

## Gene Regulation and Epigenetics (1002621)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

<b>Course size</b>	<i>(nominal values; actual values may depend on programme)</i>		
<b>Credits</b> 3.0	<b>Study time</b> 90 h	<b>Contact hrs</b>	30.0 h

### Course offerings and teaching methods in academic year 2020-2021

A (semester 2)	English	Gent	lecture	20.0 h
			seminar	5.0 h
			self-reliant study activities	5.0 h

### Lecturers in academic year 2020-2021

Kyndt, Tina	LA25	lecturer-in-charge
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### Offered in the following programmes in 2020-2021

	crdts	offering
<a href="#">Master of Science in Bioscience Engineering: Cell and Gene Biotechnology</a>	3	A
<a href="#">Exchange Programme in Bioscience Engineering: Cell and Gene Biotechnology (master's level)</a>	3	A

### Teaching languages

English

### Keywords

Eukaryotic gene regulation, epigenome, DNA methylation, histone modifications, gene silencing, chromatin, paramutation, imprinting, stress responses, signal transduction

### Position of the course

In this course various mechanisms that influence gene expression and protein production in eukaryotes will be discussed: chromatin configuration, DNA methylation, RNA based gene silencing. The importance of gene regulation for the normal development of organisms will be highlighted. The dynamic response of a cell upon influences by the environment (stress responses, signal transduction) will be explained.

### Contents

1. Background
2. Transcriptional regulation and translational regulation
3. Epigenetic mechanisms
  - a. DNA methylation
  - b. Chromatin-based epigenetic mechanisms
  - c. Gene silencing: small and long non-coding RNAs (PTGS and TGS)
  - d. uORFs
4. Regulation at the post-translational level: signal transduction
  - a. Stimuli - receptors
  - b. Messengers
  - c. Major pathways: MAPK, cAMP-dependent pathway
5. Role of epigenetic regulation during development
  - a. examples in animals (parental imprinting)
  - b. examples in plants (transposable elements, paramutation, vernalisation)
6. Role of gene regulation during stress and disease
  - a. cancer, medical diagnostics
  - b. abiotic and biotic stress in plants
7. Seminar on Ethics by guest lecturer

### Initial competences

Basic knowledge biochemistry, molecular biology, gene technology

### **Final competences**

- 1 Insight into the complex gene regulatory networks in eukaryotic organisms.
- 2 Have knowledge about the role of gene regulation in normal biological processes.
- 3 Have knowledge about disturbances of gene regulation which occur during disease and stress responses
- 4 Discuss scientific literature about epigenetic processes.
- 5 Critically analyze the ethical aspects concerning the described techniques.

### **Conditions for credit contract**

Access to this course unit via a credit contract is determined after successful competences assessment

### **Conditions for exam contract**

This course unit cannot be taken via an exam contract

### **Teaching methods**

Lecture, seminar, self-reliant study activities

### **Extra information on the teaching methods**

This course involves oral lectures and a guest seminar. The students have to write a assignment about two selected scientific articles related to the course content, in which these articles have to be summarized and critically assessed.

### **Learning materials and price**

Powerpoint presentation, course notes

### **References**

### **Course content-related study coaching**

by email or personally (after the class or on appointment)

### **Evaluation methods**

end-of-term evaluation and continuous assessment

### **Examination methods in case of periodic evaluation during the first examination period**

Written examination with open questions

### **Examination methods in case of periodic evaluation during the second examination period**

Written examination with open questions

### **Examination methods in case of permanent evaluation**

Assignment

### **Possibilities of retake in case of permanent evaluation**

examination during the second examination period is possible

### **Extra information on the examination methods**

Participation (during seminar), assignment, and written exam

### **Calculation of the examination mark**

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.