development of diseases, and how these alterations are coupled to the microstructure of pathological tissues.

**Intended learning outcomes :** After the course the student should 1) understand the mechanisms behind basic pathological events; 2) be able to identify selected pathological tissues at light microscopical level and describe the components/cells and their functions; 3) be able to search for and combine information regarding a selected group of diseases, followed by an oral presentation and discussion.

**Contents of the course :** The course is divided into two parts. One part illustrates cell injury, adaptation, tissue repair, inflammation, cancer development and classification. Methods in molecular pathology are discussed. During the other part of the course a selected group of diseases are studied both during digital microscopy practices and as a written and an oral presentation. How basic pathological responses to inflammation or injury might be the first steps on a multi-step path to malignancy is also discussed.

**Teaching and learning activities :** This is a full time course with lectures, demonstrations, microscopy exercises and a project work.

**Examination :** Written examination and project work.

**Compulsory elements :** Demonstration/microscopy, pathology ""tour"" and project work are compulsory. Absence is compensated with a written report.

**Number of students :** 8 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :**

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**Course responsible :**

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# Title : Tumor Immunology and Immune Therapy of Cancer

**Course number :** 3110

**Credits :** 1.5

**Date :** 2023-11-13 -- 2023-11-17

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Oncology-Pathology

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is to deepen the knowledge in the field of tumor immunology. More specifically, to understand how the immune system is regulated in cancer and how this knowledge can be used to treat patients with cancer.

**Intended learning outcomes :** Upon completion of the course the students will be able to; (1) explain central concepts of tumor immunology, (2) discuss specific forms of immunotherapy including cellular therapy, cancer vaccination, and immune checkpoint inhibition and 3) explain advantages and disadvantages of such therapies, (4) describe different mechanisms of immune escape and 5) how the tumor microenvironment impacts on anti-tumor immune responses, and 6) discuss the rationale how different immunotherapies can be combined with conventional cancer therapies and how such therapies impacts on clinical outcome in patients with cancer.

**Contents of the course :** This course covers basic and applied immunology and a current review of experimental research and clinical application of tumor immunology. Both pre-clinical and clinical aspects of cancer vaccination, adoptive cell therapy, and antibody therapy will be discussed. Development of novel therapies through modification of immune cell subsets will be presented. Features of the tumor microenvironment, cancer-associated inflammation, immune surveillance and escape, and immunosuppression will also be discussed. One day is dedicated to lectures by invited international experts in the field.

**Teaching and learning activities :** Introductory lectures on immunology and tumor immunology. Specific lectures on different forms of immunotherapy including cellular therapy, cancer vaccination, and immune checkpoint inhibition. Approximately ten lectures in total. Reading and group discussions on contemporary literature. Group discussions and presentation on a selected topic. Class room discussions and summary of each day.

**Examination :** Oral group presentation and individual assignment based on case-studies and a written examination. Each student will be individually assessed.

**Compulsory elements :** All lectures and teaching activities are mandatory. Absence from mandatory parts of the course will have to be compensated by other relevant activities after discussion with the course leaders.

**Number of students :** 16 - 32

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :**

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## Course responsible :

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## Title : Basic Course in Tumor Biology and Oncology

**Course number :** 3112

**Credits :** 3.0

**Date :** 2023-09-25 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Oncology-Pathology

**Specific entry requirements :**

**Purpose of the course :** This course is an introduction to modern cancer research and oncology. The course is recommended to all PhD students within the field of basic and clinical cancer research. The purpose of the course is to give a general overview of CLINICAL ONCOLOGY and the molecular mechanisms that promote the carcinogenic transformation. The overall aim of the course is THEREFORE to form a bridge between pre-clinical and clinical aspects of tumor biology and oncology for PhD students and to provide the students a BROAD understanding of cancer. We aim to link the basic tumor biology concepts with the main principles of diagnosis and treatment of cancer patients in line with the modern concept of translational and personalised cancer medicine.

**Intended learning outcomes :** Upon completion of the course the students will be able to; • Explain the concepts of modern cancer treatments in relation to basic cancer biology. • Understand concepts of clinical cancer management, personalized cancer medicine and outcome evaluation in cancer. • Reflect on and discuss the concept of clinical trials, the role of translational research and the challenges thereof. • Reflect on and discuss the most important problems that need to be solved in cancer. • Reflect on and discuss future goals in cancer prevention, diagnostics and therapy.

**Contents of the course :** The course will describe the causes as well as the consequences of the transformation of a normal cell into its malignant counterpart, in order to create an understanding of cancer --from molecule to patient--, eventually also discussing the management and treatment of cancer. The topics of the course include genetics, the cell cycle, apoptosis, immunology, diagnosis and treatment, all topics presented from the cancer perspective. There will be focus on a few malignant diseases, described in more detail serving as models for basic concepts of Tumor Biology and Oncology, including molecular genetics, curative treatment and palliative care, psychosocial aspects of cancer, ethics and epidemiology.

**Teaching and learning activities :** The course consists of introductory lectures on cancer management and concepts in cancer, and specific lectures including cancer biology and clinical applications. Reading and group discussions. Group seminars and presentations All students will be offered a possibility to visit the the clinic and meet cancer patients.

**Examination :** Written individual examination and oral presentation of the group assignment based on the concept of cancer and tumor biology. Each student will be individually assessed.

**Compulsory elements :** Full time during two consecutive weeks. All lectures and teaching activities are mandatory. Single missed occasions will have to be compensated by other relevant activities after discussion with the course leaders.

**Number of students :** 12 - 30

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held at KI campus and at Karolinska University hospital.

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### Course responsible :

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### Contact person :

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## Title : Molecular Immunology

**Course number :** 3114

**Credits :** 3.0

**Date :** 2023-10-02 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Microbiology, Tumor and Cell Biology

**Specific entry requirements :** Basic knowledge in immunology corresponding to the learning outcomes of the courses "Basic immunology".

**Purpose of the course :** This course is an extension of the Basic Immunology course and is suitable for students who already have some background knowledge of immunology. The aim of the course is to expose students to the molecular aspects of the immune responses.

**Intended learning outcomes :** After the course, the student should be able to relate their own research project to the cutting-edge developments in other areas of immunology research. Furthermore, they should be able to present novel information about an immunological problem or a specific technique.

**Contents of the course :** The course covers topics of immune cellular interactions, immune cell signalling as well as the role of epigenetics and genetics in determining immune responses and immune cell development. Students will be asked to study an immunological method or problem deeply at the theoretical level.

**Teaching and learning activities :** Lectures, seminars and oral presentations. The course is given over 2 weeks. Invited national and international lecturers give their views on selected problems, or techniques, in immunology. The seminars take off from basic facts, and after that the speakers move on to current problems, and focus on both scientific and methodological aspects. During the course the students will be expected to present orally selected topics within the field of immunology focusing on molecular events important in the development or maintenance of immune responses. At the end of the course, the students will write an essay on these methods or problems.

**Examination :** Oral presentation of selected topics and a final written exam based upon take home essay questions. These questions cover current problems, theories in immunology or relate the student's own research to cutting edge developments in the other areas of immunology research.

**Compulsory elements :** Oral presentation of selected topics. If a student misses the presentation, a special presentation with the course leader will be arranged.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Course will be held on the Solna campus and online

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### Course responsible :

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## Title : Forskningsetik

**Course number :** 3118

**Credits :** 1.5

**Date :** 2023-08-29 -- 2023-09-19

**Language :** Swedish

**Level :** Forskarnivå

**Responsible KI department :** Department for Clinical Science, Intervention and Technology

**Specific entry requirements :**

**Purpose of the course :** Få en inblick i och förståelse av centrala forskningsetiska teorier, principer och riktlinjer och därmed få möjlighet att reflektera över etiska aspekter av den egna och andras forskning.

**Intended learning outcomes :** Den forskarstuderande ska efter att ha gått kursen kunna: 1. Redogöra för forskningsetiska teorier, principer och till viss del riktlinjer, 2. Visa kunskap angående vanliga forskningsetiska problemsituationer och de etiska verktygen som kan användas för att hantera forskningsetiska konflikter  
**Färdigheter:** Den forskarstuderande ska efter att ha gått kursen kunna: 1. Analysera forskningsetiska konflikter, 2. Ge hållbara forskningsetiska argument för eller mot ett förfarande  
**Förhållningssätt:** Den forskarstuderande ska efter att ha gått kursen ha: 1. Utvecklat ett forskningsetiskt förhållningssätt till andra forskarstuderande, handledare och seniora forskare, 2. Förståelse för hur ett etiskt förhållningssätt uppfattas hos allmänheten 3. Förståelse för vilken roll forskarens egen hederlighet och integritet har

**Contents of the course :** Att ge en introduktion till etiken i samband med forskning och en orientering om dess tillämpning på problem inom det vetenskapliga området. Kursen behandlar bl.a. följande teman: centrala etiska principer, teorier och argument, forskningsetik/forskareetik, grundläggande värderingar och normer för god sed i forskningen, innehåll i och värdet av regelverk så som Helsingforsdeklarationen dess funktion, tillämpning, möjligheter och begränsningar, etikprovningar, avvikelser från värderingar, forskningsfusk och vetenskaplig oredlighet. Det informerade samtyckets historia och komponenter. Försöksdjursetisk, innefattande argument för och emot att använda olika djur för forskningsändamål samt de 3 R:en. Hantering av vetenskapligt författarskap (medförfattarskap, författarordning) och intressekonflikter i forskningen.

**Teaching and learning activities :** Föreläsningar (ca 6t), gruppövningar, seminarier(ca 8t) och muntlig och skriftlig presentation

**Examination :** Vi bedömer att lärandemålen för kursen är uppnådda genom examination som består av fyra delkomponenter: i) formativ bedömning i samband med aktivt deltagande i seminarier, ii) en muntlig presentation av etiska dilemman i eget eller aktuellt forskningsområde, iii) ett skriftligt PM där synpunkter från opponent på den muntliga presentationen inarbetats, och iv) opponering på annan students presentation av etiska dilemman i forskning. Godkänd kurs innebär att det framgår att erforderliga kunskaper, färdigheter och förhållningssätt har uppnåtts genom aktivt deltagande i seminarier och godkänd muntlig och skriftlig presentation av examinationsuppgiften samt opponering på annan students presentation av etiskt dilemma.

**Compulsory elements :** Obligatoriskt är att delta vid introduktionstillfället och vid seminarier. Vid frånvaro kan detta kompenseras med utökad PM skrivande och muntlig presentation för kursen eller kursgivare.

**Number of students :** 10 - 20

**Selection of students :** Urvalet baseras på 1) kursplanens relevans för den sökandes doktorandprojekt (enligt motivering), 2) startdatum för doktorandstudier

**More information :** Kursen ges digitalt en eftermiddag per vecka (tisdagar kl.13:30-17:15) under total fyra veckor. Kursen innehåller föreläsningar, seminarier, gruppövningar samt studenters muntliga och skriftliga presentationer. Mellan kurstillfällena finns material att läsa enligt schema som ges till antagna studenter.

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### Course responsible :

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### Contact person :

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## Title : Flow cytometry: from theory to application

**Course number :** 3120

**Credits :** 1.5

**Date :** 2023-10-09 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Solna

**Specific entry requirements :**

**Purpose of the course :** The course aims to provide doctoral students with: 1) a systematic introduction of flow cytometry, 2) an overview of flow cytometric applications in biomedical research, and 3) a hands-on opportunity of flow cytometry lab training designed for various levels of flow cytometer users.

**Intended learning outcomes :** Through this one-week course, the participants will acquire the knowledge of flow cytometry principles. They will know flow cytometric sample preparation and analysis, protocol set-up, major flow cytometric applications, as well as data interpretation and presentation.

**Contents of the course :** The course covers basic knowledge and main applications of flow cytometry, and contains both lectures and laboratory/group work. Experts in different fields of flow cytometric application are invited to give the lectures. The participants will be able to learn: a) Principles of flow cytometry: working mechanisms of flow cytometer; molecular and cellular probes for flow cytometry; quality control; and safety procedures and instrument maintenance. b) Basic skills: flow cytometric protocol design; sample handling and storage; data processing and analysis, and data presentation. c) Major applications of flow cytometry in biomedical research: leukocyte phenotyping, endothelial cell analysis, stem cell analysis, apoptosis, platelet measurement, cell function analysis (including membrane potential, oxidative metabolism, intracellular calcium mobilization, pH, and intracellular organelles), as well as nucleic acid analysis.

**Teaching and learning activities :** The course includes 28 hr lectures and 12 hr hands-on lab work.

**Examination :** The exam consists of two parts: a 30 min written test on flow cytometric principles; and a 60 min hands-on lab work examining flow cytometric lab skills.

**Compulsory elements :** The participants must attend hands-on lab sections during two afternoons. The students who have missed these sections can book extra lab section time within 4 weeks to compensate the absence.

**Number of students :** 20 - 32

**Selection of students :** Selection will be based on: 1) The relevance of flow cytometry for the applicant's project (according to written motivation) 2) Urgency of flow cytometry training for the applicant's project (according to written motivation) 3) Previous application (priority given to those who have applied previously)

**More information :** Course will be given during week 41 (Oct 9-13, 2023; 9:00-16:30). The major part of the course activities will be onsite, while some lectures may be given via Zoom for our responsibilities of sustainable development and minimizing environment burden of travelling. The course will have one whole-day wet lab sessions. Course lecture hall have been booked at Fakultetssalen/Faculty lecture hall, L1:00, Karolinska University Hospital-Solna. Lectures will be given by 14-15 lecturers, usually half of them from institutions outside KI, with two to three lecturers from abroad. All the lecturers are well-established experts in their lecture subjects of flow cytometric applications. The course has been given 1-2 times/year at KI for 23 years. It has been highly appreciated by the participants throughout the years, with a median general satisfaction score never below 8 (out of 9; referred to paper-based course evaluation between 2001-2013), and highly remarked with the electronic course evaluation (since 2014).

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### Course responsible :

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## Title : Experimental techniques in study of metabolic and endocrine disorders

**Course number :** 3121

**Credits :** 1.5

**Date :** 2023-10-09 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Molecular Medicine and Surgery

**Specific entry requirements :**

**Purpose of the course :** This course will enable the doctoral student to acquire the necessary knowledge to address experimentally key points of metabolic characterization of experimental models in diabetes research.

**Intended learning outcomes :** After the course the students will be able i) to measure glucose transport in isolated rodent skeletal muscle; ii) to measure lipolysis in isolated adipocytes; iii) to dissect out mouse pancreatic islets and measure the insulin release; iv) to judge and analyze obtained data. The students will also be able to describe the possibilities and limitations of the above techniques.

**Contents of the course :** The course is laboratory based, aiming to give all participants hands on experience with isolation of pancreatic islets, skeletal muscle and adipose tissue. Techniques for measurement of glucose transport in isolated rodent skeletal muscle, of lipolysis in isolated adipocytes, and for studying insulin release from pancreatic islets will be covered. Theoretical and practical considerations will be presented and discussed.

**Teaching and learning activities :** The course meets for five days full time, including three full day laboratory practical sessions. The first day will consist of several lectures to give a background to the metabolic questions which will be addressed in the practical part of the course. Our aim is to provide the student with a hands on experience of each technique covered. In order to achieve this, for the laboratory work the course participants will be subdivided into smaller groups.

**Examination :** Summative assessment of the laboratory notebook notes from each student, of a short oral presentation of the project work, of the discussions with the course leader and the other students, and of a short summary of the project work by each group.

**Compulsory elements :** All three laboratory tasks are compulsory; as an exception, a written task could be given to a participant to compensate absence.

**Number of students :** 9 - 18

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This practical course will be held in Solna and Flemingsberg KI campuses, from Monday to Friday week 41, 9-13 of October 2023.

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### Course responsible :

Alexander Chibalin

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### Contact person :

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## Title : Human Cell Culture. Methods and Applications

**Course number :** 3127

**Credits :** 1.5

**Date :** 2023-10-02 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** The institute of Environmental Medicine

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is to enable doctoral students to acquire state-of-the art knowledge and good understanding of human cell culture.

**Intended learning outcomes :** After the course the students should be able to: - Describe the theory and give examples of practical applications of human cell culture. - Explain basic and state-of-the-art methods applied to cell cultures. - Discuss possibilities and challenges in cell culture work.

**Contents of the course :** Cell culture reflecting stem, transit amplifying, differentiated and terminally differentiated tissue states. Monolayer and organotypic culture involving one or more cell types. Applicability of cell cultures as alternatives to laboratory animal experiments. Mechanisms regulating cell growth and viability, differentiation and apoptosis. Assessment of cell transformation to immortal and malignant phenotypes. Isolation of specific cells, e.g., epithelial cells, characterisation of cultured cells. Handling and sterile techniques, choice of materials and media for cell culture, e.g., serum-dependent vs. serum-free culture conditions. Cell cloning and gene transfer. Practical handling of cultures: thawing/freezing, passage, expansion and long-term storage. Handling of normal and tumor tissue for optimizing obtainment of cultures. High-throughput screening technologies. Tissue engineering practices. Transcriptomics, proteomics and informatics methods for biomedical research with cell lines. Discussion of participants' own culture experience and problems.

**Teaching and learning activities :** Interactive lectures, laboratory work, computer exercises and group discussions on pitfalls and possibilities with cell cultures.

**Examination :** Examination is in the form of a written assignment and oral presentation.

**Compulsory elements :** Participation in interactive lectures, group discussions, laboratory work and oral examination is compulsory. Absence from compulsory elements can be compensated by participation at the next course occasion.

**Number of students :** 8 - 15

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held on campus Solna.

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### Course responsible :

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# Title : Epidemiology I: Introduction to epidemiology

**Course number :** 3128

**Credits :** 1.5

**Date :** 2023-11-06 -- 2023-11-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** The institute of Environmental Medicine

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is to give an introduction to epidemiological theory and practice.

**Intended learning outcomes :** After successfully completing this course students are expected to be able to: - give examples of the contribution of epidemiology to science and discuss the importance of epidemiology as a research discipline. -estimate and in a general way interpret measures of disease occurrence and measures of association, and describe how a specific measure is governed by the study design. -explain strengths and weaknesses of common epidemiological study designs. -identify and explain possible sources of bias in epidemiological studies. -describe theoretical models for causation and discuss the principles of causal mechanisms. -apply knowledge of epidemiological concepts when critically reviewing scientific literature. Intended learning outcomes are classified according to Bloom's taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956, extended by Anderson and Krathwohl, 2001).

**Contents of the course :** The course gives an introduction to epidemiological theory and practice. It comprises basic principles regarding design, interpretation, and analysis of epidemiological studies. It introduces the concept of causation, concepts related to measures of disease occurrence and measures of association, common designs for epidemiological studies (with main focus on cohort studies), and the role of bias.

**Teaching and learning activities :** The course focuses on active learning, i.e. putting knowledge into practice and critically reflecting upon the knowledge, rather than memorising facts. Different strategies for teaching and learning will be used, such as lectures, group discussions and various forms of group exercises on selected topics.

**Examination :** To pass the course, the student has to show that the learning outcomes have been achieved. Assessments methods used are group assignments (formative assessments) along with an individual examination (summative assessment). The examination is viewed as contributing to the development of knowledge, rather than as a test of knowledge. Students who do not obtain a passing grade in the first examination will be offered a second chance to resubmit the examination within two months of the final day of the course. Students who do not obtain a passing grade at the first two examinations will be given top priority for admission the next time the course is offered.

**Compulsory elements :** The individual examination (summative assessment) is compulsory.

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** The course is extended over time in order to promote reflection and reinforce learning. Course dates are November 6, 8, 10, 13 and 15.

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## Course responsible :

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## Contact person :

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## Title : Basic Course in Medical Statistics

**Course number :** 3134

**Credits :** 3.0

**Date :** 2023-11-13 -- 2023-11-24

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is to introduce the basic statistical methods and the fundamental principles of statistical inference and to offer basic skills that involve hands on data analysis using statistical software.

**Intended learning outcomes :** The course participants shall after the course be able to; 1) perform and interpret basic descriptive statistics from frequency tables and graphical presentations, 2) perform and interpret results from basic inferential statistical analysis and tests, 3) recognize and critically examine the statistics being presented in articles within the medical field of research.

**Contents of the course :** Concepts being treated are descriptive vs inferential statistics, collection of data and study design, different types of data and level of measurement, independent and dependent samples, correlation and regression, hypothesis testing and different type of statistical errors in relation to the testing and data collection procedure. The major topics for the course are t-test, chi-square test, nonparametric test and regression analysis, and how to evaluate the assumptions for the different techniques.

**Teaching and learning activities :** This course is a Team-Based Learning (TBL) course. TBL is a specific form of learning method that integrates individual assessment and group work with immediate feedback. Focus will be on solving statistical problems in a team setting. This two weeks course consists of online preparation through video lectures and exercises, and several TBL sessions (in class meeting). The time in between TBL sessions will be spent reading the course material, and preparing for the assessment and group application exercises.

**Examination :** Individual and group readiness assurance tests, as well as application exercises.

**Compulsory elements :** In class attendance during TBL sessions are mandatory for passing grade. If a student misses one of the five TBL sessions a supplementary exercise will be given. If the student misses more than one TBL session it is recommended that the student takes the course at another occasion (since absence also affects the other members of the team).

**Number of students :** 35 - 45

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This course is a TBL-course, former 3134. TBL, Team-Based Learning, is a special form of learning that integrates individual work, group work and immediate feedback. Focus will be on solving statistical problems in group/team setting. Apart from individual work, the students are expected to be physically present for 2-3 full days per week for two weeks. These dates are November 13 (10-12), November 14 (10-16:00), November 16 (10-16:00), November 20 (10-16:00), November 22 (10-16:00) and November 24 (9-12:00)

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### Course responsible :

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## Title : Epidemiology II. Design of Epidemiological Studies

**Course number :** 3138

**Credits :** 1.5

**Date :** 2023-12-07 -- 2023-12-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** The institute of Environmental Medicine

**Specific entry requirements :** Knowledge in epidemiology equivalent to "Epidemiology I: Introduction to epidemiology" or corresponding courses.

**Purpose of the course :** The course focuses on key considerations in designing and critically interpreting different types of case-control studies, as well as matching in cohort and case-control studies.

