



## Course Syllabus: Epigenetics and Chromatin - B 390F

<b>Division</b>	Biological and Environmental Sciences & Engineering Division
<b>Course Number</b>	B 390F
<b>Course Title</b>	Epigenetics and Chromatin
<b>Academic Semester</b>	Summer
<b>Academic Year</b>	2016/2017
<b>Semester Start Date</b>	06/04/2017
<b>Semester End Date</b>	08/03/2017
<b>Class Schedule</b> (Days & Time)	09:00 AM - 05:00 PM   Sun Mon Tue Wed Thu

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Valerio Orlando	Valerio.Orlando@KAUST.ED U.SA	+966128082674 8082674		Sun-Thu 9-10am 3234, 2, Ibn Al-Haytham (bldg. 2)
Wolfgang Fischle	wolfgang.fischle@kaust.edu.s a	+966128082498	3334, 2, Ibn Al-Haytham (bldg. 2)	Sun-Thu 9-10am 3334, 2, Ibn Al-Haytham (bldg. 2)

Teaching Assistant(s)	
Name	Email

Course Information

<p><b>Comprehensive Course Description</b></p>	<p><b>INTRODUCTION</b></p> <p>The aim of the 3 week block course is to train participants (max. 10 from KAUST plus 10 VSRP from abroad) in fundamental theory of EpiGenome Structure and Function and cutting-edge experimental technologies that are currently used to answer key questions at the frontiers of Epigenetics research. To improve students' skills in designing and analyzing experiments, the course combines two principles: theory and practice, covering Chromatin Biochemistry (Chromatin Fractionation), Epigenome Structure (ChIP-seq, ATAC Seq) and Nuclear Organization (3C, 4C, HiC). The course is shaped according to international EMBL (European Molecular Biology Laboratories) and MPI (Max Planck Institutes) advanced method courses for M.Sc. and Ph.D. students. Profs. Orlando and Fischle (including their laboratories' staff) together with highly recognized, invited instructors from abroad will introduce Applied Epigenetics on the basis of dissection of classical and recent experiments. Hands on experiments with step-by-step instructions will be carried out.</p> <p><b>COMPREHENSIVE COURSE DESCRIPTION</b></p> <p>This course combines theoretical knowledge with state-of-the-art practical approaches. It was developed on the basis of advanced method courses for students held at the European Molecular Biology Organisation (EMBO) and International Max Planck Research Schools (IMPRS). Profs. Orlando and Fischle (including their laboratories' staff) will introduce up to date research questions and technologies in current Epigenetics and Chromatin Research. In addition, highly recognized, external instructors from abroad will summarize current principles in Epigenetics and teach students cutting edge methodologies. Hands on experiments with step-by-step instructions will be carried out in the KEEP laboratories involving laboratory staff.</p> <p>Topics include:</p> <ul style="list-style-type: none"> <li>- Epigenome Structure I: Genome-wide mapping of Histone Modifications, Chromatin Factors, ncRNA (ChIP, ChIP-seq, ncRNA mapping, data analysis)</li> <li>- Epigenome Structure II: Nuclear Architecture, long-range Chromatin Interactions, Chromosomal Domains (chromosome paint, 3C/4C/5C/Hi-C)</li> <li>- Cell Memory and Imprinting: DNA Methylation and Imprinting (analysis of DNA Methylation by different methods)</li> <li>- The Histone Code: Biochemistry of Modifying Enzymes, Binding Proteins and RNAs in Chromatin Regulation (protein-protein, protein-nucleic acids interactions, complex purification)</li> <li>- Fractionation of cells and nuclei for Chromatin preparation, basic analysis of Chromatin Architecture (nucleosome positioning, and remodeling)</li> </ul> <p>The course is open to KAUST M.Sc. and Ph.D. students (max. 10 participants plus 10 from international institutions).</p> <p>Acceptance to the Course will be subjected to selection based on a motivation statement in which applicants describe their current research project.</p> <p>Priority will be given to Students whose Thesis (PhD or Ms) projects will clearly benefit from attending the course.</p> <p>All students will have to complete reading assignments on basic and advanced topics in Epigenetics and the experimental approaches used in this field (to be provided by instructors ahead of the beginning of the course). Written reports summarizing and discussing the experiments in reflection of this theoretical background are part of the evaluation for all students. In addition, Ph.D students are expected to give seminars on selected topics.</p> <p>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.</p>
<p><b>Course Description from Program Guide</b></p>	<p>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 Gene 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 out. 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</p>
<p><b>Goals and Objectives</b></p>	<p>The course combines three major training objectives:</p> <ul style="list-style-type: none"> <li>- to provide the participants with fundamental theoretical understanding of basic and complex Epigenetic Phenomena</li> <li>- to give the participants hands-on training in the planning of and acquaintance with advanced experimental protocols in Chromatin Biology, Epigenome Structure and Nuclear Organization.</li> <li>- Promote interaction of KAUST Students to World recognized experts in the field and other students from International institutions</li> </ul>
<p><b>Required Knowledge</b></p>	<ul style="list-style-type: none"> <li>- Basic understanding of molecular and cell biology methods</li> <li>- Basic experimental skills in molecular and cell biology</li> </ul> <p>M.Sc. students should have successfully completed the following courses: Molecular and Cellular Biology Lab (B241); Cell Biology I (B241) and II (B223)</p>
<p><b>Reference Texts</b></p>	<ul style="list-style-type: none"> <li>- Epigenetics, CSHL press, 2nd edition</li> <li>- Epigenetics Protocols (Methods in Molecular Biology) 2nd edition</li> <li>- Detailed handouts provided by instructors</li> </ul>
<p><b>Method of evaluation</b></p>	<p><b>20.00%</b> - Oral presentation  <b>60.00%</b> - Written report  <b>20.00%</b> - Attendance and Participation</p>

<b>Nature of the assignments</b>	<p>All students will prepare the theoretical background of different scientific topics on the basis of individual and group reading assignments (primary and secondary literature)</p> <ul style="list-style-type: none"> <li>- under supervision all students will execute different experiments individually and in groups.</li> <li>- on the basis of detailed assignments students will prepare and present seminars in front of the class to provide the background and scope of different experimental methods and in context of different scientific questions</li> </ul> <p>All students will prepare a written report of the experiments performed including dissection and discussion of the results. This will be done in style of a scientific manuscript.(5-6 pages).</p>
<b>Course Policies</b>	Attendance of theoretical and practical classes is mandatory.
<b>Additional Information</b>	The instructors reserve the right to make changes to this syllabus as necessary.

### Tentative Course Schedule

*(Time, topic/emphasis & resources)*

Week	Lectures	Topic
1	Sun 07/02/2017 Mon 07/03/2017 Tue 07/04/2017 Wed 07/05/2017 Thu 07/06/2017	Practical Hands On lab work, Lectures, Presentations
2	Sun 07/09/2017 Mon 07/10/2017 Tue 07/11/2017 Wed 07/12/2017 Thu 07/13/2017	Practical Hands On lab work, Lectures
3	Sun 07/16/2017 Mon 07/17/2017 Tue 07/18/2017 Wed 07/19/2017 Thu 07/20/2017	Presentations, Discussion Groups, Full Report preparation
4		-
5		-
6		-
7		-
8		-
9		-
10		-
11		-
12		-
13		-
14		-
15		-
16		-
17		-
18		-

**Note**

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