



## DEPARTMENT OF CLINICAL NEUROSCIENCE

### **K8F2601 Epigenetics and its Applications in Clinical Research, 1.5 credits (hec)**

Epigenetik och dess kliniska användning, 1,5 högskolepoäng

*Third-cycle level / Forskarnivå*

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#### **Approval**

This syllabus is approved by the The Committee for Doctoral Education on 2023-10-31, and is valid from Spring semester 2024.

#### ***Responsible department***

Department of Clinical Neuroscience, Faculty of Medicine

#### **Prerequisite courses, or equivalent**

No prerequisite courses, or equivalent, demanded for this course.

#### **Intended learning outcomes**

##### **Purpose**

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.

## Course content

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.

## Forms of teaching and learning

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.

### *Language of instruction*

The course is given in English.

## Grading scale

Pass (G) /Fail (U)

## Compulsory components & forms of assessment

### Compulsory components

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.

### Forms of assessment

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.

## Course literature

Course literature will consist of lecture handouts, current scientific papers and reviews handed out during the course. We also recommend the following books (not compulsory): *Epigenetics* (2nd Edition) David C. Allis 2015 (ISBN: 9781936113590); *Epigenetics in Human Disease*, Trygve Tollefsbol, 2012 (ISBN: 9780123884152).