**Intended learning outcomes :** After successfully completing this course you as a student are expected to be able to: - in a self-directed manner, formulate the principles of different types of common epidemiological study designs. - mainly independently, explain how a specific measure of disease occurrence and measure of association is governed by the study design. - in a self-directed manner, explain and discuss epidemiological concepts, including accuracy, in the context of different epidemiological study designs. - draw conclusions from epidemiological scientific papers and to review and criticize these regarding study design, results and accuracy. Learning outcomes are classified according to Bloom's taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation.

**Contents of the course :** The course focuses on issues related to study design with emphasis on case-control methodology and different types of sampling strategies, study base, study efficiency, matching in epidemiological studies, induction time, interpretation of epidemiological evidence.

**Teaching and learning activities :** Lectures, group discussions and various forms of group exercises on selected topics, will be used. The course focuses on active learning, i.e. putting knowledge into practice and critically reflecting upon the knowledge, rather than memorising facts.

**Examination :** To pass the course, the student has to show that the learning outcomes have been achieved. Assessments methods used are group tasks (formative assessments) along with a written individual task (summative assessment). The examination is viewed as a contributing to the development of knowledge, rather than as a test of knowledge. Students who do not obtain a passing grade in the first examination will be offered a second examination within two months of the final day of the course. Students who do not obtain a passing grade at the first two examinations will be given top priority for admission the next time the course is offered.

**Compulsory elements :** The individual examination.

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** The course is extended over time in order to promote reflection and reinforce learning. Course dates are December 7, 8, 11, 13 and 15. The course will be held at KI campus.

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### Course responsible :

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### Contact person :

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# Title : Embryology I

**Course number :** 3150

**Credits :** 1.5

**Date :** 2023-11-06 -- 2023-11-10

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Biosciences and Nutrition

**Specific entry requirements :**

**Purpose of the course :** The aim of the course is to instruct the participants in human reproductive biology with focus on assisted reproduction technologies (ART), as well as to give them practical experience through practical demonstrations in embryological and micro-manipulation techniques. To provide understanding of the components of culture systems used in ART, so that the student can evaluate, troubleshoot and improve existing systems.

**Intended learning outcomes :** At the conclusion of this course students should show a good understanding of: Laboratory environment, input materials. Physical-chemical properties of culture system. Functional characteristics of different workstations for ART and their benefits. The influence of the laboratory and clinic environment on embryo culture. The morphology of oocytes, zygotes and cleavage stage embryos as well as morulae and blastocysts. Developmental milestones. Student should be aware of the general aspects and implication of the stem cells research and the potentiality that this represent for clinical application. Morphological aspects of the blastocysts for derivation of ICM and Derivation methods. Characterization of the embryonic stem cells and the importance of the pluripotency of these cells. The different differentiation assay on stem cells and what is ongoing in this field. The production of isogenics embryonic stem cells by somatic cell nuclei transfer or therapeutic clone (SCNT). Finally the students will improve their capacity to produce coherent, logical and concise explanations of data and concepts - both written and oral, through consideration of the course material. Students will also develop their ability to criticize scientific literature related with ART and reproduction physiology in a constructive and informed fashion.

**Contents of the course :** Sperm theory (lecture) 1. Anatomy of the testis, sperm production and maturation, fertilization. 2. Cryopreservation of spermatozoa. 3. Sperm preparation for IVF and ICSI, criteria for ICSI. Embryology ( Lecture) 1. Follicle growth and maturation, ovulation. 2. Cell biology and oocyte genetics. 3. Embryo development in-vitro, morphological evaluation of embryos. 4 Cryopreservation of embryos, theory and practice. 5. Embryonic stem cells. 6. Selection of embryos for transfer and cryopreservation. Technical demonstrations (Lab) 1. How to work with sperm, oocytes and embryos. 2. Manipulation and training with mouse oocytes and mouse embryo handling. 3. Micro manipulation techniques, presentation. 4. Micromanipulation training. ICSI and embryo biopsy. Genetics (Lecture) 1. Genetic aspects of prenatal diagnostics and PGD. 2. Cloning techniques.

**Teaching and learning activities :** The course runs for one week with lectures, and practical demonstration in embryo-micro manipulation techniques (intra-cytoplasmic sperm injection and Embryo biopsy for PGD).

**Examination :** Individual written exam on the last day of the course.

**Compulsory elements :** The laboratory demonstrations are obligatory. The student should compensate for absence at a laboratory demonstration by presenting a literature report in agreement with the course leader.

**Number of students :** 8 - 14

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held at Karolinska Institutet, Department of Bioscience and Nutrition, NEO Huddinge.

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## Course responsible :

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**Contact person :**

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## Title : Mechanisms of Gene Regulation in Metabolism

**Course number :** 3157

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Physiology and Pharmacology

**Specific entry requirements :**

**Purpose of the course :** The students of this course will get a broad perspective of how the regulation of gene expression is linked to metabolic and endocrine regulation in different tissues. The course will also cover molecular and physiological aspects related to inter-organ communication, and how this is essential to maintain metabolic homeostasis.

**Intended learning outcomes :** At the end of the course students will understand and be able to discuss the different mechanisms that regulate gene expression. They will be able to describe how these processes can affect metabolic disease and disease progression. The students will be able to choose the most appropriate methodologies to study diverse aspects of gene regulation in metabolism.

**Contents of the course :** This course aims at giving students an overview of the current understanding of how metabolism and metabolic dysfunction are controlled at the level of gene regulation. During one week, students will focus on the genetic and epigenetic mechanisms that affect transcriptional output in diverse organs and tissues in health and disease situations. This will include: basic mechanisms of gene transcription, transcription factors and coregulators, mRNA splicing and genetic variability, the chromatin landscape and associated DNA and histone modifications, noncoding RNAs and regulation of gene expression. Attention will be given to single gene analysis as well as global regulation of gene expression. In each module the student will be introduced to the basic concepts in the field and analyze situations in which dysregulation of the processes under examination leads to metabolic disease. Each module will include a chapter dedicated to the presentation and discussion of current experimental approaches relevant to research in that particular field of science.

**Teaching and learning activities :** This course will consist mainly of lectures and group discussions covering both theoretical and practical questions related to the different areas of gene regulation and metabolism. Some sessions will be dedicated to problem solving and presentation of state-of-the-art methodologies relevant to research in each field.

**Examination :** Examination will consist of an oral presentation in which students discuss an example of metabolic disorder caused by dysregulation of gene expression and propose a research plan to further study that problem. Students will be able to discuss each other's presentations. The research plan should include appropriate methodology learned during the course.

**Compulsory elements :** Presence at lectures, group work, and final presentation and discussion is mandatory. To compensate for absence a written essay on the missed topic must be performed.

**Number of students :** 8 - 30

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held at campus Solna.

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**Course responsible :**

Duarte Ferreira

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**Contact person :**

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# Title : Extracellular Vesicles: Progress Towards Diagnostics and Therapy

**Course number :** 3175

**Credits :** 2.0

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Laboratory Medicine

**Specific entry requirements :**

**Purpose of the course :** It is only in the past decade that extracellular vesicles (EVs) have been discovered to mediate essential biological processes and cell-cell communication in both health and disease. In addition to characterizing their roles in vivo, these findings have also given rise to unique strategies to treat and diagnose disease. The goal of this course is to expand student's knowledge of EV diversity, biological function and potential applications.

**Intended learning outcomes :** After the course is completed, the student will: -Be able to describe the basics of EV biology and function, as well as a number of novel technologies for EV isolation and characterization. -Gain the skills necessary to critically evaluate publications and methods used in the EV field. -Gain an appreciation for the breadth and relevance of the EV field at present and the questions that are yet to be addressed.

**Contents of the course :** The course will cover key developments in EV biology, function and clinical application. This will begin with an introduction to EV diversity and biogenesis, as well as important examples of their in vivo roles in health and disease. It will include an overview of the most important methods used for EV isolation and characterization. Finally, we will discuss the latest strategies for utilizing EVs as tools in diagnostics and the treatment of disease. Students will play an active role in discussions with experts, as they give summaries of the latest findings in the EV field.

**Teaching and learning activities :** This course will primarily consist of interactive lectures with corresponding review papers. The information gained from these will be used for small group discussions and presentations, where the students will be required to take part in assessing the progress and pitfalls within the field. The examination will be a written report that is handed in after the course.

**Examination :** A written project report, consisting of two A4 pages covering one of the three topics provided by the course leaders, is expected to be handed in within one week of the course ending. We will also evaluate individuals for their contributions to group discussions and presentations. These elements will be evaluated for each student's understanding of the central concepts in EV biology, function and clinical application.

**Compulsory elements :** Students will be required to attend the lectures and discussions held during the course. The examination must be handed in within one week of course completion. Absence from any component must be compensated for by individual written assignments on the topics missed

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held in Novum on the Flemingsberg campus of Karolinska Institute. Lectures and discussions will be held between 9-16:30, October 16-20, 2023.

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## Course responsible :

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## Contact person :

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## Title : Basic Immunology

**Course number :** 3187

**Credits :** 3.0

**Date :** 2023-09-04 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :** Knowledge in basic cell biology

**Purpose of the course :** To give doctoral students the possibility to acquire a solid knowledge and understanding of fundamental principles in immunology. All other courses in the doctoral education program Aii (Allergy, immunology and inflammation) assume that students have taken the Basic Immunology course, or otherwise have attained the same level of previous knowledge and understanding.

**Intended learning outcomes :** To be able to: - Explain the basic principles of innate and adaptive immunity and how different components of the immune system cooperate. - Describe and compare principles of immune-related diseases in a clinical perspective. - Apply knowledge gained on the function of the immune system to propose an experimental project in immunology in the form of a written assignment, that will be discussed in pairs. - Review a chosen immune cell type/process/disease, which will be presented as a group project.

**Contents of the course :** The course is separated into two parts. In part 1 we discuss basic immunological mechanisms within the innate and adaptive immune response. In part 2 we apply the knowledge in clinical settings such as defence against infection, autoimmune and allergic diseases or transplantation. Part 1: An overview of the immune system, T cells, B cells, Antigen presenting cells, Innate lymphoid cells, Innate vs adaptive immune responses. Part 2: Immune defence against bacterial and viral infections, Primary immunodeficiencies, Autoimmune disease, Allergy, Vaccination, Clinical Immunology, Transplantation, Tumour Immunology. Questions and discussions. Presentation of projects.

**Teaching and learning activities :** The course consists of lectures and seminars arranged during mornings five days per week. In the afternoon, students are assigned for reading to prepare for the next day's topics as well as project work, further reading, meeting with mentors and a written assignment. Course literature will be available on the course platform in advance of the course start and will be the basis for active discussion during the lectures. We will run exercises and immunological quizzes connected to the different parts of the course, so that the student will be able to digest the relatively big material. On the last day of the course the project work will be presented orally.

**Examination :** Each student will be examined on the project work and the written assignment, as well as its contributions during the discussions. The project work will be evaluated by the group project mentor and by the course organizers during the oral presentations of the work. The individual written assignment is evaluated by the course organizers and will be discussed in pairs.

**Compulsory elements :** All activities included in the course are compulsory. Absence needs to be compensated for in agreement with the course director.

**Number of students :** 12 - 32

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This will be a in-person course run in two blocks of 5 days: 23/09/04 to 23/09/08, and 23/09/25 to 22/09/29. Lectures will be held during the mornings (9:00 to 13:00) at the Center for Molecular Medicine (CMM), Visionsgatan 18, KI Solna Campus. Literature will be provided in advance. Afternoons are reserved for reading in preparation for the subsequent days as well as for both individual and group projects.

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### Course responsible :

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### Contact person :

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Bruno Raposo

Institutionen för medicin, Solna



# Title : Clinical and Experimental Neuroimmunology

**Course number :** 3200

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :**

**Purpose of the course :** The purpose of this course is to enable doctoral students and other participants to gain an understanding of the major neuroinflammatory diseases and the key players involved, including the interaction between the central nervous and immune systems. An additional purpose is that those who participate in the course learn to understand critical aspects of creating and using experimental systems to model neuroinflammatory diseases.

**Intended learning outcomes :** After this course the students should be able to: (i) describe the basic clinical characteristics of the major neuroinflammatory diseases; Multiple Sclerosis (MS), Myasthenia Gravis (MG) Guillain-Barré Syndrome (GBS), and Narcolepsy, (ii) explain how to create experimental models for neuroinflammatory diseases in rats and mice, compare models and discuss their advantages and limitations, (iii) evaluate and interpret new findings and recent scientific papers in the field in relation to main previous findings and (iv) speculate on and discuss molecular mechanisms underlying neuroinflammatory disease and hypothesize how knowledge on these mechanisms can enable therapy and prevention.

**Contents of the course :** The course includes an overview of clinical symptoms, signs, pathology, treatments and diagnostic criteria for the most important neuroimmunological diseases including MS, MG GBS/CIDP and Narcolepsy. Also included is an overview of experimental models of neuroimmunological diseases, with an emphasis on techniques for genetic analysis (designing and creating intercrosses, congenics, transgenics in rats and mice etc). Key molecular concepts in neuroinflammation are covered such as immune mechanisms (the blood-brain barrier (BBB), major cell players, MHC-TCR interaction, costimulation, chemoattraction) as well as key tissue degeneration/regeneration. Different techniques used to study neuroinflammation are discussed including imaging, high-throughput genotyping, expression analysis and proteomics.

**Teaching and learning activities :** The course combines: (i) traditional lectures (usually in the morning), given by the experts in the field, (ii) presentation of diverse experimental models, (iii) a structured discussion in small groups to design an experimental model for one of the major neuroinflammatory diseases with a short presentation to the class, followed by the evaluation of strengths and weaknesses of an experimental model proposed by another group and (iv) an individual assignment followed by an interactive presentation/discussion on the last day. The assignment will preferably consist of a presentation of a high-impact scientific paper relevant to the student's own research topic, and that is of importance for the neuroimmunology field. Alternatively, experimental setting/data as a part of one's own doctoral project may be presented.

**Examination :** Examination will be based on the groups assignment/discussion and the individual assignment, including the subsequent discussions (please see "Teaching and learning activities") and the feedback given to other students on their assignments. In their presentations, students should be able to comment on the design of their experimental model for one of the major neuroinflammatory diseases or article of choice in the context of the items described above under "learning outcomes". Guidelines for the preparation of the assignments will be sent out to the students two weeks before the start of the course.

**Compulsory elements :** All lectures, demonstrations and group tasks are compulsory. Compensation for absence can be discussed with the course directors, and may involve literature reviews with written reports on the topic missed.

**Number of students :** 8 - 30

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This course is given jointly by the doctoral programmes Allergy, immunology and inflammation (Aii) and Neuroscience (Neuro). See: <https://ki.se/en/staff/doctoral-programmes>. Time: Monday-Friday, 9:00-17:00; Location: Center for Molecular Medicine (CMM), Karolinska University Hospital, Solna, building L8, lecture hall/seminar room and conference room.

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**Course responsible :**

Manuel Zeitelhofer

Department of Medical Biochemistry and Biophysics

Manuel.Zeitelhofer@ki.se

**Contact person :**

Pernilla Strid

Institutionen för klinisk neurovetenskap

Pernilla.Strid@ki.se



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Milena Zeitelhofer-Adzemovic  
Institutionen för klinisk neurovetenskap

Milena.Zeitelhofer-Adzemovic@ki.se

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## Title : Function B - to Design Procedures and Projects Involving Research Animals

**Course number :** 3214

**Credits :** 3.0

**Date :** 2023-11-07 -- 2023-12-14

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Comparative medicine

**Specific entry requirements :** Previous education in laboratory animal science to carry out scientific procedures on animals (i.e. Function A).

**Purpose of the course :** The course provides education to doctoral students and scientists who will be involved in the design of scientific procedures involving research animals as part of their research. This course also provides education in laboratory animal science to doctoral students who are not necessarily directly involved with studies using in vivo models but would like to learn how to better interpret and analyze scientific data generated from animal studies.

**Intended learning outcomes :** After completion of this course, students should be able to meet the defined learning outcomes as set out in the EU Education and Training guidelines, specifically for modules 7 (rodents), 9, 10-11. The list of suggested learning outcomes by the EU guidelines is comprehensive, but in summary, participants will acquire the knowledge to design and evaluate procedures involving research animals. At the end of the course participants should be able to: • Describe appropriate methods of handling and restrain, and appropriate techniques needed to carry out or plan minimally invasive procedures without anesthesia. [EU 7 – focus on rodents] • Demonstrate a broader and deeper level of understanding of legal requirements and responsibilities, ethics, animal welfare, and the 3Rs in relation to animal research. [EU 9] • Recognize principles of good experimental design of animal studies. [EU 10] • Relate principles of good scientific practice in research using animals. [EU 11]

**Contents of the course :** This course follows the latest EU guidelines for the education and training of persons designing procedures and projects using animals, i.e. Function B, as stated in the EU Directive 2010/63 and the Swedish legislation (SJVFS 2019:9) on the protection of animals used for scientific purposes. In particular, this course will cover the Function B-specific modules established in the European Union guidelines such as modules EU 7 (Minimally invasive procedures without anesthesia for rodents and lagomorphs), EU 9 (Ethics, animal welfare, and the 3Rs - level 2), EU 10 (Design of procedures and projects - level 1), and EU 11 (Design of procedures and projects - level 2). The course contents are based on the EU Education and Training Framework and include: • Procedures on animals (focus on rodents). • Regulations affecting animal research. • Ethics, animal welfare and the 3Rs. • Experimental design and statistical analysis of animal studies. • Good scientific practice in animal research.

**Teaching and learning activities :** This is a blended course that combines in-person seminar lectures, webinars, e-learning, individual work (home study), group work, student's presentations, in-class discussions and interactions.

**Examination :** Formative feedback will be given to students' presentations. A final summative exam containing short answer questions and/or multiple choice questions will be used to assess theoretical knowledge.

**Compulsory elements :** All parts of the course and active participation is compulsory. In order to participate in the final exam, at least 70% of the live sessions must have been attended. Missed parts must be compensated for in agreement with the course leader.

**Number of students :** 8 - 16

**Selection of students :** This course is primarily aimed at experienced senior researchers, but postdocs and doctoral students at the last stage of their studies will be accepted. Preference will be given to participants involved in projects dealing with animal models.

**More information :** Teaching days will be held on eight separate days: (7/11, 9/11, 16/11, 23/11, 30/11, 7/11, 12/12, 14/12) between approx. 9 am and 5 pm. The course includes international, national, and local experts in laboratory animal science. This course is FELASA-accredited and follows the specific learning outcomes for Function B modules in accordance with the EC Education and Training Framework, recently endorsed by the new Swedish L150 (SJVFS 2019:9).

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### Course responsible :

Rafael Frias

Comparative medicine

085246660

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### Contact person :

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# Title : Gene and Cell Therapy Product (ATMP) Drug Development

**Course number :** 3218

**Credits :** 1.5

**Date :** 2023-11-27 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department for Clinical Science, Intervention and Technology

**Specific entry requirements :**

**Purpose of the course :** In this course, the students acquire an understanding of how to develop a gene or cell therapy product (ATMP), including Good Manufacturing Practice (GMP) production and proving efficacy through clinical trials. The course provides a broad understanding of ATMP development from a research idea to registration as an approved form of therapy where the cost of treatment is covered by the state. Students will learn about the European Medicines Agency (EMA) regulations for ATMP and requirements for commercial models and health economy considerations. This broad scope gives students access to information and contacts for a plethora of future career opportunities in ATMP development and provides an opportunity to build both national and international networks.

**Intended learning outcomes :** After the completed course, the doctoral student can: - fully understand and review the classification of ATMPs and the regulations associated with different stages of the ATMP development pipeline. - understand and critically review the research, development, manufacture, clinical, and commercial aspects of ATMP. - understand and review the need for multi-disciplinary expertise and interactions for translation of research with commercial and clinical considerations.

**Contents of the course :** To achieve a better understanding of ATMP development, and to construct systems and organisations for bringing ATMP options to patients, it is necessary to understand the specific needs in terms of research, commercial and clinical aspects. In this course, leading experts in the fields of ATMP drug development will discuss different aspects of intellectual property, regulation, manufacture, clinical trials, health economy, business models and marketing approval strategy in general and more specifically using various ATMPs as examples. The nature of the course is translational and provides a wide range of knowledge from pre-clinical to GxP to patient delivery and market approval.

**Teaching and learning activities :** The course is a combination of theoretical knowledge and practical skills. Some of the lecture parts of the course are based around a sandwiched conference on the same theme. There are additional lectures on basic knowledge of the field as well as practical activities and demonstrations such as some basic GMP philosophy and procedures. The course is demanding and requires full-time presence and attention.

**Examination :** The students are examined with an individual written report according to the course learning outcomes. The participants receive written feedback for their reports from the examiner. All students are also required to peer-review another student's examination report.

**Compulsory elements :** Full presence in all parts of the course is required. Necessary absence will be regulated with the course leader and compensated as extra tasks.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :**

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## Course responsible :

Heather Main

Department for Clinical Science, Intervention and Technology

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## Contact person :

Evren Alici

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Heather Main

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Hazel Reilly

Institutionen för medicin, Huddinge

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## Title : Basic Human Neuroscience

**Course number :** 3220

**Credits :** 10.0

**Date :** 2023-11-27 -- 2024-01-12

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neuroscience

**Specific entry requirements :**

**Purpose of the course :** The purpose of this course is to provide students without a previous education in biomedicine/medicine knowledge in basic human neuroscience equivalent to that of the medical programme. It will satisfy the requirement for a course providing a grounding in human biology/physiology and/or pathology.

**Intended learning outcomes :** After the course, the doctoral student shall have obtained a thorough knowledge about the human nervous system that includes the following: 1) Macro- and microscopic organization and development of the nervous system; 2) Cellular neurobiology including signaling in the nervous system; 3) Structure and function of sensory systems underlying vision, somatosensation and pain, hearing and balance, smell and taste; 4) Structure and function of motor systems underlying the planning, initiation and regulation of movements. 5) Higher central nervous system functions including neuropsychology and regulation of behavior.

**Contents of the course :** The course will follow the curriculum of the Neuroscience course for medical students. The content consists of lectures, seminars and practicals that provide knowledge and understanding of nervous system organization and development, cellular neurobiology, sensory and motor functions, and higher nervous system functions.

**Teaching and learning activities :** Lectures, laboratory practicals, oral exam seminars, and neuroanatomy and neurohistology workshops.

**Examination :** Three formative oral exam seminars, one formative practical test in neuroanatomy, and a final summative written exam.

