I

Special topic: Epigenetics and Chromatin - Course Syllabus

Course Number: B390

Course Title: Special Topic: Epigenetics and Chromatin /Applied Epigenetics

Academic Semester:	Early Summer	**Academic Year:**	2015/ 2016
Semester Start Date:	May 23, 2016	**Semester End Date:**	June 10, 2016

Class Schedule: 9:00 - 17:00

Classroom Number: laboratories of KEEP, seminar rooms in Bldg 2

Instructor(s) Name(s): Wolfgang Fischle, Valerio Orlando
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Office Location: Bldg 2, Rm 3334
Office Hours: Thursdays, 9-10 am
Teaching Assistant name:
Email:

COURSE DESCRIPTION FROM THE PROGRAM GUIDE

The major aim of the 4 week summer block course is to train participants (max. 20) in Chromatin Biology, Epigenome Structure and Nuclear Organization to address fundamental questions in Epigenetics and Genetics Regulation: not only theory but also try out in practice how cutting-edge technologies can be used to answer outstanding questions at the frontiers of research. The course is shaped according to EMBL and MPI advanced method courses for Ph.D. students. Each week will be focused on one (1) method. Highly recognized, invited instructors from abroad and Profs. Orlando and Fischle (including their laboratories staff) will introduce the technologies on the basis of discussion of basic and current work. Hands on experiments with step-by-step instructions will be carried. Note that students must be able to undertake a further 3 credits of Direct Research or Dissertation Research during the summer session to satisfy the full time registration requirements.

COMPREHENSIVE COURSE DESCRIPTION

This course combines theoretical knowledge with practical approaches. It is shaped according to highly successful advanced method courses for PhD students at the European Molecular Biology Organisation (EMBO) and International Max Planck Research Schools (IMPRS). Highly recognized, invited instructors from abroad and Profs. Orlando and Fischle (including their laboratories' staff) will introduce state-of-the-art research questions and

technologies in current Epigenetics and Chromatin research. Hands on experiments with step-by-step instructions will be carried out in the KEEP laboratories involving laboratory staff.

Topics include:

- Genome wide mapping of chromatin factors and modifications (ChIP, ChIP-seq, ncRNA mapping, data analysis)

-- Organization of chromatin in the nucleus, long range chromatin interactions (chromosome paint, 3C/4C/5C/Hi-C)

- DNA methylation and imprinting (analysis of DNA methylation by different methods)

- The histone code: Modifying enzymes, binding proteins and RNAs in chromatin regulation (protein-protein, protein-nucleic acids interactions)

- Fractionation of cells and nuclei for chromatin preparation, basic analysis of chromatin architecture (nucleosome positioning, and remodeling).

- Systems of Epigenetic memory (Chromatin Remodelers and Higher Order Organizers)

- Dosage compensation in different organisms.

The practical part for this year will focus on ChIPseq and HiC technologies.

In addition Students will have to prepare presentations and discuss defined general and technology related topics in Epigenetics (to be provided by Instructors short before the beginning of the course).

GOALS AND OBJECTIVES

The major aim of the 3 weeks block course is to train participants (max. 12) in Chromatin Biology, Epigenome Structure and Nuclear Organization to address fundamental questions in Epigenetics and Gene Regulation.

The course combines two major objectives:

- fundamental theoretical understanding of complex epigenetic phenomena

- hands on training in state-of-the-art experimental approaches in current epigenetic and chromatin research

REQUIRED KNOWLEDGE

- Courses Cell Biology I (B241) and II (B223) are a mandatory requirement

- Molecular and Cellular Biology Lab (241) is a must

- Courses in Genomics (B204) or Molecular Genetics (B209) are a plus

- Basic understanding of molecular and cell biology methods

REFERENCE TEXTS

- Epigenetics, CSHL press, 2nd edition

- Epigenetics Protocols (Methods in Molecular Biology) 2nd edition

- detailed handouts by instructors

METHOD OF EVALUATION

Graded content
Students will produce a written report of the experiments performed including dissection and discussion of their results. This will be done in style of a scientific manuscript. Also, participants will need to prepare a brief oral presentation of how they will apply the acquired technologies to their PhD or Postdoctoral work. Evaluation: attendance (10%), written report (50%), oral presentation (40%).

COURSE REQUIREMENTS

Assignments

- Students will need to prepare the theoretical background of different topics of the class based on individual reading assignments (primary and review scientific literature.
- different experiments will be executed under supervision at the bench
- written and oral presentations of the results and their implication

Course Policies

Attendance of theoretical and practical classes is mandatory. Any planned absence needs to be discussed with the course instructors.

Additional Information

NOTE
The instructor reserves the right to make changes to this syllabus as necessary.