**Compulsory elements :** The three oral exam seminars, the practical test in neuroanatomy and the final exam.

**Number of students :** 1 - 6

**Selection of students :** Doctoral students that work in a neuroscience-related project but lack a basic education in biomedicine/medicine will get priority. The start date of doctoral studies will also be considered.

**More information :** The course is given in parallel with the neuroscience course in the bachelor biomedicine programme. All teaching activities will take place in Solna Campus. To obtain a detailed schedule send an e-mail to [lennart.brodin@ki.se](mailto:lennart.brodin@ki.se). The course will meet the requirement for a course providing the grounding in human biology/physiology and/or pathology, but cannot be counted as a project specific course.

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**Course responsible :**

Lennart Brodin

Department of Neuroscience

0852486902

[Lennart.Brodin@ki.se](mailto:Lennart.Brodin@ki.se)

**Contact person :**

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# Title : Artificial Intelligence and Machine Learning for Biomedical and Clinical Research

**Course number :** 5223

**Credits :** 3.0

**Date :** 2023-10-02 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Microbiology, Tumor and Cell Biology

**Specific entry requirements :** At least 1,5 credits from a course in basic statistics.

**Purpose of the course :** To increase knowledge about Machine Learning (ML) and Artificial Intelligence (AI) applications in biological and medical research, introduce first-hand experience and skills with different frameworks. The course requires no preliminary programming skills as well as no preliminary expertise in ML and AI. This course is given at a basic/novice level with no expertise in ML/AI and preliminary programming skills required, though experience in data analysis using RStudio/MatLab or similar analytic environment is an advantage.

**Intended learning outcomes :** After the completed course, the participants will be able to describe and discuss general aspects of ML and AI in a biomedical or medical context including ethical dilemmas and challenges. Practically, they should be able to prepare and analyse different data types related to own research, such as texts, omics, genomic sequences, images etc. using a range of ML and AI exploration and classification techniques as well critically analyse the outcome and estimate performance.

**Contents of the course :** Basic information about AI and ML, multivariate dataset preparation, classic methods of univariate and multi-dimensional analysis (Principal Component Analysis, Linear Discrimination Analysis, Factor Analysis), variable selection and sparse regression models (lasso regression, ridge regression, elastic net), supervised and unsupervised learning with neural networks, federated learning, performance estimation methods.

**Teaching and learning activities :** The course consists of lectures, group discussions, and hands-on labs. Previous experience from practical experience applying modelling in a computer-based environment (e.g. in R, SAS, STAT, Matlab or Python), is strongly recommended.

**Examination :** The student will be examined by their (a) labs accomplishment (b) final project report and (c) written reviews of projects of 2 other students.

**Compulsory elements :** All planned activities including lab and group works are mandatory. Absence has to be compensated with a report on the lab work, which student will have to do.

**Number of students :** 8 - 8

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course takes place at Campus Solna. It is full time and intensive, and there are obligatory practical exercises. For any questions about course contents and practicals, email [iurii.petrov@scilifelab.se](mailto:iurii.petrov@scilifelab.se) who is the main teacher of the course.

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## Course responsible :

Andrey Alexeyenko

Department of Microbiology, Tumor and Cell Biology

[Andrey.Alexeyenko@ki.se](mailto:Andrey.Alexeyenko@ki.se)

## Contact person :

Matti Nikkola

Institutionen för cell- och molekylärbiologi

[Matti.Nikkola@ki.se](mailto:Matti.Nikkola@ki.se)

## Title : Advanced Scientific Writing

**Course number :** 5227

**Credits :** 1.5

**Date :** 2023-09-11 -- 2023-09-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :** Knowledge corresponding to basic doctoral courses in scientific writing at KI and some experience of scientific writing.

**Purpose of the course :** This is an advanced course in scientific writing, specifically designed for post docs and PhD students in the later part of their education. The aim is to improve the participants' ability to write, revise and review original scientific articles.

**Intended learning outcomes :** After passing the course, the participant will: - have a better understanding of how to write an original scientific article, including use of the proper structure and language - be aware of and, thereby, able to avoid the common mistakes involved in writing scientific articles - have the ability to offer constructive criticism regarding these matters to other scientists (e.g., co-workers, as peer reviewers for journals) - be able to assess constructive criticism of their manuscripts from other scientists and revise accordingly

**Contents of the course :** This is an advanced course in scientific writing that requires prior knowledge and experience in writing research articles. The participant will be writing and revising manuscripts based on their own research (written, at least in part, before the course begins) as well as peer reviewing the manuscripts of other course participants. The teachers will focus on giving feedback in great detail on the scientific articles of the students and also guiding the revision of the manuscripts after the review sessions.

**Teaching and learning activities :** Lectures, individual writing and revising of manuscript, individual and group peer reviewing of the manuscripts of other course participants, group discussions including feedback from the teachers.

**Examination :** Writing and rewriting a manuscript based on the comments and feedback from the other course participants and teachers, thoughtful peer reviewing of the manuscripts of other course participants, active participation in group exercises.

**Compulsory elements :** All scheduled teaching, unless stated otherwise or the participant informs the teachers in advance of an acceptable reason for not being present. Absence can be compensated for by individual work specified by the teachers or in connection with the next time the course is taught.

**Number of students :** 8 - 14

**Selection of students :** Selection will be based on 1) personal motivation, including prior experience in manuscript writing 2) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 3) the start date of doctoral studies (priority given to an earlier start date)

**More information :** The course is online, with all lectures in real-time and according to schedule (no pre-recorded lectures). <BR> This is an advanced course on scientific writing for Post Docs and PhD students later in their education. The focus will be on writing and revising your own manuscript with a lot of individual coaching. To participate, a requirement is to bring a manuscript draft to work on. <BR> Please address ALL questions to: anna.hildenbrand.michelman@ki.se or phone: 0707890607 <BR>

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### Course responsible :

Anna Hildenbrand Michelman

Department of Women's and children's health

070-789 06 07

anna.hildenbrand.michelman@ki.se

### Contact person :

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# Title : Advanced presentation techniques: Oral Presentation of Own Research

**Course number :** 5231

**Credits :** 1.5

**Date :** 2023-11-20 -- 2023-11-24

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Women's and children's health

**Specific entry requirements :** Basic course in presentation techniques or similar knowledge level.

**Purpose of the course :** The purpose of the course is to build skills and increase the participant's confidence in presenting own research results. This is an advanced course in presentation skills requiring prior experience of presenting your research. The course is specifically targeting post docs and PhD students in the later part of their education.

**Intended learning outcomes :** After passing the course, the participant will: - be able to structure and build compelling presentations based on own research results - have skills in how to consistently deliver in an engaging manner - be capable of building instant rapport and get an audience on their side every time - understand the best use of voice, body language and posture - be able to make their mark and be remembered - understand how to deal with challenges during presentations, e.g. hostile audience members, difficult questions, technology problems, nervousness and blacking out - have knowledge of a broad variety of presentations styles in order to find their own - be able to use supportive media - be able to design presentation slides that support the message

**Contents of the course :** The course is highly personalized, tailored to the specific needs of the individual participants. A variety of techniques will be presented and tried out to enable the participants to develop in their own way to become more professional at presenting, yet remaining authentic. The course includes: - presentation structure - presentation techniques - dealing with the audience - overcoming challenges, e.g. hostile audience members, questions, nervousness, technology issues - body language, voice and presence on stage - filming of an elevator pitch, which the participants get to keep after the course to use e.g. on a webpage - how to design successful PowerPoint presentation slides - how to use supporting media

**Teaching and learning activities :** Lectures, group work, exercises, individual coaching and filming.

**Examination :** Presentations and participating in exercises during the course.

**Compulsory elements :** All scheduled teaching and group work is compulsory. Absence can be compensated for during individual assignments or during the next course occasion.

**Number of students :** 8 - 14

**Selection of students :** Selection will be based on 1) Personal motivation, including previous experience and/or relevant courses on the topic 2) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 3) the start date of doctoral studies (priority given to earlier start date)

**More information :** Welcome to apply for PhD course 5231 Oral presentation of own research! This is an advanced presentation techniques course for Postdocs and PhD students who have previous experience presenting their research results and want to improve their skills further. The focus will be on presenting your results in different formats and includes a lot of individual coaching. The course is given online, with all lectures in real-time and according to schedule (no pre-recorded lectures). <BR> Please address ALL questions to: anna.hildenbrand.michelman@ki.se or phone: 0707890607 <BR>

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## Course responsible :

Anna Hildenbrand Michelman

Department of Women's and children's health

070-789 06 07

anna.hildenbrand.michelman@ki.se

## Contact person :

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## Title : Tumor Microenvironment

**Course number :** 5232

**Credits :** 1.5

**Date :** 2023-10-09 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Oncology-Pathology

**Specific entry requirements :** Basic course in tumor biology and oncology or corresponding knowledge

**Purpose of the course :** The purpose of the course is to provide: -A systematic overview on the cellular, structural and chemical composition of the tumor microenvironment (TME) -A platform for scientific discussions on how differences in the tumor microenvironment can influence tumor progression and therapy response -Practice in what to consider when selecting a relevant TME model system and how to analyze the tumor microenvironment ex vivo and in vivo -A context for reflection on advances and challenges with existing and future TME-targeting therapies

**Intended learning outcomes :** After completion of the course, the students should be able to: - Describe the main cellular and acellular components of the TME - Discuss principal mechanisms of TME communication - Systematically identify and compare properties of different TMEs and their clinical impact - Critically evaluate different methods and model systems for TME studies and motivate their use from a context-dependent perspective (level of complexity, ethics, clinical relevance, etc)

**Contents of the course :** The course content is structured as follows: -Components of the TME are introduced (cancer-associated fibroblasts, endothelial cells, pericytes, immune cells, ECM and associated factors etc). Processes like angiogenesis and lymphangiogenesis are discussed together with conditions like hypoxia and acidosis. -TME properties are related to malignant growth, invasion, metastasis, and response to therapy from a clinical perspective. The specific TME of selected tumor types will be further studied in depth according to the participants' interest. -Model systems and tools for TME studies are presented (organoids, digital image analysis etc.).

**Teaching and learning activities :** The course consists of lectures, group work and discussions, literature search, and a hands-on demonstration of digital image analysis using clinical tissue samples. TME characteristics of different tumor types will be explored by problem-based learning (starting from a clinical case). The course is designed to stimulate interactive learning. Digital platforms like Canvas and Zoom will be used and internet connection is therefore needed.

**Examination :** The course assignments consist of: (1) Daily Canvas quiz in groups (formative assessment) (2) Oral group presentation (3) Essay, 1 page (summative assessment)

**Compulsory elements :** All parts of the course are mandatory and require full attendance. Absence must be compensated for by other activities (after discussion with the course organizer).

**Number of students :** 10 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :**

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### Course responsible :

Monika Ehnman

Department of Oncology-Pathology

Monika.Ehnman@ki.se

### Contact person :

Charlotte Rolny

Institutionen för onkologi-patologi

charlotte.rolny@ki.se

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## Title : Clinical and Molecular Parasitology and Mycology

**Course number :** 5234

**Credits :** 1.5

**Date :** 2023-09-25 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Microbiology, Tumor and Cell Biology

**Specific entry requirements :**

**Purpose of the course :** The purpose of this course is to expose students to advanced aspects of clinical and molecular parasitology and mycology. Students will be presented to cutting-edge technologies and approaches used in research on these fascinating eukaryotic pathogens, to stimulate their curiosity and inspire them to translate and apply it to their own research.

**Intended learning outcomes :** After the course, the students will have acquired knowledge on the current understanding of the cellular and molecular interplay between parasites, parasitic fungi and their hosts. The students will be able to give examples of interdisciplinary studies in host-parasite interaction and should be able to relate their own research project to the forefront developments in other areas of parasitological and mycological research. Thus, after the course the students will have a more holistic picture of infection biology, and hopefully be encouraged to apply new information for the benefit of their further graduate training and research.

**Contents of the course :** The course covers topics on microbial virulence, transmission and evolution, the cellular and molecular interplay between eukaryotic pathogens and their hosts and how this related to disease pathogenesis.

**Teaching and learning activities :** The course consists of lectures by invited national and international experts on parasitological and mycological research. Lectures will cover basic aspects of parasite and host biology and disease pathogenesis to provide the students with a foundation in the subject. In addition, the lectures will contain a more advanced part where state-of-the-art research is presented. The students will be encouraged to actively interact in discussions with the lecturers and to think on the spot to ask questions. The students will also be presented to selected scientific and/or methodological conundrums and are expected to choose and write an essay on one of these, containing suggestions on research approaches on how to solve the scientific mystery.

**Examination :** The students will be presented a number of current scientific problems related to the parasitological and mycological research topics discussed during the course. The students are expected to choose and write an essay on one of these. The essay should contain a summary of the research field, suggestions on research approaches aimed to solve the scientific conundrum and relate it to their own research. This essay assignment serves as course examination, where students will be individually assessed.

**Compulsory elements :** Attendance of the lectures is compulsory. If the students are unable to attend lectures they should write a summary based on the course literature provided for that lecture. Obligatory is also a written essay assignment where students will present and discuss a chosen scientific and/or methodological problem.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Course will be held on the Solna campus as well as online

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### Course responsible :

David Plaza

Not set

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### Contact person :

Benedict Chambers

Institutionen för medicin, Huddinge

Benedict.Chambers@ki.se

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# Title : Human Viral Diseases: Mechanisms and Pathogenesis

**Course number :** 5237

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Huddinge

**Specific entry requirements :** Ingen

**Purpose of the course :** The aim of the course is to enable students to acquire a good knowledge on mechanisms and pathogenesis related to viral infection in humans.

**Intended learning outcomes :** The course should give knowledge of molecular virology with special consideration to the role of virology within medicine. On completion of the course the student is expected to: - Be able to account for taxonomic subdivision of viruses. - Be able to account for the most important human pathogenetic viruses. - Be able to account for the molecular mechanisms of the virus life cycle - Be able to account for emerging viruses and pandemics - Be able to account for viral pathogenesis - Be able to account for virological methods in research - Be able to account for viral immunology, antiviral therapy and vaccination.

**Contents of the course :** Virus taxonomy, important human pathogenic viruses, virus structure, infection process at cell level and organism level, pathogenesis, epidemiology, molecular interactions between viruses and host cells, genetic stability of viruses, influence on host cell growth control, immune response against viruses, virus vaccines, antiviral drugs, virus vectors for gene therapy

**Teaching and learning activities :** The course will be given over one week (full time). The teaching is mainly through lectures/seminars. The lectures include introduction to the various topics (described above).

**Examination :** Written exam containing open questions.

**Compulsory elements :** All seminars and lectures. Absence needs to be compensated for in agreement with the course leader. More than one day of absence cannot be compensated for.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Course will be held on the Flemingsberg campus and online

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**Course responsible :**

Magdalini Lourda

Department of Medicine, Huddinge

Magdalini.Lourda@ki.se

**Contact person :**

Benedict Chambers

Institutionen för medicin, Huddinge

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# Title : Implementation Science – Implementation Leadership in Healthcare and Social Services

**Course number :** 5249

**Credits :** 5.0

**Date :** 2023-09-20 -- 2023-12-10

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :**

**Purpose of the course :** The course aims to increase the participant's personal and scientific leadership capabilities regarding implementation research and enhance the opportunities to build international networks of learning with other course participants, teachers and researchers.

**Intended learning outcomes :** At the end of the course the student needs to be able to: • Demonstrate specialized personal and scientific leadership skills to influence implementation, and to support the development of these skills in other participants. • Evaluate different aspects of contexts (macro, meso and micro level) and their potential to affect implementation research and practice. • Critically appreciate how to design an effective implementation research project in order to have an impact on practice and policy. • Demonstrate understanding of the challenges of leading implementation practice in and across health and social services.

**Contents of the course :** The course covers subjects related to implementation science that are necessary for participants to successfully conduct implementation research and perform implementation practice. This includes the following topics: implementation leadership, macro, meso and micro context prerequisites, implementation strategies, and evaluation.

**Teaching and learning activities :** Students will work individually and collectively. To enable transnational learning, the course will utilise a Technology Enabled Learning (TEL) strategy. The course will provide lectures, seminars, peer reviews and workshops online. Students are expected to undertake self-directed learning, which include reading, critical analysis and assignments. The student will use an implementation-oriented project as a learning case. All teachers in the course are active researchers in the field of implementation science and collaborative research.

**Examination :** The student's knowledge and skills will be assessed in relation to the expected learning outcomes. Examination will involve an oral presentation and a written assignment. The written assignment will focus on developing a plan for an implementation research project, which the student will present and discuss in a seminar.

**Compulsory elements :** The participants are expected to participate in the teaching and learning activities in the course. Absence will be compensated in agreement with the course director.

**Number of students :** 10 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation) and 2) the start date of the doctoral studies (priority given to earlier start date) Five seats will be reserved for PhD students from Högskolan på Vestlandet, Norway (Western Norway University of Applied Sciences).

**More information :** The course starts with two days with introduction to the course and key lectures. Then there are four course days focusing each on the topics Context, Leadership, Implementation strategies, and Study Design and Evaluation. The course will finish with a course day with Examination seminar. There will be preparatory work between the five course days which will take approx one work day. The course will be digital. Course days:

September 20-21: Introduction to the course, lectures and group work. October 4: Lectures, group work and discussions. October 18: Lectures, group work and discussions. November 1: Lectures, group work and discussions. November 15: Lectures, group work and discussions. November 29: Examination seminar. December 10: Final day for submission of examination. The course was developed through the EISEN network and teachers from the network will be part of the course. Please follow this link <https://prosjekt.hvl.no/eisen/>

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## Course responsible :

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## Title : Human Physiology - distance course

**Course number :** 5253

**Credits :** 3.0

**Date :** 2023-11-20 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Physiology and Pharmacology

**Specific entry requirements :**

**Purpose of the course :** KI is a medical university with research and education in medicine and health. All PhD students have to obtain basic knowledge regarding the human body in health and disease in case they lack basic higher education knowledge in the field of medicine. The aim of the course is to give PhD students without a medical background a basic overview and introduction to human physiology. The students will gain a basic understanding of how the human organ systems function and interact under normal conditions. The content covered in this course will be useful for further studies where knowledge about human biology is of value and can hopefully add value to the PhD project and beyond.

**Intended learning outcomes :** After completing the course, the student will have gained a basic understanding of how the human organ systems function and interact under normal conditions. More specifically, the student will be able to: - Demonstrate knowledge and understanding of basic functions and interactions between organ systems in the human body. - Demonstrate a critical and scientific approach to literature sources for the different course tasks.

**Contents of the course :** The course will cover the following areas within human physiology: - Overview of cellular and integrative physiology - Basic anatomy - Biochemistry and cell biology - Nervous system - Endocrinology - Digestive system - Cardiovascular physiology - Renal physiology - Respiration - Basic immunology

**Teaching and learning activities :** The course is given as a distance course on the course platform used at KI and through online seminars and lectures. For each area there will be recorded lectures, study questions, quizzes and live occasions. There will also be asynchronous group discussions and seminars.

**Examination :** The learning outcomes are examined with a project presentation and a written online test. Students that are absent from the examinations or do not obtain a passing grade in the first examination will be offered a second examination.

**Compulsory elements :** The students need to participate in group discussions and send in seminar assignments during the course. If absent or if assignments are not sent in, a new deadline will be issued.

**Number of students :** 15 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is held online.

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### Course responsible :

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### Contact person :

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## Title : Introductory Course in Clinical Studies: From Idea to Archiving

**Course number :** 5274

**Credits :** 1.5

**Date :** 2023-10-02 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Oncology-Pathology

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is to give the participants a practical understanding and insight into the process, principles and rules within the start-up, implementation and completion of clinical studies.

**Intended learning outcomes :** After the course, the doctoral student is expected to: - be able to plan and develop a study protocol including a thorough methodical evaluation and selection of an appropriate study design. - be familiar with the various regulations surrounding a clinical study (Declaration of Helsinki, Ethical Review Act, EU Regulation 536/2014 CTR, Data Protection Regulation GDPR, etc.) and based on these be able to plan, carry out and end a clinical study in the right way. - know the various agreements required at start-up, of a clinical study. - be able to reflect critically on other students' research projects in a scientifically constructive way.

**Contents of the course :** - Review of the study process /study planning - Writing study protocols - Statistics and method review Study implementation (data collection, journal entries, safety reporting, etc.) - Review of different concepts and actors in clinical studies (incl. medical technology and IVDR) - Lectures on Good Clinical Practice (GCP), Declaration of Helsinki and other regulations - Applications (Ethical Review Authority, Medical Products Agency, Biobank) - Ethics in research based on regulations (Declaration of Helsinki, Ethical Review Act, CTR, etc.); to weigh risk against benefit, to write a patient information consent, the consent process, etc., - Agreement/cost calculation - Closing/Archiving/Reporting

**Teaching and learning activities :** Lectures from authorities and people specialised in their respective fields, group exercises, seminars and oral and written presentations. The course focuses on practical learning by translating knowledge in a practical sense and critical reflection of ability.

**Examination :** To pass the course, the student must demonstrate that the intended learning outcomes have been achieved. This is assessed through active participation in seminars and approved oral and written presentation. Participants will be divided into smaller groups. The aim is to review the study protocols within each group, critically analyse the content, and give feedback to each other. Participants will complete several assignments throughout the course, which will aid their ability to write a study protocol. Certificates in GCP are included for those who pass.

**Compulsory elements :** Compulsory attendance at lectures, group exercises and presentations. Absences are made up for at a later course after consultation with the course coordinator.

**Number of students :** 10 - 15

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is given for one week at Karolinska University Hospital in Solna.

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### Course responsible :

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# Title : Health Science and Implementation: Conceptual Foundations

**Course number :** 5294

**Credits :** 2.0

**Date :** 2023-09-13 -- 2023-09-21

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :**

**Purpose of the course :** To introduce concepts that shape and are shaped by health science as well as trigger critical reflection about how this impacts on a knowledge continuum relevant in understanding implementation and utilization of evidence-based interventions.

**Intended learning outcomes :** Based on relevant conceptual resources, upon completion of the course the learner is expected to be able to: • Identify, situate, and compare central concepts and ideas in health science research • Reflect and critically explore an alignment between relevant concepts and methodologies concerning i.e. design, intervention, relevance, and implementation in a continuum of health sciences research. • Identify models and methods that form the basis for promoting health, preventing and treating disease, and contributing to the development of sustainable, ethically grounded, and evidence-based interventions.

**Contents of the course :** The course commences with an introduction of concepts often related to health science, with an explicit point to trigger critical dialogue about: what is health science, or what is it not? Illustrations will be used to generate discussion about research methodologies, methods, and implementation strategies. Moreover, the course rests on assumptions that utility/relevance of research is important, thus challenging course participants to reflect on the practice and social implications as well as utility for health science research. The course builds on illustrations from different fields such as environmental medicine, health education, nursing, occupational therapy, physical therapy, psychology, public health, and social work to name some.

**Teaching and learning activities :** The course is designed to constitute a series of expert lectures, seminars, and debates in combination with active group work, individual writing, and oral presentations, which will culminate in the foundations for a written examination. The learning experience builds on a mix of active reading and own reflection in combination with dialogue around learning activities with others. The course thus requires active involvement of the learner.

**Examination :** The examination will consist of an individual written report. Each participant has to show that all the ILOs are reached. Results will be assessed as Pass/not pass

**Compulsory elements :** All course activities are mandatory. Absence of max 20% can be compensated for by additional tasks in agreement with the course organiser. At least 80% attendance and passing the final examination is mandatory for a grade of "pass" in the course.

**Number of students :** 8 - 18

**Selection of students :** Selection will be based on 1) enrolment in the 2023 cohort of the Research School in Health Science (FiH), 2) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), and 3) start date of doctoral studies (priority given to earlier start date) if spaces are available.

**More information :** Course will be held on campus Flemingsberg. The course start will be September 13, 2023 and run until September 21, 2023. There will be a combination of lectures, workshops, seminars, presentations, and written assignments for which learners will engage Wednesday-Friday week 1, and Monday-Thursday week 2. Please see course plan for more information.

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## Course responsible :

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## Contact person :

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# Title : Get started with R – Programming Basics, Data Analysis and Visualisation

**Course number :** 5300

**Credits :** 3.0

**Date :** 2023-08-21 -- 2023-09-04

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :**

**Purpose of the course :** The course is practical and aims at teaching students how to: Use the programming environment R and RStudio, which includes installation, how to handle errors, problem solve and access helper documents. Use basic concepts of programming, such as data types, logical and arithmetic operators, if else conditions, loops and functions. Use common R packages to perform basic statistical analysis (e.g., t-test, chi2-test, correlation) and visual presentation (e.g., boxplot, histogram and heat-map) of data in R.

**Intended learning outcomes :** After attending the course the student should know: • How to download, install and navigate R and RStudio • How to solve common problems arising from data formatting and handling • Common programming concepts and how to employ them in R • How to import data and packages in R • How to use R for basic statistical analysis and visual presentation of data

**Contents of the course :** Course participants start the course by installing and familiarising with the R and RStudio environment. This includes version control, as well as structuring and documenting code for publication. Next, basic concepts shared between all programming languages are introduced, such as data types and operators. Students will also learn how to use recommended naming conventions, syntax and how to comment code. Methods for importing packages and data is then introduced and students will learn how to search for help and get examples of common problems that may arise. Finally, students will practice using packages for data management, statistical analysis and visual presentation. Methods include distribution tests, power-analysis, t-test, chi2-test, correlation, boxplot, scatterplot and bar plot. Visual presentation will mainly use the ggplot2 package, providing a good example of object-oriented programming in R. Throughout all lectures focus will be on application and understanding of the methods used, not statistical assumptions or interpretation of the results. Examples will primarily be taken from experimental research and tasks will use dataframes available upon installation of R. However, when possible students are encouraged to use their own data. The last day of the course can either be used to continue to apply R on own data or to learn procedures that can be performed with R which most other statistical software's cannot. Such as, managing folders and files, querying databases and importing codes and algorithms.

**Teaching and learning activities :** Distance learning with online interactive lectures. Group and individual exercises where a teacher will be available to help. Assignments and Canvas quizzes that the student completes on their own. Reviewing other students' code and interaction with other students. Individual project work. Four days each week will consist of lectures in the morning introducing concepts and tasks in the afternoon, where these concepts are put to practice. The last day of each week will be a larger exercise where the student is required to combine introduced concepts into a whole. This exercise will be reviewed by a fellow student who will have the opportunity to comment on ways to improve the work. The 11th (last) day is optional and described in the previous paragraph.

**Examination :** Project presentation and review.

**Compulsory elements :** Canvas quizzes and tasks. Individual projects and reviews of other students' project. Participation during project presentation and review. Students who miss obligatory elements will complete extra tasks associated with the specific element. Course participants unable to participate during the project presentation will have the presentation for the course administrator but will miss the opportunity to get their work reviewed by other participants.

**Number of students :** 15 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** From Monday to Thursday, the course consists of Zoom lectures in the morning (8:30 - 11:00) after which (11:00-16:00) quizzes and tasks will be provided for the student to complete alone. Both Friday's students will hand in an exam assignment, which will be presented and reviewed by another student.

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## Course responsible :

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# Title : Methods for Design and Formative Evaluation of eHealth Interventions

**Course number :** 5301

**Credits :** 3.0

**Date :** 2023-11-06 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** Digital health—eHealth—is a rapidly growing area with high potential to improve health, social and self-care from both a clinical and individual perspective. In research, digitalization creates new possibilities for data collection, but also the ability to increase outreach and to deliver information, support and care to different patients or population groups. There is a great need for innovative digital solutions to improve health, social- or self-care; however, to ensure that an eHealth intervention will be useful in the specific context that it is intended for, it needs to be built upon evidence-based design methods and be carefully tested and evaluated before being implemented. It is these design and evaluation methods that are addressed in this course. The course is designed for doctoral students and postdocs who work on an ongoing eHealth project, or plan/aim to include an eHealth component or digital tool in a research intervention study.

**Intended learning outcomes :** At the end of this course, the students should be able to: [Knowledge and understanding] • understand and discuss the importance of understanding and analyzing healthcare organizations, users' needs and requirements in different contexts • understand and compare different methods for context-of-use and user needs analyses and their application • explain, discuss and analyze different evaluation methods and techniques to assess functionality and usability in eHealth interventions [Skills] • based on the chosen individual assignment and the student's own research project, apply at least one of the methods related to user needs analysis, requirements specification, or formative evaluation • critically assess the choice and application of method in another student's individual work [Attitudes] • explain and motivate the need of an iterative development process and continuous user involvement

**Contents of the course :** When studying the effects of eHealth interventions, the results will be highly dependent on how well the developed eHealth intervention or digital tool is designed to suit the intended use and specific context of care. Therefore, this course focuses on human-centered and collaborative methods for the design as well as evidence-based tools for formative evaluation of interventions – to avoid pitfalls in eHealth design. During the course, students will learn about methods for analyzing health and social care organizations and end user needs, as well as documentation and communication of these and formulation of requirements based on the needs. Specific prerequisites for requirements engineering in health, social and self-care are discussed. Furthermore, the course gives an overview of relevant methods and techniques for evaluation of eHealth solutions in health, social and self-care, and lifestyle interventions. The aim is also to provide an understanding of the role of formative evaluations in the design process. The course is structured around the design activities outlined in the ISO standard for Human-Centred Design for Interactive Systems (ISO 9241-210:2019), which serves as a framework for discussing different steps in the design process. Various methods and tools will be presented, and the students will work on their own research project by applying at least one of these methods during the course.

**Teaching and learning activities :** The course spans over 4 weeks (50%) with lectures, seminars, group discussions and an individual assignment related to the student's own research project. The individual assignment will be supervised by an external researcher with experience in the area.

**Examination :** Examination consists of an individual written assignment, oral presentation of the individual work at the examination seminar, as well as peer review of another student's work. Peer review includes an oral opposition at the examination seminar.

**Compulsory elements :** Active participation in group discussions and participation in seminars when individual assignments are presented is compulsory. The course examiner assesses if and, in that case, how absence can be compensated. In order to pass the course the student needs to have participated in all compulsory parts, or compensated absence in accordance with the examiner's instructions and to have passed the examination.

**Number of students :** 8 - 12

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date).

**More information :** The course will be given online through Zoom. The preliminary course schedule is published at <https://ki.se/en/lime/education-at-hic> . The course targets PhD-students or postdocs with different types of background, who conduct or plan to conduct an intervention study with a digital/eHealth component.

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## Course responsible :

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# Title : Information Literacy, Philosophy of Science and Research Ethics

**Course number :** 5302

**Credits :** 3.0

**Date :** 2023-11-06 -- 2023-11-17

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The aim of this course is to enhance the doctoral student's capacity to identify, analyse and critically reflect upon theories, concepts and problems in information literacy, philosophy of science and research ethics, especially problems that may arise in relation to medical research. The aim is also to provide the doctoral students with extended possibilities to develop a scientific and ethical approach to medical research.

**Intended learning outcomes :** After the course the student is expected to be able to: with respects to Information Literacy: 1) describe how search strategies are created and adjusted to a specific information source/database, and 2) be able to compare, evaluate and manage the outcome of different search strategies. with respects to Philosophy of Science: 1) account for central concepts and theories in philosophy of science, 2) account for common problems that arise in the area of the philosophy of science, and 3) identify, analyze and discuss problems that arise in the area of philosophy of science, especially in the field of medical sciences. with respects to Research Ethics (in accordance with <https://ki.se/en/staff/purpose-and-requirements-for-doctoral-courses-in-research-ethics>): 1) account for important research ethical theories, principles and, to a certain extent, guidelines, 2) account for common problems that arise in the area of research ethics, 3) identify, analyze and discuss ethical problems and conflicts that might emerge in the area of research on humans and animals, and 4) be able to carry out a research ethical argumentation for or against a particular procedure.

**Contents of the course :** The course provides general scientific knowledge in a coherent block as an introductory basis for further doctoral education. The main content of the course: Philosophy of science and research ethics 2 hp (Research ethics 1.5, philosophy of science 0.5) Information literacy 1 hp

**Teaching and learning activities :** The pedagogic framing is based on student activity with interactive lectures, seminars and workshops. The scheduled face-to-face activities in the course will be mixed with individual work and feedback from teachers and peers via the web-based platform Canvas.

**Examination :** The knowledge, skills and attitudes acquired in the course will be assessed through written assignments and oral presentations. For a pass grade, the course participant has to show that all intended learning outcomes of the course have been achieved.

**Compulsory elements :** Assignments, seminars and group activities. Absence from seminars and group activities can be compensated by replacement activities.

**Number of students :** 8 - 20

**Selection of students :** Doctoral students within the research school in health science will be given priority. In addition, priority for admission will be based on 1) date for registration as a doctoral student (priority given to earlier registration date), 2) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation).

**More information :** Information Literacy 1.0 credits, Philosophy of Science 0.5 credits, Research Ethics 1.5 credits. This course takes place on site on Campus Solna.

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## Course responsible :

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## Contact person :

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## Title : Clinical Trials in Heart Failure Research

**Course number :** 5307

**Credits :** 1.5

**Date :** 2023-11-16 -- 2023-11-21

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Solna

**Specific entry requirements :** Epidemiology I and Biostatistics I or equivalent knowledge

**Purpose of the course :** To enable students to learn the principles of study designs and data analyses/interpretation for clinical trials in heart failure.

**Intended learning outcomes :** At the end of the course, the participants are supposed to be able to: - choose the adequate trial design to conduct an interventional study - apply important ethical principles while designing a clinical trial - design a clinical trial which satisfies the requirements of the regulatory agencies - choose and use key statistical methods for running randomized controlled trials and meta-analyses of randomized controlled trials - critically interpret data from randomized controlled trials and meta-analyses of randomized controlled trials

**Contents of the course :** The lectures will cover: 1) Key elements in randomized controlled trials design: methods for randomization; differences between superiority and non-inferiority trials; different types of endpoint analysis (e.g. first to time event vs. recurrent event analysis), interpretation of subgroup analyses 2) Novel randomized controlled trial design: registry based randomized controlled trials, adaptive, basket & umbrella & platform designs 3) Key aspects differentiating randomized controlled trials from registry-based studies 4) Systematic Reviewers and Meta-analyses of randomized controlled trials: different designs and main methods The "Hands-on" workshops will consider: 1) Power and sample size calculations 2) Survival analysis including competing, recurrent event analysis, interaction analysis 3) Key statistical methods for meta-analysis 4) Adjusting and matching in registry-based studies (e.g. propensity score): how to run it and why it does not replace randomization

**Teaching and learning activities :** The course will consist of: - two and half days distance learning via Zoom or using prerecorded lectures and provided readings - two days on-site lectures/workshops - half day: exam The formats of course activities include: - Distance learning with critical readings of course literature - On-site lectures/seminars - Debates on relevant clinical trials - Workshops - Group work

**Examination :** Home-based assignment including open questions and multiple choice questions. All learning outcomes of the courses need to be achieved to pass the course.

**Compulsory elements :** Participants should attend all the sessions and the exam to pass the course. The students who have missed course sessions will be assigned extra reading and home work to compensate for the absence.

**Number of students :** 8 - 15

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** November 16: home study/distance learning using provided readings November 16-17: PhD students travel to Sorrento (Italy) November 17 (afternoon) TO November 19 (lunch time): frontal teaching/workshops November 19 afternoon: PhD students fly back to Stockholm November 20: home study using provided readings / recorded lectures. November 21 (half day): home-based exam Location: Frontal teaching/workshops on November 17 (lunch time) TO November 19 will be held in SORRENTO, ITALY. The course is run in collaboration with the Heart Failure Association (HFA) of the European Society of Cardiology, which will support the organisation of the course, provide well-known global trialists as speakers and faculty. Travel grants from HFA will be provided to allow the attendance in SORRENTO (ITALY) and more information will follow.

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### Course responsible :

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### Contact person :

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## Title : Cancer and Cancer Stem Cells

**Course number :** 5309

**Credits :** 1.5

**Date :** 2023-10-02 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Huddinge

**Specific entry requirements :** Basic knowledge in Cancer Biology and Cell Biology.

**Purpose of the course :** The purpose of the course is to deepen the participant's knowledge about the concept of cancer stem cells and to understand the necessity of targeting cancer stem cells directly in cancer treatment. The course will provide a historical perspective of the discovery of the cancer stem cells. It will focus on current research in the field and methods to detect cancer stem cells in solid tumors and hematological cancers. Another focus point will be the therapeutical applicability of targeting cancer stem cells specifically.

**Intended learning outcomes :** After completion of the course, the student will be able to describe the concept of cancer stem cells, the relationship between cancer and cancer stem cells, as well as assays to identify these stem cells. Within this framework, the student will be able to demonstrate an understanding for the development of cancer in the context of solid tumors and hematological cancers. In addition, the students will be able to critically evaluate the advantages and drawbacks of basic mechanisms employed for cancer treatment in the clinic.

**Contents of the course :** The course covers key principles of cancer development and cancer therapies, and provides an appreciation for the concept of cancer stem cells and its implications from a clinical and basic science perspective. This includes a general overview of molecular and cellular mechanisms underlying cancer development, drug resistance, disease relapse, cancer stem cells, therapeutic stem cell transplantation and clinical care for the treatment of solid tumors and leukemia, immunological cancer-related considerations, and perspectives for novel cancer therapies. The student will be required to take an active part in this course by contributing with presentations and discussions related to cancer and cancer stem cells.

**Teaching and learning activities :** The pedagogic frame of this course is based on lectures combined with topic-related research articles. The course includes workshops where the students are required to present articles, integrate the knowledge acquired from lectures and reading of the articles, and actively discuss their acquired knowledge as a group. Each student will research, prepare and present his or her examination task orally. Online presentation of methods combined with a short lab visit may be offered (depending on the appropriateness at the timepoint of the course).

**Examination :** The individual performance of each student will be evaluated separately based on their presentation of a cancer stem cell-related topic and the feedback the student provides to their fellow students. The content and organization of the presentation and discussion will follow a format provided by the instructors.

**Compulsory elements :** The lectures and discussions are mandatory. Absence is compensated according to the instructions of and in agreement with the course director.

**Number of students :** 8 - 20

**Selection of students :** The selection process will be based on a comprehensive assessment of the applicants, including students and postdoctoral researchers: 1. Motivation for the course 2. Topic of their PhD project 3. Years since PhD registration (priority will be given to earlier registration date)

**More information :** The course is organised by the Department of Medicine, Huddinge and the Center for Hematology and Regenerative Medicine, KI Huddinge. The course is given jointly by the doctoral programmes Development and Regeneration (DevReg) and Tumor Biology and Oncology (FoTO). The course sessions will take place at KI Huddinge campuses. Some lectures will be held via zoom.

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### Course responsible :

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### Contact person :

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## Title : Diabetes and Cardiovascular Disease

**Course number :** 5310

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Solna

**Specific entry requirements :** Undergraduate study in medicine or biomedicine

**Purpose of the course :** To provide an overview of diabetes epidemiology, pathophysiology and treatment options in a cardiovascular perspective, with emphases on up-to-date therapeutic strategies, key findings of major clinical trials, and major challenges of future clinical managements and research. This includes the management of diabetes in the broad spectrum of cardiovascular disease as well as understanding and interpretation of large cardiovascular outcome trials of new glucose-lowering agents. Gaps in knowledge will be emphasized in order to create ideas for future clinical research in the field.

**Intended learning outcomes :** The participants should, after the course, be able to: 1. show a good insight in the pathophysiological mechanisms linking diabetes to cardiovascular disease 2. know how to appropriately screen for and diagnose diabetes and pre-diabetes 3. perform cardiovascular risk stratification of patients with diabetes 4. understand the prognostic influence of diabetes on cardiovascular diseases 5. show an insight in preventive measures for diabetes and cardiovascular disease 6. know and interpret results of recent, large cardiovascular outcome trials on glucose-lowering drugs 7. understand some of the gaps in knowledge in the relation between diabetes and cardiovascular disease

**Contents of the course :** Lectures/Seminars on the following topics: - Epidemiological aspects of the combination of diabetes and cardiovascular disease - Screening of diabetes and pre-diabetes in different populations - Cardiovascular risk assessment in people with glucose perturbations - Mechanisms of cardiovascular disease in diabetes: biomarkers, epigenetics, insulin resistance and microvascular disease - Multifactorial management of people with diabetes and cardiovascular disease through lifestyle interventions and pharmacological treatment - Cardiovascular outcome trials on glucose-lowering agents and their effects on atherosclerotic cardiovascular disease, heart failure and kidney disease - Proposed mechanisms of cardioprotection by means of cardioprotective glucose-lowering agents - Patient-centered care and management of complications - Learning activities through interactive polls and clinical case presentations

**Teaching and learning activities :** Lectures/Seminars with international lecturers and guideline experts Debates about clinical issues Clinical case presentations and discussion with interactive polls Group work Presentation and discussion of assigned group work

**Examination :** In collaboration with other course participants, to prepare and present a written synopsis of a study protocol on topics given by the faculty members. Multiple choice questions and quizzes will be integrated in the different sessions of the course. To pass the course the course participant must be able to show that all intended learning outcomes of the course are achieved.

**Compulsory elements :** The course participants should attend no less than 75% of the scheduled contents of the course. The participants must actively involve in the preparation of group work and attend the sections of their respective group work and presentation/discussion. Absence from these sections cannot be compensated for.

**Number of students :** 8 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held at the Research Department of the Cardiovascular Unit at Norrbacka, Karolinska University Hospital Solna (second floor, conference room S1:02)

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### Course responsible :

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### Contact person :

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## Title : Biostatistics II: Logistic Regression for Epidemiologists

**Course number :** 5314

**Credits :** 1.5

**Date :** 2023-09-25 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Global Public Health

**Specific entry requirements :** Knowledge in epidemiology and biostatistics equivalent to Epidemiology I: Introduction to epidemiology and Biostatistics I: Introduction for epidemiologists or corresponding courses

**Purpose of the course :** The course introduces statistical methods for the analysis of categorical outcome data.

**Intended learning outcomes :** After successfully completing this course you as a student are expected to be able to: - choose the appropriate regression model for studying a specific research hypothesis using data collected from an epidemiological study, implement the model using standard statistical packages, assess the goodness of fit, and interpret the results, - explain the concept of confounding in observational studies and use statistical models to control/adjust for confounding, - apply appropriate statistical models to study and interpret effect modification, - carefully read an epidemiological paper to critically review the methodological aspects of the article, with emphasis on the study assumptions, design, analysis and interpretation. Intended learning outcomes are classified according to Bloom's taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956, extended by Anderson and Krathwohl, 2001).

**Contents of the course :** The course focuses on the formulation and application of the logistic regression model in the analysis of epidemiological studies to estimate relative and absolute effect measures. Topics covered include a brief introduction to binary outcome data, measures of associations in two-by-two tables, univariable and multivariable models, interpretation of parameters for continuous and categorical predictors, flexible modeling of quantitative predictors, confounding and interaction, model fitting and a glance to model diagnostics.

**Teaching and learning activities :** Lectures, computer based assignments with applications focusing on analysis of real data sets, using statistical packages such as Stata or R, hand based exercises, group discussions and literature review.

**Examination :** The student has to show that the learning outcomes have been achieved to pass the exam. The course grade is based on the individual written examination (summative assessment). The focus of the examination will be on the understanding of the underlying principles of categorical data models and their application to analysis of epidemiological studies, and therefore less emphasis will be given to mathematical details. Students who do not obtain a passing grade in the first examination will be offered a second examination within two months of the final day of the course. Students who do not obtain a passing grade at the first two examinations will be given priority for admission to the next course's offering. If the course is not offered during the following two academic terms then a third examination will be scheduled within 12 months of the final day of the course.

**Compulsory elements :** The individual take-home written examination (summative assessment).

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students are prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) date for registration as a doctoral student. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken. Prior knowledge in any software, e.g. Stata, R or SAS is strongly recommended.

**More information :** Prior knowledge in any software, e.g. Stata, R or SAS is strongly recommended.

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### Course responsible :

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### Contact person :

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## Title : Fundamentals of Stata Language

**Course number :** 5315

**Credits :** 1.5

**Date :** 2023-09-11 -- 2023-09-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Global Public Health

**Specific entry requirements :**

**Purpose of the course :** This course aims at introducing students to the fundamental elements of the statistical software Stata. Motivating examples arising from health-related research will be used to demonstrate how to use the programming language. Learning activities will give students the possibility to learn Stata the hard yet easier way – that is – problem, code, and run.

**Intended learning outcomes :** After successfully completing this course you as a student should be able to: - describe quantitative, categorical, and string data - recode existing variables - explain how to work with time and space variables - select an appropriate visualization according to the data - illustrate how to control and automatize code - draw random variables from realistic mechanisms - compare distributions of statistics under repeated sampling - write do-files for preparing and analysing research data - create well-structured do-files to facilitate reproducible research

**Contents of the course :** This course is providing the basics to import, and describe common forms of data; create tables of descriptive statistics eventually stratified; generate new variables; recode existing variables; and visualize either empirical data or theoretical data. Advanced topics include define a new function; avoid replication of code by looping; and simulate a plausible data generating mechanism. Learning activities will be based on real or hypothetical studies arising in health-related research.

**Teaching and learning activities :** Lectures, group work, exercises, and individual coding workout using Stata®.

**Examination :** Individual written examination. Students who do not obtain a passing grade in the first examination will be offered a second chance to resubmit the examination within two months of the final day of the course.

Students who do not obtain a passing grade at the first two examinations will be given top priority for admission the next time the course is offered.

**Compulsory elements :** The individual examination (summative assessment) is compulsory.

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** The content on how Stata can be used to analyze epidemiological data is not covered in this course. Students should bring their own laptop with a Stata license (any version will do).

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## Title : Sex and Gender Perspectives in Biomedical Research

**Course number :** 5318

**Credits :** 1.5

**Date :** 2023-10-23 -- 2023-10-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department for Clinical Science, Intervention and Technology

**Specific entry requirements :** Second cycle - Master 's level study in medicine or biomedicine

**Purpose of the course :** "Every cell has sex and every person is gendered". This course encourages students to examine the validity and implications of this statement in the field of experimental and clinical medical research, and; in particular, in relation to their PhD projects. It will focus on what the current evidence and regulations suggest in respect to implementation of sex and gender perspectives (gender dimension) in the field of experimental and clinical medicine with further implementation in cardiovascular, metabolic, neurological, immunological and renal fields of medicine and in experimental and clinical research towards personalized medicine.

**Intended learning outcomes :** After completion of both the online module and the face-to-face part of the course, students are expected to be able: I) to account for sex and gender in biomedical research involving animals, cells or tissues; II) to account for sex and gender when considering aspects of experimental and clinical research in humans. III) to account for gender dimension in the research content in their PhD projects and potential grant applications.

**Contents of the course :** This short course consists of two modules. The first module consists of a web-based course developed by Canadian Institute of Gender and Health with the title SEX AND GENDER IN BIOMEDICAL RESEARCH, as well as individual work designed by course organizers mainly including web based tools for requirement of relevant information. The face-to-face module will concentrate on research topics in the selected research fields. It will include a number of in-house seminars/workshops with guest lecturers (Meet an Expert - Get Inspired) who will facilitate and enhance the learning process as it draws on team-based learning approaches, while promoting a sense of community among the students. Examples of experimental and clinical research towards cardiovascular, neurological, metabolic health, sex-specific cell signaling in health and disease, female and male models for the disease of interest will be linked with presentations of subjects of importance regarding sex/gender perspectives in the diseases development, and with presentation of symptoms, availability and feasibility of treatment regimens and outcomes. Finally, the advice for successful execution of implementation of gender dimension in the research projects and potential grant applications will be discussed with leading experts in the field for Horizon Europe grant applications.

**Teaching and learning activities :** The course consists of an online creative, flexible and free-accessible module SEX AND GENDER IN BIOMEDICAL RESEARCH that anyone can take in one's own pace (about one day to complete) and face-to-face days with seminars/workshops with guest lecturers (Meet an Expert - Get Inspired). The participants should write a reflective report (1-2 A4 pages;) followed by preparation of a group presentation/s on the topic of interest with application of sex and gender perspective in the content for the selected project or application for a grant for a final presentation day.

**Examination :** Exam format: I) assessment of the web-based course: pass when acquiring the answer to 90% of the questions. II) presentations of assigned work, either individually or in group.

**Compulsory elements :** All sections of the course are mandatory and cannot be compensated for.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :**

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### Course responsible :

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## Title : Global Mental Health

**Course number :** 5320

**Credits :** 3.0

**Date :** 2023-09-04 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Global Public Health

**Specific entry requirements :** Background or previous coursework in public health, global health, health care, or other relevant medical or social science subject area.

**Purpose of the course :** The aim of this course is to provide an overview of the field of Global Mental Health, and advance students' understanding of its key concepts and challenges. Students will consider mental health across cultures and contexts, and learn innovative approaches to preventing and treating mental disorders in low-resource settings. We will integrate knowledge and approaches from public health, global health, transcultural psychiatry and psychology, anthropology, and psychiatric epidemiology.

**Intended learning outcomes :** • Define key concepts in the field of global mental health, • Describe the epidemiology of mental disorders, risk factors, and social determinants of mental health in a global perspective. • Describe mental health challenges in low- and middle-income countries and discuss issues unique to understanding, measuring and caring for mental health in these settings. • Discuss the role of culture and stigma in the presentation of mental disorders. • Identify vulnerabilities in different populations, such as at different ages and life stages, and for those exposed to migration or armed conflict. • Discuss complex issues related to mental health and its care across socially and culturally diverse contexts globally.

**Contents of the course :** This course examines global mental health beginning with an understanding of the foundations of the field, to social and cultural shaping of mental health, to approaches to reduce the global burden of mental disorders. The course will explore various perspectives and a diversity of experiences from low- and middle-income countries when considering models of global mental health research and practice. Students will learn methods of cross-culturally adapting psychological tools, and challenges for measurement, interventions and mental health research in low-resource settings and humanitarian contexts. Topics will include: • the epidemiology and burden of mental disorders, and mental health challenges in low-and middle-income countries • social determinants of mental health, risk factors and vulnerabilities of particular populations, such as across different phases of development and for individuals exposed to violence, trauma, migration and armed conflict; • the role of culture in the shaping of mental health and presentations of mental disorders; the impacts of stigma; • mental health and psychosocial support in humanitarian and post-conflict settings • the promotion of mental health and strengthening of mental health systems, and approaches to prevention and treatment of mental disorders, especially in resource-constrained settings.

**Teaching and learning activities :** The course will be held over 2 consecutive weeks, full-time. Learning activities include lectures, group discussions, video-lectures and interactive seminars with international experts, individual and group presentations. Students will critically review relevant scientific articles and other works, and are expected to engage analytically with assigned readings, coming to class ready to participate actively in discussions of the issues raised therein. Students will be encouraged to question, critique and reflect on ideas, assumptions, evidence and examples presented in course activities.

**Examination :** The students will have two individual assignments during the course that need to be presented orally. The students are expected to be discussant on presentations by peers and show active participation in course discussions and presentations. All intended learning outcomes have to be achieved in order to pass the course.

**Compulsory elements :** It is compulsory to attend all lectures, seminars, group work sessions, and discussions. There will also be two individual assignments with oral components and a group presentation that are compulsory. Absence may in special circumstances be compensated by extra individual assignments arranged in agreement with the course organizers.

**Number of students :** 12 - 16

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** For the Fall 2023 Course occasion, the course will be held over four weeks. The format will comprise three weeks of part-time self-study online, followed by one week of full-time learning activities in-person on campus Solna. The online self-study activities include reading assignments, pre-recorded lectures, internet-based tasks and quizzes on the Canvas e-learning platform. Following completion of the online self-study modules, students will participate in the full-time week on-campus with learning activities including seminars, workshops, as well as individual and group presentations.

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### Course responsible :

Andreas Lundin

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**Contact person :**

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# Title : Imaging in Neuroscience: with a Focus on Functional Magnetic Resonance Imaging Methods

**Course number :** 5522

**Credits :** 1.5

**Date :** 2023-09-26 -- 2023-11-14

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :** Background in cognitive sciences, psychology, medicine, biomedicine, biology, medical imaging, computational biology or any humanistic discipline where neuroimaging is used as an experimental tool.

**Purpose of the course :** The main purpose of the course is to enable the students to acquire solid understanding of the tools available to analyze brain activity data measured with functional magnetic resonance imaging (fMRI). The students will develop the ability to critically review results provided by different methods, to select the most adequate tools and experimental designs to answer different questions and to compare their relative advantages.

**Intended learning outcomes :** After attending the course the student should be able to: 1) describe the usual preprocessing steps of fMRI; 2) give a brief overview of different methods to analyze the data and explain when to use them; 3) conduct simple fMRI analysis using several methods; 4) be acquainted with experimental designs to answer different questions using fMRI; 5) give a brief overview of the usage of magnetic resonance imaging to study brain structure and function; 6) give a brief overview of other techniques to study brain function non-invasively and describe their relative merits and challenges.

**Contents of the course :** The course focuses on experimental design and analysis of fMRI data. We will briefly introduce the basis of the blood-oxygen-level dependent (BOLD) signal and how it is measured. The image processing steps, before statistical analysis, will be explained. The application of general linear model analysis to fMRI data will be explained, including random effects analysis and correction for multiple comparisons. We will discuss experimental designs for fMRI studies. The study of functional connectivity using fMRI data will be explained. We will also introduce machine learning techniques for analysis of fMRI data. Finally, structural measures of gray and white matter will be introduced as well as other techniques to measure functional and metabolic brain activity non-invasively.

**Teaching and learning activities :** The course consists of lectures, hands-on sessions, group discussions and student presentations.

**Examination :** The learning outcomes will be assessed throughout the course during the hands-on sessions where the students have to perform data analyses. The students will also complete a more extensive assignment based on one of the hands-on sessions. In the final day of the course the students will present and discuss their assignments with the rest of the group.

**Compulsory elements :** Attendance of at least 90 % on all parts of the course moments is compulsory. In certain cases students can be exempted from participation in a moment of the course. In these cases the student can be asked to complete a compensatory assignment.

**Number of students :** 8 - 15

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will take place from 9.00 to 12.00 on the following days: 26th of September, 3rd of October, 10th of October, 17th of October, 24th of October, 31st of October, 7th of November; and from 9.00 to 15.00 on the 14th November. This course is planned and offered in cooperation with the Department of Linguistics and the Department of Psychology at Stockholm University. The course is overlapping with the course Imaging in neuroscience: with a focus on functional magnetic resonance imaging methods, 1.5 higher education credits, offered at Stockholm University; and partly overlapping with the course with the same name but with 7.5 higher education credits at Stockholm University. The classes will be at Stockholm University Brain Imaging Center (SUBIC), Svante Arrhenius väg 16 A.

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## Course responsible :

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## Contact person :

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## Title : Overview Course in Cancer Drug Discovery

**Course number :** 5541

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Oncology-Pathology

**Specific entry requirements :** Students must have acquired a basic understanding of cancer biology, for example by having participated in the Basic course in tumor biology and oncology or equivalent.

**Purpose of the course :** This course describes the steps, processes and approaches needed for drug discovery with a focus on oncology. Through lectures and interactive workshops, the students will learn about current drug discovery techniques, from screening for hit discovery to the synthesis of the final drug candidate through lead optimization. Aspects of clinical testing and precision medicine will also be addressed. In this five-day course, students will attend lectures by prominent scientists from academic and industry active in the fields of drug screening, drug library design and logistics, disease models, drug development, medicinal chemistry, image analysis, chemoinformatics, precision medicine, and clinical trials. The students will also participate in a group-based learning project to design their own screening strategy, and site-visits to drug discovery companies based in Stockholm, as well as the screening platform at SciLifeLab Chemical Biology Consortium Sweden. At the end of the course, the students should have a good overview and understanding of the drug discovery workflow in cancer research, allowing them to pinpoint potential career directions for their own scientific paths.

**Intended learning outcomes :** At the end of the course the student is expected to be able to: Knowledge and understanding -Describe, define and understand the different drug discovery approaches used in both academia and industry. -Familiarity of the drug discovery process through to clinical implementation. Competence and skills - Ability to describe the concepts and terminology of drug discovery in cancer. -Understanding the different screening strategies and the associated benefits and shortcomings. -Ability to describe and understand how a compound can become a drug and its clinical implications. Judgement and approach -Demonstrate the ability to understand the concepts of drug discovery. -Evaluate how a drug discovery campaign can be used to discover new anti-cancer drugs. -Evaluate how drug discovery techniques can be currently used in a clinical setting for precision medicine.

**Contents of the course :** The main blocks of the course include: Drug discovery in pharma and academia: a perspective -ChemoInformatics -Drug Library design -Model systems Drug discovery strategies -Target-based in vitro screens -Cell-based phenotypic screens -Virtual screens -High-throughput phenotypic screening -High content imaging -Image analysis -Multi-parametric analysis Target identification -Thermal Shift (CETSA and others) -CRISPR -Transcriptomics (cMap) -PISA Lead optimization and Medicinal chemistry -Journey from compound to drug -ADME and toxicity Clinical trials and patient stratification -Diagnostics -Drug repurposing in personalised cancer medicine Workshop: design your screening strategy to target one of the hallmarks of cancer.

**Teaching and learning activities :** Lectures, workshops and site-visits.

**Examination :** The examinations will consist in a written (2 pages) and short oral presentation of a mock drug discovery project that is well motivated in background of the current state of knowledge/lack of knowledge in the cancer research area of choice or their own scientific path. Each student should actively participate (ask questions or comment) the other students's presentations at the final session of the course. One needs to show that all intended learning outcomes are reached for a pass.

**Compulsory elements :** Attendance to all lectures and workshops is compulsory. Attendance will be compensated for using summaries of literature articles addressing the topics corresponding to the missed lectures.

**Number of students :** 8 - 30

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held in person at the KI Solna campus.

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### Course responsible :

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### Contact person :

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## Title : Research for Societal Impact

**Course number :** 5546

**Credits :** 1.5

**Date :** 2023-11-06 -- 2023-11-10

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The course aims to allow doctoral students to reflect on the importance of academic research and how this can lead to societal change. Starting from and building on the doctoral students' existing knowledge, experience, and research, the course will lay the foundation for understanding factors influencing the societal impact of academic research, improved interdisciplinary collaborations, and enhanced communication skills among researchers and society.

**Intended learning outcomes :** Upon completing the course, the student should be able to: • Put their research in relation to societal challenges and communicate to a broader community within academia and the general public how their research might contribute to overcoming a societal challenge. • Identify relevant research topics at the intersection of different fields and evaluate the potential for collaboration, innovation, and societal impact. • Set up and manage interdisciplinary projects (research or development) utilising relevant entrepreneurship tools to generate societal value.

**Contents of the course :** The course will introduce the students to different pathways to create impact from research to society, collaborate across disciplines, and communicate science within academia and the general public. The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, and the 17 Sustainable Development Goals (SDGs) will be used as inspiration.

**Teaching and learning activities :** The course uses a student-centred educational model building on the doctoral students existing knowledge, experience, and research. Following the introduction, most learning will be conducted through practical work in teams. The participants will work in interdisciplinary project teams with participants from different schools and/or faculties. The teams can either choose to address challenges that have already been identified by stakeholders (i.e. UNOPs, the United Nations office for project service) or identify their own. At the end of the course, the teams will present their work to peers and a panel of stakeholders.

**Examination :** • Slide presentation based on the project outcome (a possible pathway to create societal impact). • An individual written reflection on the learning experience, including expectations, outcomes, and future application.

**Compulsory elements :** • Oral presentation of one's own research. • Oral presentation and opposition of team project.

**Number of students :** 30 - 40

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This course prepares doctoral students to create societal impact by collaborating across disciplines. Building on your existing knowledge, experience, and research, the course will lay the foundation for understanding the societal impact of academic research, improved interdisciplinary collaborations, and enhanced communication skills among researchers and society. The course runs full-time and is equivalent to one week of full-time. Classroom sessions are scheduled 6-7 November and 10 November. The rest of the week is dedicated to self-organised group work and coaching. The course is given in English and in collaboration with the Stockholm School of Entrepreneurship.

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### Course responsible :

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### Contact person :

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## Title : Methods for Systematic Review, from Idea to Project Plan

**Course number :** 5555

**Credits :** 4.5

**Date :** 2023-08-28 -- 2023-10-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :**

**Purpose of the course :** Systematic literature reviews are important for summarizing preceding scientific knowledge and experiences, and for identifying potential knowledge gaps. The aim of the course is to introduce the methodology of research synthesis, to gain skills for performing systematic reviews, and to be able to evaluate the process critically. A secondary aim is to stimulate in-depth knowledge and understanding within the participants own research area.

**Intended learning outcomes :** After completing the course, the participants are expected to: 1) have developed skills in the use of research synthesis, 2) be able to critically evaluate procedures for systematic reviews.

**Contents of the course :** • Introduction to methods of systematic literature review. • Formulation of a research question according to PICO (population, intervention, control, outcome), PEO (Population, exposing/diagnos, outcome) or SPICE (setting, population, intervention, comparison, evaluation) • Choose of appropriate reporting tool (e.g. PRISMA; STROBE) • Search string construction • Study quality assessment using different risk of bias tools • Setting up a protocol (PM), with focuses on an aspect of relevance to the participant's own doctoral project. • Critical evaluation and discussion of weaknesses and strengths in their own and co-students' protocols and reviews.

**Teaching and learning activities :** The course is a digital part-time course and includes 2 blocks (1-3 days each), and a final seminar day. Teaching and learning activities include lectures, independent work, peer-learning by evaluation of others' work and group discussions. The focus of the blocks is to gain skills that are necessary to conduct a systematic review (e.g. formulate proper research question(s) and relevant in- exclusion criteria, to perform a preliminary literature search, to critically the risk of bias of some the included studies), and to understand the role of the chosen component/aspect within the participant's own doctoral project. For the final seminar, the participant writes an individual PM (in PROSPERO format) describing the methods that are planned to be used to answer the research question regarding the chosen components, and a co-student's examination assignment is discussed.

**Examination :** The course is examined individually, orally and in writing, in the form of a project plan (PM) for a literature review based on systematic approaches and according to the grading criteria. To pass the course, the learning goals must be fulfilled, which requires active participation in compulsory parts, and an approved results for the following activities: 1) An individual essay in the form of a project plan for a literature review on (a) selected research question(s) and based on a systematic approach. The focus of this assignment will be on a) how the student has formulated the selected research question(s) and in- exclusion criteria, b) how the student in the methods discussions has critically assessed the included studies and the procedures in their own review, and c) has provided valuable input in according to the grading criteria to a peer student's PM. 2) Active participation in the final seminar where the individual assignment is presented and discussed.

**Compulsory elements :** • Participation in group discussions online • Performing the examination assignment and participate in the final seminar day • Provide peer feedback on course and examination assignments. Absence from the final seminar day must be compensated by a critical discussion (in writing) regarding another student's PM submitted to the final seminar.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This course has both digital and physical lectures at Campus Flemingsberg. In special cases, we could arrange with a hybrid session as well. Preliminary schedule: 28 August - start of course with own work, digital registration. 6-7 September, physical lectures, 8 September digital lecture of the library. 27, 28, 29 september own work. 26 October physical lectures and the examination seminar is held on the 27th October.

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### Course responsible :

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### Contact person :

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# Title : Teaching and Learning in Higher Education: An Online Doctoral Course

**Course number :** 5558

**Credits :** 4.5

**Date :** 2023-09-04 -- 2023-12-01

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Learning, Informatics, Management and Ethics

**Specific entry requirements :**

**Purpose of the course :** The course aims to prepare students for teaching in higher education and contribute to the professional development as teacher.

**Intended learning outcomes :** Intended Learning Outcomes At the end of the course, students are expected to be able to: - Analyse different roles of a professional university teacher and current conditions related to teaching-learning within higher education. - Understand and be able to employ core educational concepts of teaching and learning in Higher Education. - Design teaching in regards to outcome- and competency based curriculum frameworks in relation to theories of learning or research on student learning in higher education.

**Contents of the course :** - Roles and conditions related to being a professional university teacher - Pedagogical core concepts - Students learning in higher education - Different forms of teaching and learning activities - Design of teaching for learning

**Teaching and learning activities :** This online course is based on peer- and self-regulated learning strategies and theories of experiential learning, collaboration, and meaningful learning. This means that active participation during course sessions is an essential part of the course content. The learning environment is digital and where participants meet both synchronously and asynchronously through Canvas and Zoom. The course is primarily focused on individual written assignments and peer-feedback and participants must be prepared for some substantial scholarly work. Students get the opportunity to experience a variety of teaching-learning activities and teaching techniques related to e.g. lectures, different forms of seminars and group work. The variety of forms is planned to facilitate learning and serve as models for own teaching. Diversity and equal treatment in relation to teaching and learning are considered during the course.

**Examination :** Participants will through a written essay describe and review a teaching experience (or if needed participated as a student) within higher education, reason about the experience based on pedagogical theories/principles. The essay maybe written in English or Swedish and will be presented orally.

**Compulsory elements :** - Participation during three webinars. The webinars, scheduled for 1.5 hours each, are used to follow up two of the assignments and will be held in Zoom. - Provide feedback based on peer-review of one written essay. Absence from compulsory sessions will need to be compensated through written tasks.

**Number of students :** 12 - 18

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This is a three-week course spread out over the semester and which requires time for independent work outside of scheduled class time. The first two days of the course are devoted to getting familiar with the course in Canvas and presenting oneself to the other course participants. Scheduled sessions are on the following dates: 6 September (Virtual Campus Day), 5 October (Webinar), 18 October (Webinar), 9 November (Webinar) and 28 November (Virtual Campus Day). The course is given in English.

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## Course responsible :

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## Contact person :

Maria Appelgren

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# Title : Vascular Cell Biology

**Course number :** 5560

**Credits :** 3.0

**Date :** 2023-09-25 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Molecular Medicine and Surgery

**Specific entry requirements :** Function A course: Carrying out minor procedures in rodents

**Purpose of the course :** The objective of the course is to build up knowledge in the field of cardiovascular biology and disease using translational approaches. More specifically, the course provides an overview of the healthy and diseased vessel wall from the cellular and molecular perspective, including vascular development, biomechanics, blood flow and role of inflammation, lipid metabolism and smooth muscle cells. The course is designed to lay a solid foundation for the student commitment to basic, clinical, and translational cardiovascular research utilizing the most advanced technologies and expertise in the field. Through team-work and joint presentations/discussions, students should increase their skills for collaborative networking, scientific presentation and communication to peers and to the public. An additional objective of the course is to introduce the students to the concepts of relevant sustainability goals, applicable to cardiovascular diseases and related clinical and experimental research.

**Intended learning outcomes :** Knowledge and understanding - At the basic level students should be able to account for the various cell types and extracellular matrix components in the vessel wall, and critically review/discuss the potential cellular transdifferentiations in pathological conditions relevant to cardiovascular disease. - They should be able to interpret the complex interactions among the different components, biomechanical and systemic influences within the vessel wall, and use it to explain the causality in the development of vascular disease. - Students should become aware of social- and gender- related inequities with respect to cardiovascular diseases and best medical treatment opportunities (SDG3, SDG4, SDG5, SDG10). Competence and skills - By conducting laboratory projects during the course, students should be able to make a synthesis of the theoretical and practical knowledge and envision how that knowledge could be applicable in their own research projects. - They should be able to discuss and compare state-of-the-art laboratory, translational and animal techniques applied for specific questions in this research area. Judgement and approach - Students should be able to demonstrate awareness of the ethical perspectives related to the biobanking and animal research in cardiovascular disease, which will be incorporated and discussed during the course from the perspective of related sustainability goals (SDG12, SDG14, SDG15, SDG9). - They should be able to demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used. - They should be able to demonstrate insight into the importance of partnerships and large, international collaborations for sharing research data and resources in order to achieve more sustainable scientific and clinical developments for broad societal benefit (SDG17).

**Contents of the course :** The course will provide a theoretical and practical introduction to the basic cell types, extracellular components and their transformations present in the healthy and diseased vascular wall. Focus will also be on the signaling and basic biological process of cell activation, migration, proliferation and turnover involved in the vessel wall homeostasis during vascular development (arteriogenesis, angiogenesis), as well as the main vascular pathologies and vascular remodeling during injury and healing reactions. The impact of vessel biomechanics and components from the systemic blood flow on cell plasticity will also be covered. Sustainable development goals specified above will be incorporated throughout the course, both in lectures and in practical moments.

**Teaching and learning activities :** The learning methods in this course include both individual and group studies, exemplified through literature reading, journal club discussions and practical workshops related to the intended learning outcomes. Seminars with expert lecturers from KI and externally invited, will initiate and enhance the learning process. A practical laboratory project, where the students will test relevant methods for vascular research (in vitro, in situ and in vivo) and produce their own results, will be integrated. Course leaders will serve as facilitators for discussions, promote networking and collaboration skills during team-work.

**Examination :** All learning outcomes of the course must be reached to pass the course. Every participant will be individually assessed and examination will be based on several formats: i) oral presentations of assigned research group work. Time for group work will be designated during the whole course where teams prepare a presentation based on the experimental research project they have designed and results they produced during laboratory work, supervised by the seminar leaders. ii) participation during workshop/journal club that will encompass e.g. critical evaluation of assigned papers, writing short risk assessment for laboratory protocol, or a prototype ethical application for a clinical or mouse study, etc. including discussion among the teams facilitated by the seminar leaders.

**Compulsory elements :** The course is work-intensive. Presence is strongly recommended during the whole course, but is compulsory during group work, practical experimental tasks and examination. Absence is allowed in exceptional circumstances only and will have to be compensated with a written assignment in agreement with the course leader.

**Number of students :** 8 - 20

**Selection of students :** Selection is based on: 1) relevance of the course plan for the applicant's doctoral project (according to the motivation letter) 2) start date for doctoral studies

**More information :**

**Course responsible :**

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**Contact person :**

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# Title : Stem Cells and Organoids Models with Focus on Regenerative Medicine

**Course number :** 5562

**Credits :** 1.5

**Date :** 2023-10-16 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Biosciences and Nutrition

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is to enable doctoral students to obtain a basic understanding of stem cell biology with focus on production and study of organoids in vitro culture, cell-based therapies, genome engineering and translational medicine. Experts in the field will provide a fresh overview of clinical and pre-clinical research aiming at development of novel treatment possibilities, but also discussing current limitations and general ethical aspects. In addition the students will be enabled to improve their capacity to produce coherent, logical and concise explanations of data and concepts - both written and orally, through consideration of the course material.

**Intended learning outcomes :** At the conclusion of this course students should be able to show a comprehensive view of: - Preimplantation Embryology - Derivation methods and culture conditions of hESCs - Nutritional requirements of the blastocyst and stem cells - Functional characteristics of different 3D-tissue culture incubators - Characterization of the organoids and the importance of the 3D bioprinting of these cells and what is ongoing in this field - Production of isogenic embryonic stem cells by somatic cell nuclear transfer (SCNT) - The pluripotency induction of somatic cells by transduction (the iPS cells) - Know the prospective possibilities of having a good culture system and be aware of potential development of organoids technology in the future. - Be aware of the general aspects and implication of the stem cells and organoids research and the potentiality that these represent for research and clinical application.

**Contents of the course :** 1. Preimplantation embryology 2. In vitro culture system 3. Stem cells culture (lectures) 4. Characterization of stem cells & Stem cell-derived organoids 5. Genome engineering 6. Introduction to different cell types and organoids 7. Cell reprogramming and editing 8. Stem cells therapy and organoids challenge today 9. Future in stem cells and organoids models

**Teaching and learning activities :** Lectures from experts in the field, laboratory demonstrations, course test, evaluation, discussions, examination and closing of course.

**Examination :** Constructive feedback and evaluation that supports learning (that is formative assessment) is included during active participation in all parts of the course. A summative assessment including an individual written assignment is carried out at the end of the course.

**Compulsory elements :** The laboratory parts are obligatory. Absence at the laboratory demonstration needs to be compensated for by a literature review in accordance with the instructions from the course leader.

**Number of students :** 8 - 14

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held at Karolinska Institutet, Department of Bioscience and Nutrition, NEO Huddinge.

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## Course responsible :

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**Contact person :**

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# Title : Neurodegenerative Disorders I: Genes, Mechanisms and Clinical Aspects

**Course number :** 5572

**Credits :** 1.5

**Date :** 2023-09-25 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is for participants to gain knowledge concerning genetics, molecular mechanisms as well as clinical features and treatment strategies of neurodegenerative disorders. To gain and apply new knowledge, participants will (in addition to lectures by experts in the field) prepare and give own oral presentations as well as ask and answer questions in the group during the course week. The course will allow interaction between PhD-students and students of the KI Master's programme in biomedicine (elective course in their second year), all with a special interest in neuroscience.

**Intended learning outcomes :** The student should after the course: Be able to discuss and give examples of 1) genetics, molecular mechanisms and cellular processes of neurodegeneration, 2) how genetic dysfunctions help us understand the molecular mechanisms of disorders and 3) mechanisms of protein turnover, degradation and aggregation in relation to neurodegenerative disorders. The student should at the end of the course 4) have achieved basic knowledge about epidemiology, symptoms, inheritance, pathology and current treatments (symptomatic or curative) of the most common neurodegenerative disorders such as Alzheimer disease, Parkinson disease, frontotemporal dementia, amyotrophic lateral sclerosis and multiple sclerosis. 5) In addition, the student should be able to discuss the relevance (pros and cons) of different disease models, i.e. give examples of how well different models can model the clinical picture as well as possible disease mechanisms.

**Contents of the course :** The course will cover topics related to the degeneration of neural cells, apoptosis and necrosis as well as the cellular and biochemical reactions to neurodegeneration. During the course we will also present and discuss genetics, epidemiology, pathology, symptoms, diagnosis and treatment strategies of the most common neurodegenerative disorders such as Alzheimer disease, Parkinson disease, frontotemporal dementia, amyotrophic lateral sclerosis and multiple sclerosis. Molecular mechanisms of current and future treatment strategies, disease models and their potential will be presented and discussed. In addition, the students may within group assignments study other neurodegenerative diseases such as dementia with Lewy bodies, ataxias and prion diseases.

**Teaching and learning activities :** The course runs daytime for 1 week full-time with a mix of lectures by invited scientists, participants group assignments as well as individual studies.

**Examination :** The examination part includes: the group assignments, short formative examination questions at the end of some of the days during the course week, the oral presentations by the students and the following general discussion between all participants. All students are individually assessed.

**Compulsory elements :** In order to achieve the learning outcomes all participants are expected to be present the whole week. The group assignments, the oral presentations by the students and the following general discussion between all participants are compulsory. Students that are absent from these parts will have to individually submit a written presentation of the subject.

**Number of students :** 10 - 25

**Selection of students :** If a selection of course participants is necessary, we will prioritize 1) students for whom the course is mandatory, 2) students with an educational plan encompassing the topics of the course and 3) PhD-students with an early registration date that are close to finalizing their doctoral studies.

**More information :** The course will be held at Karolinska Institutet, Solna. This course is replacing two previous courses: #2600 Neurogenetics (<https://survey.ki.se/Report/5cWbCliXwqq>) and 2629 Neurodegenerative Disorders I - From Molecule to Treatment (<https://survey.ki.se/Report/6h2oRAiSgjP>).

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## Course responsible :

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## Contact person :

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## Title : Functional Cognitive Neuroanatomy

**Course number :** 5573

**Credits :** 1.5

**Date :** 2023-10-09 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neuroscience

**Specific entry requirements :**

**Purpose of the course :** This course aims to provide a basis in cognitive neuroscience and the neuroanatomy that supports it. The course will enable participants to get a good understanding of how the brain makes decisions, forms long term memories and handles emotions.

**Intended learning outcomes :** After the course the students should be able: to describe the field of cognitive neuroscience to explain how the brain can make decisions, form lasting memories and compute emotional states. to show where in the brain and by which structures these different functions are controlled.

**Contents of the course :** The course consists of theoretical sessions and practical work related to decision-making, memory formation and emotion. It will also include the neuroanatomy related to these functions using both MRI and human brains. The participants will be actively involved in group work dealing with practical and theoretical aspects of cognitive neuroanatomy.

**Teaching and learning activities :** Lectures, seminars and practical group work in the dissection room.

**Examination :** Practical exam on neuroanatomy and oral presentation for the theoretical part.

**Compulsory elements :** Lectures, seminars, group work in the dissection room and the final exam are obligatory. To compensate for absence participants will be given individual tasks that involve the respective theoretical or practical item missed.

**Number of students :** 8 - 40

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course has a combination of labs in the anatomy department and lectures at Biomedicum. The course is quite intense and requires full time studies.

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**Course responsible :**

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**Contact person :**

Konstantina Kilteni

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## Title : Quality Assurance of Clinical Research

**Course number :** 5580

**Credits :** 1.5

**Date :** 2023-09-04 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Solna

**Specific entry requirements :**

**Purpose of the course :** This course is suitable for any kind of clinical researcher at KI. The purpose of the course is to carry insights to the participant how to create trustful data, and how to become a trusted researcher. The course brings information of what is required to act safely and in accordance with local rules, national legislation and international treaty's when involved in clinical research. Whether your research is interventional or non-interventional, using quantitative or qualitative methodology, you will after this course know how to act to secure your research persons, your data and your professional career.

**Intended learning outcomes :** Knowledge and understanding: Conclude which legislations affects clinical research and how they do it. Deduce how clinical research integrity is affected by fabrication, falsification and plagiarism. Account for common problems that may arise in clinical research. Competence and skills: Differentiate the responsibilities between the investigator, the study team members, and the sponsor in a clinical study. Analyse the validity of a research project proposal or publication with a risk-benefit analysis. Translate general research quality systems into own research area. Judgement and approach: Critically identify good clinical scientific practices and deviations from it in clinical research. Judge data validity and their reproducibility. Handling bias, sponsorship, and scientific authorship in a paper.

**Contents of the course :** This course presents different quality systems in clinical research including good clinical practice (GCP). In more detail the course also discusses: How and when the informed consent shall be asked for in relation to the research. Why you can't substitute research persons. What to consider when constructing a study protocol. How to handle violations to the protocol. Why you need to screen for unwanted effects. What is the responsibility on your shoulders as an investigator? What you can do to safeguard your research and career.

**Teaching and learning activities :** You should have some basic experience using Canvas as this software is our learning management system. The course is provided in a digital format with video lectures, readings, discussion postings and self-tests. It is divided into two phases. These correspond to one-week full time course distributed over four weeks. The course is self-paced. In the first phase digital lectures are provided on research quality. There are self-tests after each lecture. The first phase includes the GCP course. The second phase lets the student pick an article from a selection of different research areas for an in-depth critical analysis using the analysing tools provided. Finally, the student has to present how quality is applied to, or how it could be incorporated, in the students' own research area. The faculty is available and on stand-by during the study period (office hours). The study path of each student is monitored.

**Examination :** Having cleared all preceding moments including self-tests and mandatory multiple choice test, an individual final examination with short answer questions is taken. The theme for this refers to implementation of the quality standards in the students own research field. If the final exam is not cleared a new final exam will be offered at next course occasion.

**Compulsory elements :** There will be a mandatory attendance check upon study start. If no-show, the seat will be cancelled and referred to another student on the waiting list for the course. Each self-test must be passed to be considered completed. There is a mandatory multiple choice test to pass halftime into the second phase. To be able to take the final exam all preceding moments must have been cleared.

**Number of students :** 25 - 35

**Selection of students :** The selection is based on the written motivation of the applicants as to why they want to take the course and starting date for PhD studies. Priority will be given to applicants who has not got a seat at earlier applications. The course is only open for PhD students registered at KI.

**More information :** The course is digital, and self-paced over 4 weeks. The first day a mandatory webinar takes place 9-10.30. The last day is examination day. You need to set aside time for the tests. Usually they take app. 2 hours. The tests are open for you between 9-17.

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### Course responsible :

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**Contact person :**

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## Title : Quality Assurance of Clinical Research

**Course number :** 5580

**Credits :** 1.5

**Date :** 2023-10-09 -- 2023-11-03

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Solna

**Specific entry requirements :**

**Purpose of the course :** This course is suitable for any kind of clinical researcher at KI. The purpose of the course is to carry insights to the participant how to create trustful data, and how to become a trusted researcher. The course brings information of what is required to act safely and in accordance with local rules, national legislation and international treaty's when involved in clinical research. Whether your research is interventional or non-interventional, using quantitative or qualitative methodology, you will after this course know how to act to secure your research persons, your data and your professional career.

**Intended learning outcomes :** Knowledge and understanding: Conclude which legislations affects clinical research and how they do it. Deduce how clinical research integrity is affected by fabrication, falsification and plagiarism. Account for common problems that may arise in clinical research. Competence and skills: Differentiate the responsibilities between the investigator, the study team members, and the sponsor in a clinical study. Analyse the validity of a research project proposal or publication with a risk-benefit analysis. Translate general research quality systems into own research area. Judgement and approach: Critically identify good clinical scientific practices and deviations from it in clinical research. Judge data validity and their reproducibility. Handling bias, sponsorship, and scientific authorship in a paper.

**Contents of the course :** This course presents different quality systems in clinical research including good clinical practice (GCP). In more detail the course also discusses: How and when the informed consent shall be asked for in relation to the research. Why you can't substitute research persons. What to consider when constructing a study protocol. How to handle violations to the protocol. Why you need to screen for unwanted effects. What is the responsibility on your shoulders as an investigator? What you can do to safeguard your research and career.

**Teaching and learning activities :** You should have some basic experience using Canvas as this software is our learning management system. The course is provided in a digital format with video lectures, readings, discussion postings and self-tests. It is divided into two phases. These correspond to one-week full time course distributed over four weeks. The course is self-paced. In the first phase digital lectures are provided on research quality. There are self-tests after each lecture. The first phase includes the GCP course. The second phase lets the student pick an article from a selection of different research areas for an in-depth critical analysis using the analysing tools provided. Finally, the student has to present how quality is applied to, or how it could be incorporated, in the students' own research area. The faculty is available and on stand-by during the study period (office hours). The study path of each student is monitored.

**Examination :** Having cleared all preceding moments including self-tests and mandatory multiple choice test, an individual final examination with short answer questions is taken. The theme for this refers to implementation of the quality standards in the students own research field. If the final exam is not cleared a new final exam will be offered at next course occasion.

**Compulsory elements :** There will be a mandatory attendance check upon study start. If no-show, the seat will be cancelled and referred to another student on the waiting list for the course. Each self-test must be passed to be considered completed. There is a mandatory multiple choice test to pass halftime into the second phase. To be able to take the final exam all preceding moments must have been cleared.

**Number of students :** 25 - 35

**Selection of students :** The selection is based on the written motivation of the applicants as to why they want to take the course and starting date for PhD studies. Priority will be given to applicants who has not got a seat at earlier applications. The course is only open for PhD students registered at KI.

**More information :** The course is digital, and self-paced over 4 weeks. The first day a mandatory webinar takes place 9-10.30. The last day is examination day. You need to set aside time for the tests. Usually they take app. 2 hours. The tests are open for you between 9-17.

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# Title : Bioinformatics Analysis and Visualisation of Medical Genomics Data

**Course number :** 5633

**Credits :** 3.0

**Date :** 2023-10-04 -- 2023-10-17

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Biosciences and Nutrition

**Specific entry requirements :**

**Purpose of the course :** To increase the understanding of the basic principles of bioinformatics and to gain practical skills in bioinformatics analysis of genomic sequencing data.

**Intended learning outcomes :** After the completed course, the participants will be able to understand the principles and perform basic bioinformatics analysis of genomics sequencing data. The participants will be able to plan experimental designs and to critically evaluate the appropriateness of the different sequencing based omics methods and technologies for genome-wide gene regulation studies.

**Contents of the course :** Principles of gene regulation in non-disease cases and dysregulation in diseases at individual locus level as well as on genome-wide level. Principles of sequencing based genomics technologies and corresponding bioinformatics data analysis. Concrete bioinformatics data analysis by the students of selected published projects.

**Teaching and learning activities :** The course consists of preparatory work, lectures, discussion, seminars and hands-on bioinformatics analysis.

**Examination :** The students will be examined for all learning outcomes by their performance in (a) submitted replies to tasks given for course week 1, (b) discussions and quizzes during the course week 2, and (c) individual presentations at the last course day of their bioinformatics analysis results conducted during course week 2.

**Compulsory elements :** The preparation is done in the first course week without the need to be present on-site. Week 2 consists of tasks, lectures, discussions, seminars and hands-on practicals. Both parts are compulsory. Absence has to be compensated for according to the instructions from the course leader.

**Number of students :** 20 - 30

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Week 1: <br> 2023-10-04 to 2023-10-10 Work on task assignments from home <br><br> Week 2: <br> 2023-10-09 Latest day for departure from Sweden <br> 2023-10-10 Arrival in Japan <br> 2023-10-11 to 2023-10-13 Course days 1, 2, 3<br> 2023-10-14 to 2023-10-15 weekend, no course <br> 2023-10-16 Course day 4 <br> 2023-10-17 Course day 5 with examination<br> 2023-10-18 RIKEN-KI-SciLifeLab Symposium at RIKEN Yokohama (not mandatory)<br> 2023-10-19 departure from Japan<br> <br><br> The first week of the course (2023-10-04 to 2023-10-10) is in the form of individual homework assignments (distance course), as preparation for the second week of the course. Week 2 of the course (2023-10-11 to 2023-10-17) consists of tasks, lectures, discussions, and seminars in the mornings. In the afternoons, course participants will conduct data analysis in small groups under guidance of a tutor to redo key figures of selected published papers and based on the corresponding published data. The statistical language R will be used for the hands-on practical. It is strongly recommended that participants have previous experiences with R. <br><br> The course is given in collaboration with the RIKEN Institute in Yokohama. The course faculty consists of invited speakers from RIKEN and from Karolinska Institutet. The course Week 2 takes places in Yokohama, Japan. Course participants would travel to Japan and arrive in Japan latest 2023-10-10. The 2023 RIKEN-KI-SciLifeLab Symposium will be held the day after the course ends, we highly recommend the course participants to attend this symposium. Departure from Japan would be earliest 2023-10-19. <br><br> The traveling and accommodation costs for Swedish students will not be covered by the course. Financial support for some participants (KI doctoral students/KI post docs) might be available but depends on the outcome of ongoing funding applications. Please state clearly in your course application if you are also applying for travel and accommodation support. Give detailed motivation why you would need the financial support to be able to attend the course. The relevance of your motivation will be the basis to select the funded course applicants. The recipients of this support will be selected by the course directors based on their motivation presented in their course participation application. Also, the financial support will not be shared equally over all applicants but an amount of approx. 15,000 SEK (including overhead) will be given to the selected participants.

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**Course responsible :**

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**Contact person :**

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# Title : Single Case Design (SCD) in Clinical Research and Data Driven Decision Processes for Individualized Health Care

**Course number :** 5638

**Credits :** 3.0

**Date :** 2023-10-02 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :** Course in basic statistics or corresponding knowledge.

**Purpose of the course :** The course primarily targets PhD students and postdoctoral researchers involved in clinical research, with an interest in understanding individual change processes, including treatment effects. The purpose of the course is to enhance clinical research in precision health and personalized interventions, and to facilitate a scientist-practitioner approach in health care with data driven decision processes. More specifically, the course will enable the student to: 1) understand the rationale for, and implications of using, Single Case Design (SCD) in relation to group-based designs such as randomized controlled trials (RCT) (e.g. research questions and conditions, validity of results) 2) acquire substantial knowledge about different types of SCDs 3) have a basic understanding of key statistical and visual/graphical analyses 4) follow guidelines for conducting and reporting SCD studies

**Intended learning outcomes :** The course contains intended learning outcomes (ILOs) in knowledge, skills and attitude. Below follows a presentation of ILOs in each of the course modules as well as for professionalism and overall course content, together with the form of assessment for each ILO. **KNOWLEDGE** Module 1. Introduction – why SCD? - Understand limitations with group-based analytic approaches, such as RCTs (SBA, i.e. Single Best Answer) - Understand when SCD is applicable (Seminar) Module 2. Designing a single-case study - Ability to contrast individual- and group level analyses, e.g. SCD vs RCT (SBA) - Knowing the central types of SCD, including observational (SCOD) and experimental (SCED) designs Module 3. Analyzing SCD data - Knowing the basic statistical analyses for SCD data (Seminar) - Knowing the visual/graphical analyses of SCD data (Seminar) Module 4. Reporting SCD data - Oriented in the guidelines for reporting SCD studies (SBA) **Professionalism** - Ability to critically appraise ethical concerns in using individual-level data (Brief report) Overall course content - Well oriented regarding the existing SCD resources, including data collection tools and networks (Final exam) - Ability to apply guidelines for planning, conducting and reporting SCD studies (Seminar) **SKILLS** Module 1. Introduction – why SCD? - Ability to describe the main SCED designs (Seminar) Module 2. Designing a single-case study - Ability to identify a SCD design suitable for analyzing the change process in a given clinical context (SBA) Module 3. Analyzing SCD data - Ability to apply digital tools for randomization, data collection and analyses (visual and statistical) (SBA) Module 4. Reporting SCD data - Ability to write a scientific report in accordance with guidelines (Seminar) **Professionalism** - Ability to communicate about SCD with a patient (e.g., why and how) (OSCE, i.e. Objective Structured Clinical Examination) Overall - Ability to apply SCD to investigate a clinically relevant question (Seminar) **ATTITUDE** **Professionalism** - Ability to critically review and report strengths and concerns in own SCD studies (e.g., based on guidelines) (Brief report) Overall - Ability to critically evaluate the use of group-level designs, including RCTs (Final exam)

**Contents of the course :** The course will cover the fundamentals of Single Case Design (SCD), and consists of four different modules covering: 1) what SCD is and what it is used for, different designs and key differences as compared to group-level designs (e.g. RCT) 2) design and implementation, including data collection with digital tools 3) how to analyze SCD data with visual and statistical methods 4) how SCD studies are reported based on international guidelines.

**Teaching and learning activities :** To optimize learning of applied knowledge and skills, six different teaching-learning activities (TLA) are used: 1. Pre-recorded 45 min lectures by international SCD researchers followed by digital live 45 min "question and answer (Q&A)" sessions with the presenter, covering different aspects of SCD. 2. Pre-recorded digital hands-on workshops on how to conduct a SCD study in practice. 3. Reading literature, including books and papers, on SCD. 4. Digital seminars, using a Flipped teaching/learning approach with a focus on questions that stem from the lectures, Q&A sessions and the literature. 5. Digital workgroup sessions, to provide and get peer feedback on practical exercises. 6. Asynchronous communication within the work group, on assignments related to each module.

**Examination :** Examinations are designed to be in alignment with course objectives (ILOs) and learning activities (TLAs). Thus, there are assessments in each specific module (i.e., the building blocks of relevance for the overall skills, i.e., designing, analyzing and reporting SCD) for the three categories of ILOs (knowledge, skills, attitude), as well as an overall assessment of the course content, including professionalism. (Notably, summative assessments of professionalism are conducted on several occasions during the course, e.g., in two or more TLAs on ethics and methodology quality, for example "patient selection and informed consent", and "confidentiality and anonymized data".) Examinations are designed to have summative and formative functions and include 1) single best answers (SBA), 2) seminar attendance, 3) Objective structured clinical examination (OSCE), 4) brief reports and a 5) final report.

**Compulsory elements :** Attendance at the digital seminars is required, and therefore included in the summative assessment. Up to two seminars may be missed, and compensated by writing a brief report from the seminar. Pre-recorded lectures and workshops are strongly recommended activities, and information from lectures will be included in both summative and formative assessments.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :**

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**Course responsible :**

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**Contact person :**

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## Title : Bioengineering for Planetary Health

**Course number :** 5675

**Credits :** 1.5

**Date :** 2023-08-14 -- 2023-08-18

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neuroscience

**Specific entry requirements :**

**Purpose of the course :** To increase the understanding of the possibilities and technologies employed in bioengineering for planetary health, such as infectious diseases and different ways of combatting infectious agents.

**Intended learning outcomes :** Upon completion of the course, the doctoral students can describe important concepts in bioengineering, describe different technologies employed in bioengineering, and critically evaluate important methods and technologies applied on bioengineering for planetary health.

**Contents of the course :** Overview of possibilities and challenges of bioengineering for planetary health, such as for infectious diseases and different ways of combatting infectious agents. Different engineering and medical technologies employed in prevention and treatment of infectious diseases. Critical evaluation of different approaches and methods in bioengineering. Methods and technologies used in the study of brain aging.

**Teaching and learning activities :** The course is organized as a summer school, which encompasses lectures, small group discussions, student presentations, participation in a scientific symposium and a scientific conference, and site visits to research laboratories.

**Examination :** The students are examined with individual and group presentations on the course themes. Each student has to be able to show that all the learning outcomes for the course are reached.

**Compulsory elements :** Participation in the group discussions and student presentations is mandatory. Compensation is according to the instructions of the course director.

**Number of students :** 5 - 5

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** This summer school course is jointly organized by Karolinska Institutet, King's College London, Peking University Health Science Center and Keio University. Note that the total number of participants is 20, with five doctoral students participating from each one of the four universities. The course takes place at Biomedicum, Karolinska Institutet and at Uppsala University.

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**Course responsible :**

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# Title : Psychological models of Psilocybin Drug Administration

**Course number :** 5676

**Credits :** 1.5

**Date :** 2023-09-06 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :**

**Purpose of the course :** There is a paucity of treatments for many psychiatric disorders, including depression. Preliminary data suggest both a good safety profile and therapeutic potential for psychedelic substances when combined with therapy. This course aims to address the critical gap in scientific knowledge on which psychological models of psilocybin administration should be considered best practice – with a specific focus on possible research designs to test psychological models in the clinical application of psilocybin.

**Intended learning outcomes :** After completed course, the students should be able to: - Give an account of the current state of clinical applications of psilocybin, including safety, ethical, and regulatory perspectives. - Identify and analyze strengths and limitations of research in the field, including the psychological models used in psilocybin studies. - Discuss and evaluate possible strengths and limitations of alternative research designs for clinical studies, such as single case experimental design (SCED), with a specific focus on how these can be applied and aggregated into psychological models of psilocybin drug administration. - Write a solid research plan proposal to test a psychological model of psilocybin drug administration.

**Contents of the course :** This course will provide an overview of the current state of research on clinical applications of psilocybin, including safety, ethical, and regulatory perspectives. Together with leading researchers in the field, students will analyze the strengths and limitations of alternative research designs to test psychological models of psilocybin administration. In addition, students will write individual drafts of proposed research plans to test these models.

**Teaching and learning activities :** This course is conducted in a hybrid format as a combined workshop/doctoral course. Included teaching and learning activities: Reading, writing, lectures, group work, and general discussions. The workshop format enables presentations and practical exercises in both plenum and smaller groups, and also includes opportunities for networking among leading researchers in the field.

**Examination :** The doctoral students will write a proposed research plan to test a psychological model of psychedelic drug administration. The written assignment should be submitted within one month from the workshop's last day.

**Compulsory elements :** All parts of this course are mandatory. Absence can be compensated by individual assignments.

**Number of students :** 1 - 8

**Selection of students :** Postdocs and doctoral students interested or engaged in psychedelic research or clinical psychology/psychiatry are welcome to apply. Selection will be based on the relevance of the postdoc research area/doctoral project course syllabus (according to written motivation).

**More information :** This course is conducted in a hybrid format as a combined workshop/doctoral course across three Nordic countries: Sweden, Denmark, and Norway. A maximum of eight doctoral students are welcome to participate, together with 22 researchers from the three countries. During the three mandatory course days (Wednesday, September 6th, 9.00-17.00; Thursday, September 7th, 9.00-17.00; and Friday, September 8th 9.00-15.30), the students are expected to be present at Clarion Hotel Sign, Östra Järnvägsgatan 35, Stockholm. In addition to the three course days, a written proposed research plan should be submitted within one month of the last day of the workshop (i.e., October 6th).

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**Course responsible :**

Maria Beckman

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**Contact person :**

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# Title : The Interplay Between Neuro-Infections and Neurodegenerative Diseases

**Course number :** 5677

**Credits :** 3.0

**Date :** 2023-09-18 -- 2023-09-29

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neuroscience

**Specific entry requirements :** Master's degree in Biomedicine/Biomedical Science/Molecular Medicine

**Purpose of the course :** This course has the main general purpose of connecting two topics, or disease types, which are generally known by the scientific community to be completely distant from each other, such as Infections of the Central Nervous System (CNS) and neurodegenerative diseases/dementia. Students with a research project focused on CNS infections, neurodegenerative diseases, or neuroinflammation, are particularly encouraged to apply.

**Intended learning outcomes :** 1. Understanding the common molecular processes of neuronal damage between CNS infections and neurodegenerative diseases. 2. Understanding the common neuroinflammatory events between CNS infections and neurodegenerative diseases. 3. Designing an analysis using national registry databases.

**Contents of the course :** Overview of state-of-the-art knowledge concerning the molecular mechanisms of neuroinflammation and neuronal cell damage in CNS infections and neurodegenerative diseases.

**Teaching and learning activities :** Students should gain knowledge on the common neuroinflammatory processes and molecular mechanisms of neuronal damage that are common between neurodegenerative diseases and CNS infections. This course is intended to be 90% theoretical with 10% practical part. Experts (KI, non-KI, Swedish and/or international) will be invited, either in person or via Zoom during the course for giving lectures and being moderators/workshop leaders during the course. The theoretical parts will be: 1. Lectures given by experts. 2. Workshops given by experts on the use of national registry database. National Registry Databases are useful tools to assess how many people (in Sweden) with a certain type of neurodegenerative disease have been hospitalized with episodes of brain infections, and vice versa. The practical part will be for half a day (at the end of the second week): 1. Microscopy analysis of fixed neurons from Parkinson's, Alzheimer's, ALS and brain infection models (fixed human cells, mouse tissue, human brain biopsies). The students can visualize the common features of neuronal damage in neurodegenerative disease and infection pathogenesis.

**Examination :** Individual assignments: 1. Quizzes 2. Students will also submit an individual assignment in which the disease of interest in their own PhD (or master) research project will be analyzed in connection to either one type of CNS infection or one type of neurodegenerative disease. Group assignments: The assignment for each student group will be to select one type of CNS infection or one type of neurodegenerative disease (among the ones discussed during the lectures) and conceive a hypothetical project plan in which they will have to present: 1) State-of-the-art of common molecular mechanisms of their disease of interest with either one type of CNS infection or one type of neurodegenerative disease, 2) Design a new experimental approach that can be beneficial for both the type of CNS Infection and the type of neurodegenerative Disease that they have chosen.

**Compulsory elements :** Attendance to all the activities of the course, individual assignments and participation to the group assignments are mandatory. Absence from mandatory parts of the course will be compensated by other activities after discussion with the course leaders.

**Number of students :** 8 - 15

**Selection of students :** Selection will be based on: 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation) 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Students with a research project focused on CNS infections, neurodegenerative diseases, or neuroinflammation, are particularly encouraged to apply. Week 1 Day 1: Introduction and Lectures on "Neuroinflammation, with focus on brain infections" Day 2: Study time, individual assignments Day 3: Lectures on "Neuroinflammation, with focus on Parkinson's disease" Day 4: Study time, individual assignments Day 5: Lectures on "Neuroinflammation, with focus on Alzheimer's disease" Week 2 Day 1: Lectures on "Neuroinflammation, with focus on ALS and multiple sclerosis" Day 2: Study time, individual assignments Day 3: Study time for group assignment preparation Day 4: Presentation of group assignments Day 5: Lectures on National Registries/Databases (morning), Practical session (afternoon) Location: KI Campus Solna Doctoral Program: Neuroscience

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**Course responsible :**

Federico Iovino

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**Contact person :**

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# Title : Current Clinical Applications of Epigenetics in Cardiometabolic Diseases

**Course number :** 5678

**Credits :** 1.5

**Date :** 2023-11-06 -- 2023-11-10

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Solna

**Specific entry requirements :** Basic knowledge in molecular biology.

**Purpose of the course :** The aim of this course is to offer participants interested in cardiometabolic diseases a general view of epigenetics and its clinical implications (i.e., early diagnosis and treatment). Moreover, novel scientific approaches and state-of-the-art techniques in this field will be introduced. This course will provide the participants with the essential knowledge to understand and study epigenetics mechanisms in cardiometabolic diseases.

**Intended learning outcomes :** Upon completion of the course, the participants should be able to: 1) Show an in-depth knowledge of the molecular basis of epigenetics; 2) Evaluate epigenetic mechanisms and their relevance to cardiometabolic diseases (e.g. obesity, type 2 diabetes, atherosclerosis, heart failure...) by using different molecular biology techniques; 3) Have obtained basic knowledge on how experiments for epigenetic studies can be performed, analyzed, and interpreted; and 4) Show an insight into the application of epigenetics in the clinical context for studying, diagnosis, prognosis, and treatment of cardiometabolic diseases.

**Contents of the course :** Molecular fundamentals of epigenetic control under physiological and pathological conditions will be discussed. We will also examine the interplay between epigenetics and the environment and its potential inheritance. Topics to be covered include the role of DNA methylation, histone post-translational modification, and non-coding RNAs in atherosclerosis, hypertension, type 2 diabetes, insulin resistance, and other cardiometabolic diseases and mechanisms of current and future treatment. Moreover, the course will include examples of in vitro and animal models for the evaluation of epigenetics as well as examples of clinical studies. Finally, there will be a major practical component where participants will get the opportunity to see lab demonstrations and to perform hands-on bench work in the most common techniques regarding epigenetics.

**Teaching and learning activities :** The course activities will integrate daily interactive lectures and seminars given by invited scholars in the respective fields, lab demonstrations, hands-on bench work, group learning (literature review and research planning), and a group project presentation and review at the end of the course.

**Examination :** In order to pass the course, each group member needs to prove that s/he has reached the previously indicated learning outcomes of the course, to ensure this each participant has to reach a final grade which will be based on 1) a multiple choice test after each day, and participation during the discussions; and 2) an oral group presentation on the last day of the course of a research project in the field of epigenetics, which should be designed applying the knowledge learnt during the course.

**Compulsory elements :** Full attendance is required for theoretical and practical lessons to follow the course content and pass the course. Those participants who miss any session would need to perform a review of the missing content. Students need to participate in all learning activities and complete self-learning assignments. The final examination must be passed in order to pass the course.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation); and 2) the start date of doctoral studies (priority given to earlier start date).

**More information :** The course will be given in BioClinicum (Solna Campus)

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## Course responsible :

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## Contact person :

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# Title : Clinical Oncology for Basic Scientists - A Tailored Clinical Course for Researchers without Clinical Background

**Course number :** 5680

**Credits :** 1.0

**Date :** 2023-08-01 -- 2023-12-31

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Biosciences and Nutrition

**Specific entry requirements :**

**Purpose of the course :** This translational course is for pre-clinical Ph.D. students and postdocs who wish to deepen their understanding of clinical oncology. The students will join physicians at Karolinska University Hospital when they meet patients with cancer-related symptoms. They will also have the chance to observe robot-assisted cancer operations and, if possible, get the opportunity to meet patients in their area of interest by shadowing an oncologist. The students will learn about the clinical behavior of malignant tumors, the main symptoms of cancer patients, and the interdisciplinary organization of cancer care. The course program will be as individualized as possible, tailored to the student's research focus. The course is particularly, but not exclusively, suitable for students that have completed course 5505, "Clinical Oncology for Pre-clinical Doctoral Students".

**Intended learning outcomes :** After completion of the course, the students should be able to: - Describe the main symptoms of cancer and the side effects of standard therapies. - Elaborate on the different physician specialties involved in the care of cancer patients. - Describe in detail the clinical flow of cancer care - Reflect on the ethical dimension of clinical decision-making regarding the quality of life and cancer-related outcomes.

**Contents of the course :** The course will run over the whole semester and consist of two full days of seminars (one preparatory, one concluding meeting), 5 clinical visits (half days) and one reflective group meeting in the middle of the semester (half day). The course will start with a one-day meeting to introduce the clinical units involved in patient care, the common symptoms of cancer patients presenting to the emergency room (ER) due to cancer-related issues, and the side effects of anti-cancer therapy. The students will then, during the semester, on four occasions join an oncologist/resident at the oncological ER at Karolinska Hospital Solna. They will meet patients and discuss the patient cases with the resident physician. Every clinical visit is followed up with the course leader in a 30 min video meeting. On one additional occasion, the students will be able to observe a robot-assisted cancer operation at Karolinska Hospital Huddinge. In addition, one to two visits to an outpatient clinic will be organized such that the student can submit wishes as to the cancer type they are most interested in. In the middle of the semester, the group will meet. Every student will present a case they encountered during a clinical visit, which will be discussed with the group and the course leader. Psychosocial aspects of the patient encounters will be discussed in particular. The language of the course is English. The patient meetings will be held in Swedish by the responsible physician. The discussion will then be held in English.

**Teaching and learning activities :** Clinical field visits, seminars. Reflection meetings.

**Examination :** Active participation in all group meetings. Attendance of at least four field visits. Concluding oral examinations by the course leader.

**Compulsory elements :** Attendance to all the course activities and the oral examination is mandatory. The intended learning outcomes will be assessed by the student's case presentation and the student's contribution during the group discussion on the concluding day. Absence from compulsory parts of the course will have to be compensated for by other activities after discussion with the course leaders.

**Number of students :** 2 - 4

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course runs during the entire semester, starting in late August. The clinical placements are arranged individually. The course will mainly be held at New Karolinska Hospital (NKS) and KI in Solna but partly also at Karolinska Hospital, campus Huddinge.

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## Course responsible :

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**Contact person :**

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# Title : Sensory Perception in Clinical Practice and Research

**Course number :** 5684

**Credits :** 1.5

**Date :** 2023-12-11 -- 2023-12-15

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :**

**Purpose of the course :** The course aims to introduce students to human sensory perception with a focus on clinical utility and research. The neurological and evolutionary principles underlying vision, hearing, smell, taste, touch, and additional methods of perception will be introduced.

**Intended learning outcomes :** Upon completion of the course, the doctoral candidate will be able 1) To show an understanding of the evolutionary and historical context for sensory neuroscience 2) To be able to differentiate between conscious perception and sub-conscious processing 3) To outline basic scientific methods for how to assess human sensory processing 4) To show an understanding for common sensory deviations in clinical medicine

**Contents of the course :** The course will introduce the historical and evolutionary context for our senses, so as to provide an understanding for why humans operate and behave the way we do. Beyond the traditional five senses of vision, hearing, taste, smell, and touch, we will discuss several other sensory modalities available to humans, including the vestibular system. The neurological principles guiding the integration of these senses will be outlined, with special reference to subconscious and conscious decision-making. These systems will then be tested through a series of practical experiments, giving students a chance to reflect on blind-spots in human perception and how to implement these in a scientific and clinical setting. Finally, common sensory pathologies will be discussed.

**Teaching and learning activities :** Each sensory modality will be presented through a series of lectures, where key-points will be summarized through anonymous in-class quizzes. Associated with each set of lectures will be a practical experiment illustrating how sensory perception can be manipulated, carried out as group-assignments. Time will be given for self-studies in preparation for the examination.

**Examination :** The examination will be in the form of a short individual presentation on a medical condition influencing sensory perception. The presentation should reference how the condition may affect sub-conscious processing and conscious perception in different ways, and outline how these processes may be tested in a clinical or academic setting. The condition should be briefly contextualized from a historical or evolutionary perspective with special reference to implications for health or healthcare. The presentation will be followed by a group discussion lead by a student opponent. Students must play an active role during both their presentation and opponency, showing that all intended learning outcomes have been achieved to pass the examination.

**Compulsory elements :** Workshops and quizzes are obligatory, as is participation in the final examination.

**Number of students :** 8 - 15

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course is planned to be held in-person at campus Solna. Clinicians, as well as individuals with sensory impairments are planned to be invited as guest-speakers to share their perspectives.

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## Course responsible :

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STOCKHOLM

# Title : Introduction to Image Processing using MATLAB: with a Focus on Neuroscience

**Course number :** 5685

**Credits :** 1.5

**Date :** 2023-08-30 -- 2023-09-27

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :**

**Purpose of the course :** This course introduces the basics of image processing concepts with a particular emphasis on using MATLAB to perform practical image processing methods in neuroimaging as well as biological/medical applications. This includes basic techniques for data extraction, histogram/thresholding/morphological operations, noise removal, image quality enhancement, filtering, segmentation, and registration. The contents of this course (both theoretical concepts and MATLAB codes/functions) will be useful for various image-processing applications from the microscopic workflow (e.g., cell counting, detection, labeling, classification, and tissue segmentation) to animal/human brain image analyses (e.g., structural and functional images collected by CT, PET, and MRI).

**Intended learning outcomes :** At the end of the course, the students are supposed to be able to: • explain the main theoretical concepts behind image processing methods • implement MATLAB for image-processing of their own data • understand software/packages designed for neuroimage processing/analysis, such as FSL and SPM in neuroimaging

**Contents of the course :** Image Representation: read the matrix of data, understand the concepts of image pixel/voxel, image resolution and dimension, visualize 2D and 3D images, save the matrix of data Image operations: count, find min and max, perform add/subtract/divide/multiply, binarize an image, create a mask Image histogram: understand the concepts of image intensity, colormap, and intensity/color distribution, and change the contrast of the image Image size and dimension: resampling and cropping Edge detection, Object labeling, Object dilation, and erosion Image Filtering: noise removal, smoothing Image Segmentation: segment/parcellate the image objects Image Registration: align images from different subjects or from different modalities, overlay images, perform mask-based image operations

**Teaching and learning activities :** The theoretical content of the course will be taught in a form of lectures and pre-recorded videos with subsequent discussions using flip-the-classroom teaching methods. Besides the theoretical content, a series of MATLAB-based examples will show students how to implement image processing techniques in MATLAB. Teaching sessions will be complemented by hands-on sessions to help students practice their programming skills in MATLAB. Finally, there will be some hands-on projects to test how well students can apply the image processing methods with MATLAB.

**Examination :** The examination will be based on the assigned hands-on projects. In the last session, the theoretical explanation of the assignment as well as the results of the project (performed on MATLAB) will be presented in front of the other students.

**Compulsory elements :** Attending lectures and hands-on sessions is mandatory. Absence from a lecture or session may be compensated by doing the hands-on for the corresponding topic. Reporting the codes of hands-on projects is mandatory. The examination is compulsory.

**Number of students :** 8 - 16

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will take place once a week, on Wednesday from 9:00 to 16:30, in Campus Solna. Exact rooms will be announced later.

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## Course responsible :

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# Title : Mastering R - Advanced Data Science and Statistical Analysis

**Course number :** 5686

**Credits :** 4.5

**Date :** 2023-11-20 -- 2023-12-10

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Biosciences and Nutrition

**Specific entry requirements :** Basic knowledge of R (3 hp or more). Having attended for example courses "Statistics with R - from Data to Publication Figure", "Introduction to R - Data Management, Analysis and Graphical Presentation" or "Get started with R – Programming Basics, Data Analysis and Visualisation".

**Purpose of the course :** The course is practical, where the aim is to: Teach students how to work with more advanced concepts of the programming environment R and Rstudio, such as functional programming, simple algorithm development, advanced data manipulation and visual presentation, Rmarkdown and the Tidyverse.

**Intended learning outcomes :** After attending the course, the student should be able to: • Data wrangle, tidy up messy data and structure data for analysis (e.g., convert from wide to long format) • Identify situations suitable to the use of functions, loops and conditionals • Construct their own algorithms, incorporating self-created functions, loops and conditionals • Query SQL databases • Create authentication processes for secure access to, for example data bases • Use RMarkdown to create easier markup and navigation, as well as create PDF files and websites • Use version control for collaboration • Create their own packages from scratch, as well as "source" other R files from another script • Create interactive and advanced representations of scientific data • Run simple parallel process operations • Evaluate the efficiency of code, selecting the best option of, for example functions, to solve a certain problem

**Contents of the course :** The advanced R course covers more complex topics and builds upon the foundation established in basic R courses. The course contains: Functional programming, including advanced techniques for writing functions in R, such as closures, anonymous functions, and higher-order functions. Object-Oriented Programming: An introduction to the basics of object-oriented programming in R, including classes, objects, and inheritance. Advanced data manipulation, including topics such as regular expressions, string manipulation, and the use of the tidyverse packages for data cleaning and manipulation. Advanced data visualization, including the use of advanced visualization techniques, such as interactive visualizations using shiny, and visualizing complex data using the ggplot2 package. Big data analysis techniques, including parallel processing, distributed computing, and the use of packages like SparkR and dplyr to scale up data analysis. Database handling, including connecting to and querying SQL databases. An introduction to machine learning using tensorflow and keras. The course will also emphasize the use of best practices for reproducibility and collaboration. Introducing the concepts of writing modular and reusable code, using version control with Git, and using R Markdown for reproducible reporting.

**Teaching and learning activities :** Distance learning with online ZOOM lectures and labs. Videos, quizzes and tasks in Canvas. Group and individual exercises and assignments. Reviewing other students' code and interaction with other students. Individual project work. Each session will be structured around a specific concept, for example writing simple algorithms (like binary search or greedy algorithms). Each session will be comprised of two days. The first day the concept is introduced with a lecture, then quizzes and tasks, to gradually increase the autonomy of the students to use the specific concept. The second day will be a lab where they are supposed to use the concept to perform a specific action, receiving formative feedback from one peer and one teacher. The last day of every second week will be a larger either individual or group exercise, where the student is required to combine introduced concepts into a whole. This exercise will be reviewed by a fellow student who will have the opportunity to comment on ways to improve the work.

**Examination :** One individual project work and one group project work

**Compulsory elements :** Participation during lectures, quizzes, labs, individual and group projects and reviews of other students' projects. Absence from lectures can be compensated by finishing an additional task, quizzes can be finished at any time during the course. The activity of the labs can be finished at any time during the course, but there will only be support from teachers during the specific lab occasion. The remaining elements can not be compensated during the course.

**Number of students :** 12 - 18

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course duration is three weeks of 100% studies which will be held online, via ZOOM. Teaching occasions consist of lectures, labs, as well as quizzes and tasks in Canvas. Lectures are supported by videos. Examination will be conducted through one group and one individual assignment. Another obligatory element will be to reviewing other students' code. Each sessions will be structured around a specific concept, for example writing simple algorithms (like binary search or greedy algorithms). Most sessions will be comprised of two days. During the first day the concept is introduced with a lecture, then quizzes and tasks, to gradually increase the autonomy of the students to use the specific concept. The second day will be a lab where students are supposed to use the concept to perform a specific action, receiving formative feedback from one peer and one teacher. The last day of every week will be a larger individual or group exercise, where the student is required to combine introduced concepts into a whole. This exercise will be reviewed by a fellow student who will have the opportunity to comment on ways to improve the work.

**Course responsible :**

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**Contact person :**

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## Title : Societal and Life-course Perspectives on Inequalities in Aging

**Course number :** 5688

**Credits :** 3.0

**Date :** 2023-09-25 -- 2023-10-20

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Neurobiology, Care Sciences and Society

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is for students to gain an increased understanding of inequalities in aging and older age from a structural societal perspective and from an individual life-course perspective. Furthermore, the course aims to give the students an understanding of the importance of considering structural and individual factors in their own and fellow doctoral students' doctoral projects and how they can be understood and applied based on an interdisciplinary approach.

**Intended learning outcomes :** After completing this course, students are expected to be able to: 1. Identify and describe factors that contribute to late-life inequalities, from a structural societal perspective and from an individual life-course perspective. 2. Critically reflect on and discuss how structural and individual factors both independently and in interplay may shape differences in aging. 3. Apply key concepts related to inequalities in aging to their own and other students' research.

**Contents of the course :** The course provides an interdisciplinary perspective on social and health inequalities in aging and late life. Additionally, the course focuses on how these inequalities arise and change over the life course, as well as differences globally and across time. Key concepts and theories related to inequalities in aging will be presented and discussed, such as ageism, healthy and active aging, old age poverty, social exclusion, health and social care, informal care, and the retirement process. Inequalities in aging will also be viewed from the perspective of the sustainable development goals (SDGs). The students will be trained to identify main reasons for the development of inequalities as people age, both from a structural societal perspective and from an individual life-course perspective.

**Teaching and learning activities :** Different strategies for teaching and learning will be used, such as lectures, seminars, group discussions, and peer reviewing, to promote an analytical and critical approach to the course content and to facilitate multidisciplinary learning. Activities will take place on campus as well as digitally on the learning platform. The doctoral students' active participation will be required.

**Examination :** To pass the course the student must achieve the learning outcomes. This will be assessed through active participation in mandatory seminars, group work, an individual written assignment reflecting on the course content in relation to her/his own research, and a written and oral reflection on another student's individual assignment.

**Compulsory elements :** The students are required to actively participate in scheduled activities, including lectures, group discussions and seminars. The course includes both physical and online activities. The course directors assess how absence should be compensated. Assignments: 1. Group work, presented at a seminar (online or hybrid format). 2. Written individual assignment, which is presented and discussed at a final examination seminar at KI (physical meeting). 3. Peer review of another student's individual assignment, discussed at the final examination seminar.

**Number of students :** 10 - 24

**Selection of students :** The course is part of SWEAH Core Curriculum and doctoral students affiliated with SWEAH will have priority. Other applicants are also welcome to apply and will be prioritized based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date).

**More information :** The course is offered within the context of the Swedish National Graduate School on Ageing and Health (SWEAH), which is a consortium of partners from different higher education institutions across Sweden. The course is a part-time distance-learning course using an online learning platform. Apart from learning platform activities, the course includes full-day workshops and lectures requiring physical attendance. These take place at the KI campus in Solna on September 26-27 and October 19-20.

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### Course responsible :

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### Contact person :

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## Title : Age, Ageing and Cardiovascular Health

**Course number :** 5690

**Credits :** 1.5

**Date :** 2023-10-09 -- 2023-10-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Solna

**Specific entry requirements :**

**Purpose of the course :** The aim of this course is to offer participants interested in vascular diseases an overview of the effect of age and aging on the vascular wall and the clinical readouts. We will go through the spectrum of vascular modifications that characterize healthy aging and those that associates to cardiovascular diseases, from coronary heart disease to vascular pathologies.

**Intended learning outcomes :** Upon completion of the course, the participants should be able to: 1) understand the difference between healthy aging and age related disease; 2) describe the pathophysiology of the most common cardiovascular diseases related to aging; 3) discuss the concept of frailty and 4) show an insight into the application of concept learned in their current and future research

**Contents of the course :** The course will cover an introductory lecture on vascular biology in the elderly from physiology to pathology. It will then cover the manifestations of aging in the heart, large vessels and the brain. One day will be devoted to discuss the concept of frailty and the interventions to de-frail elderly patients

**Teaching and learning activities :** The course will be based on the reverse classroom model. Students will read selected papers in the morning that will be discussed with the teacher in the early afternoon. The student will be asked to prepare questions based on the articles they have read in the morning. The afternoon activities will include lectures, seminars given by a researcher expert in the field and group discussions on selected topics.

**Examination :** In order to pass the course, each participant needs to prove that s/he has reached the previously indicated learning outcomes of the course. The final grade (pass or fail) will be based on written exam written exam where the students have to write a short aessay on one topic related to the course content. Please note that the exam will be written at KI during the course hours on the last day of the course.

**Compulsory elements :** Attendance to the seminars and group work and discussion is mandatory as the discussion is part of the examination. The final written exam is also mandatory.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be held at Karolinska Institutet Solna.

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**Course responsible :**

Bruna Gigante

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**Contact person :**

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## Title : Inequalities in Health – Mechanisms and Measurement

**Course number :** 5693

**Credits :** 3.0

**Date :** 2023-11-20 -- 2023-12-13

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Global Public Health

**Specific entry requirements :**

**Purpose of the course :** The course aims to introduce and discuss theories and mechanisms behind inequalities in health as well as some of the major social determinants of health. The course intends to enable PhD students and postdocs, especially within research areas related to public health, to acquire increased knowledge and skills to discuss and measure inequalities in health. After this course the student should be able to reflect with a research mindset over his/her own research from the perspective of social determinants of health and inequalities in health.

**Intended learning outcomes :** On completion of the course the student should be able to: 1. Describe some theories and models of how health inequalities are generated and how health inequalities can be measured. 2. Discuss advantages and disadvantages of different measures of socioeconomic position 3. Describe the social gradient in health 4. Reflect upon aspects of inequalities in health in relation to your own research area

**Contents of the course :** In this course different theories and mechanisms behind inequalities in health will be introduced, as well as some of the major social determinants of health. In addition, the distribution of social determinants of health in the population and how this may create a social gradient of disease and ill health in the population will be discussed. Different methods to measure health inequalities as well as advantages and disadvantages of different measures of socioeconomic position will be discussed. As part of the course, students are expected in an individual assignment to reflect on their own research from the perspective of inequalities in health, with reference to the course literature.

**Teaching and learning activities :** Different strategies for teaching and learning will be used such as lectures, group-discussions, peer reviewing and article seminars. The focus will be on critically reflecting upon the knowledge and relating it to your own research.

**Examination :** Successful examination involves - Completed individual assignment - Presentation of own written reflection, and commenting on the reflection of others - Participation in mandatory seminars and group work

**Compulsory elements :** Group assignments, article seminars and the seminar on individual assignment are compulsory.

**Number of students :** 10 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course will be given on the following days 20/11 (online), 22/11 (online), 27/11 (online), 29/11 (online), 4-6/12 (on campus Solna) and 13/12 (online).

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**Course responsible :**

Janne Agerholm

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**Contact person :**

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# Title : Multivariate Prediction Models, Machine Learning and AI with Applications in Precision Medicine

**Course number :** 5694

**Credits :** 1.5

**Date :** 2023-11-13 -- 2023-11-17

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medical Epidemiology and Biostatistics

**Specific entry requirements :** Epidemiology I, Introduction to epidemiology; Epidemiology II, Design of epidemiological studies; Biostatistics I, Introduction for epidemiologists; Biostatistics II, Logistic regression for epidemiologists; and Biostatistics III: Survival analysis for epidemiologists, or equivalent courses

**Purpose of the course :** This course aims to provide an introduction to both supervised and unsupervised methodologies for prediction modelling with a focus on biomedical applications, molecular epidemiology and personalised medicine. The main objective of the course is to provide basic theory and to facilitate for the course participants to acquire practical knowledge that will enable to apply covered methodologies in their own research.

**Intended learning outcomes :** After successfully completing this course you as a student are expected to be able to: - Perform and assess basic quality control and outlier detection - Apply unsupervised and supervised statistical learning methods to detect patterns in data - Devise cross-validation strategies for parameter estimation, model selection and prediction performance evaluation - Make informed judgement of how to apply basic principles for variable selection - Critically evaluate prediction models and artificial intelligence in real-world applications - Conceptually design and devise applications of machine learning and deep learning in real-world applications

**Contents of the course :** Personalised medicine is a cornerstone of tomorrow's health care, and is based on the idea of stratifying patients into groups based on e.g. disease risk, prognosis or probability of treatment response and administrate the most suitable therapy for each individual. The capabilities to generate vast amounts of quantitative clinical, imaging, and molecular data from DNA- and RNA-sequencing and other molecular profiling methods are providing unprecedented opportunity for implementation of personalized precision medicine approaches in the health care system. Molecular profiling typically generates data with tens of thousands of variables of which only a subset is relevant for treatment decisions. Similarly, imaging data from e.g. radiology and digital pathology provides information rich data to inform patient management. The promise of personalised medicine relies on our ability to turn the vast molecular datasets into clinically actionable predictive models of individualised diagnostics, prognostication, and therapy response. Development and application of statistical learning methods, prediction modelling, artificial intelligence, and deep learning are central components in developing these models, and in developing the biomarker panels that can be used for subtyping, risk stratification and prediction of treatment response. This course provides an introduction to statistical learning methods, prediction models, and deep learning that are relevant for personalised medicine with a focus on real-world applications. The course covers basic theory and introduction to modern statistical and machine learning methods for prediction modelling and deep learning in high-dimensional data, together with applied data analysis through computer-based exercises. Lectures and exercises will cover the full process going from the initial data set and through data normalisation, quality control, outlier detection, application of unsupervised learning methods, application of supervised learning methods, variable selection, cross-validation, model evaluation, and recently developed methods (e.g. deep learning, conformal prediction).

**Teaching and learning activities :** The course is based on a combination of lectures, which cover methods and theory, together with computer-based exercises in R, where real-world data are analysed and interpreted. Previous experience from practical experience applying statistical models in a computer-based environment (e.g R, SAS, Stata, Matlab, Python) is strongly recommended.

**Examination :** The individual examination will be performed as a take-home examination. It consists of an individually written lab-report where results from an applied data analysis mini-project should be summarised and critically evaluated. Students who do not obtain a passing grade in the first examination will be offered a second examination within two months of the final day of the course.

**Compulsory elements :** The individually written examination.

**Number of students :** 8 - 25

**Selection of students :** Eligible doctoral students will be prioritized according to 1) the relevance of the course syllabus for the applicant's doctoral project (according to written information), 2) date for registration as a doctoral student (priority given to earlier registration date). To be considered, submit a completed application form. Give all information requested, including a short description of current research training and motivation for attending, as well as an account of previous courses taken.

**More information :** It is recommended to have taken an introductory course in R or to have equivalent experience prior to taking this course.

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## Course responsible :

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## Contact person :

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# Title : Basic Pharmacoepidemiology and Critical Review of Pharmacoepidemiological Scientific Literature In a Global Context

**Course number :** 5695

**Credits :** 3.0

**Date :** 2023-09-25 -- 2023-10-06

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Global Public Health

**Specific entry requirements :**

**Purpose of the course :** The purpose of the course is that the participants should gain basic knowledge about different study designs used in pharmacoepidemiological studies. The participants should further gain basic knowledge about how to design, conduct, analyse, interpret and report pharmacoepidemiological studies as well as treatment effects and adverse reactions to pharmaceuticals. The participants should also gain knowledge about determinants of drug use in countries at various income levels. The course will qualify the participants to critically review and evaluate pharmacoepidemiological studies.

**Intended learning outcomes :** At the end of the course the student should be able to: - Demonstrate knowledge of basic concepts in pharmacoepidemiology and its relevance for public health and for health policy making - Discuss common study designs and methods used in pharmacoepidemiological studies, including clinical trials - Explain the applications of these methods for studies of effects and adverse effects of drugs and economic consequences - Describe different types of data sources on drug exposure and explain their strengths and weaknesses - Describe systems for the reporting of adverse effects and explain their use for pharmacoepidemiological studies - Explain design of and methods to evaluate interventions qualitatively and quantitatively - Independently evaluate pharmacoepidemiological studies from scientific literature

**Contents of the course :** The course will provide an introduction to what pharmacoepidemiology is, how pharmacoepidemiological studies are conducted, how to interpret pharmacoepidemiological findings, and the relevance of pharmacoepidemiology for public health and for health policy making. The participants will be introduced to basic concepts in pharmacoepidemiology and drug statistics methodology (the ATC/DDD system). Choice of study design and common pitfalls in pharmacoepidemiological research will be discussed. Determinants of drug use such as health systems, policies, prescriber and patient factors in various contexts (low-, middle- and high-income countries) will be explored. Methods to improve use of drugs will be presented, including the role of guidelines and various kinds of information or educational interventions directed to health care professionals, patients or the public. Ways of evaluating such interventions will be presented and discussed. Clinical trial designs, including ways to design and report these, will be discussed. The role of pharmacoepidemiological studies in pharmacovigilance (drug safety) will also be discussed.

**Teaching and learning activities :** The course will use KI:s learning platform Canvas. Learning activities include lectures, seminars, individual work and group work.

**Examination :** Individual oral and written presentation of group work. Each student will be assessed individually.

**Compulsory elements :** It is compulsory to attend seminars and to participate in individual work and group work. Absence will have to be compensated by extra individual assignments provided by the course organizers.

**Number of students :** 8 - 25

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Face-to-face course held at Solna campus (Winderströmska huset). Online participation might be possible for students that cannot travel to Sweden.

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## Course responsible :

Jaran Eriksen

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## Contact person :

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# Title : Researching the Human Gastrointestinal Tract, Liver and Pancreas – An Overview

**Course number :** 5696

**Credits :** 1.5

**Date :** 2023-11-20 -- 2023-11-24

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Medicine, Huddinge

**Specific entry requirements :**

**Purpose of the course :** This course will increase the interest in and knowledge about how to study the gastrointestinal tract, which includes the liver and the pancreas, for clinical and translational research purposes. The course aims to give an overview of anatomy, function, and common diseases of the GI tract, how they are linked to metabolic features and alterations, and how the disease panorama can be studied in a translational context. The course also highlights the possibilities and challenges how to perform sampling, tissue handling, biobanking and registration according to good clinical and laboratory practice.

**Intended learning outcomes :** 1) To describe the normal anatomy and function of the gastrointestinal tract. 2) To relate the disease panorama of the gastrointestinal tract, including brief knowledge of etiologies and pathogenesis, to the most important current research questions. 3) To discriminate between and motivate the choice of the various possibilities for sampling from the gastrointestinal tract for morphologic, metabolic, immunologic, microbiotic, and genetic research purposes as well as for using samples for different in vitro techniques. 4) To reflect upon and discuss issues of creating your own sample collection in a biobank, including ethical and legal aspects and required registries.

**Contents of the course :** The course will present an overview of the basic anatomy and physiology of the gastrointestinal tract, the metabolism of the liver and the pancreas, and the disease panorama of the gastrointestinal tract. Different aspects of non-alcoholic fatty liver disease, inflammatory bowel disease, autoimmune liver and pancreatic diseases, IgG4 systemic disease and pathological conditions of the small bowel, including post-surgical metabolic complications and sarcopenia will be discussed. Various autoimmune and metabolic aspects of disease will be highlighted. A workshop will be dedicated to sampling techniques, resources and pitfalls, including endoscopic and parenchymatous biopsies, tissue handling and storage, and how to create your own sample collection in a biobank, including legal and ethical aspects. The role of the microbiome for metabolic and gastrointestinal diseases will be covered in a workshop and hot topics in microbiota research discussed in the journal club format.

**Teaching and learning activities :** The course will be based upon: 1) Lectures given by experts 2) Interactive workshops highlighting key topics 3) Literature reviews with journal clubs 4) Case-based discussions focusing on clinical cases linked to research questions.

**Examination :** Multiple choice questions covering the normal anatomy and function of the gastrointestinal tract, the gastrointestinal disease panorama, metabolic and immunological aspects, sarcopenia and the role of the microbiome (learning objectives 1 and 2) Oral assignments with supervised case-based discussions in smaller groups linking patient cases to research questions (learning objectives 3 and 4)

**Compulsory elements :** Workshops, journal clubs, oral group assignments with case-based discussions and the MCQ examination.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** The course starts on Monday at 09.30 and ends on Friday at 13.00 at Campus Flemingsberg.

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## Course responsible :

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## Contact person :

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## Title : Network Neuroscience

**Course number :** 5697

**Credits :** 1.5

**Date :** 2023-10-02 -- 2023-10-26

**Language :** English

**Level :** Doctoral level

**Responsible KI department :** Department of Clinical Neuroscience

**Specific entry requirements :** Basic knowledge of brain imaging

**Purpose of the course :** The purpose of this course is to provide students with the foundations of network theory. This course will cover all aspects of creating network models from neuroimaging data (theory, assumptions, visualization, and quantifying models).

**Intended learning outcomes :** After the course, the doctoral student shall have obtained a thorough knowledge about core concepts about network neuroscience. This includes to be able to: 1) create network models; 2) apply and interpret network measures calculated from models (centrality measures, shortest paths, community detection etc); 3) implement a network analysis and visualize the results; 4) show understanding about how network models have been applied within the neurosciences; 5) show understanding about how network models relate to theory; 6) apply recent developments within network neuroscience including multilayer connectivity and deep learning analyses of brain networks

**Contents of the course :** The basics of network models, measures to quantify networks, history of network science and applications of network models in neuroscience, exercises in how to construct network models in the second version of our software BRAPH (Brain Analysis using Graph Theory; <http://braph.org/>) and recent developments in network neuroscience. Each student will also do an individual research project applying elements from the course onto data, which can be provided by the organizers or by the student's own PhD projects.

**Teaching and learning activities :** Lectures, seminars, demonstrations, laboratory exercises, individual mini research project, oral presentation, short written report.

**Examination :** Individual mini research project. This can be carried out on the student's own data or open data provided. The analysis should be presented in a 10 minute presentation. The students are also required to submit a short written report on their project.

**Compulsory elements :** Mandatory attendance to lectures and presentation. Absence during lectures will require completing supplementary written tasks.

**Number of students :** 8 - 20

**Selection of students :** Selection will be based on 1) the relevance of the course syllabus for the applicant's doctoral project (according to written motivation), 2) start date of doctoral studies (priority given to earlier start date)

**More information :** Course schedule: <br> 02/10/2023. 09:00 to 15:00 <br> 05/10/2023. 09:00 to 15:00 <br> 06/10/2023. 09:00 to 15:00 <br> 09/10/2023. 09:00 to 15:00 <br> 13/10/2023. 09:00 to 15:00 <br> 26/10/2023. 09:00 to 15:00 - Examination <br> <br> Course Location: <br> Stora Sammanträdesrummet, Nobels Väg 9, 4th floor, KI Solna.

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### Course responsible :

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### Contact person :

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