MITBM

Master International Technologies Biomédicales

BIOTECHNOLOGY AND RECOMBINANT DNA TECHNIQUES (BTC5501) Spring 2008

SYLLABUS

Course Instructor: **Dr. Khalid SENDIDE**

Room 101 - Building 5 - Phone: 2105 - E-mail: k.sendide@aui.ma

Complementary seminars: **Dr Allaoui (ULB) and Dr Akrim (INH)**

Office Hours: **T-11:00 to 13:00, W 14:30-18:30,TR 11:00 to 13:00**

Course Text: **Molecular Biology of the cell, Garland Science, Fifth Edition 2008**

Teaching hours **T, TR : 09:30 to 11:00**

Course Description

Biotechnology is one of the major technologies of the twenty-first century. Its wide-ranging multidisciplinary activities include recombinant DNA techniques, cloning and genetics; and the application of microbiology to the production of goods and to health improvement in more than a discipline.

"Biotechnology and recombinant DNA techniques" is a wide description and could basically cover most of this master's program. However, we will try to focus on an in-depth overview of contemporary biotechnology. The course aims at providing the student with a fundamental basis, compiled from a wide scope of scientific biotechnology and molecular biology areas, which together underscore the practical realizations of application-oriented molecular biotechnology.

Recent discoveries in the role of non coding, regulatory RNA molecules will be highlighted, with a particular focus on RNA interference applications in gene therapy and diseases. In addition, this course will encompass an introduction to functional genomics with most recent high through platforms used for investigating different "Omes", particularly the phenome, the transcriptome, the interactome and the proteome. We will also include some fundamental Molecular plant biotechnology, including general plant biotechnology, plant-microbe interactions, plant breeding and transgenic plant technology. Other in depth aspects of plant biotechnology will be the subject of a separate course in this program.

We will also cover a critical review on analytical biotechnology, with different analytical molecular techniques and their respective strengths in different fields.

Students are also required to attend the laboratory sessions that accompany the lectures. These practical sessions are of great interest as they should allow students to have hands-on basic molecular biology techniques.

Objectives of the Course

This is a graduate course that will provide students with in depth information in molecular biotechnology techniques and their use in industry, biomedicine, and agriculture. Laboratory session will strengthen this knowledge by giving students hands on and practical experience in the field

Intended Learning Outcomes

Students will be expected to develop the following skills upon successful completion of the course:

- Understand molecular basis behind the storage, expression and transmission of genetic information
- Be able to explain the similarities and differences, related to the control of gene expression, between prokaryotic and Eukaryotic cells
- Learn main molecular engineering techniques and methods.
- Understand functional genomics in its “omes” levels, from the phenome to the interactome.
- Learn the theoretical part, but also some practical aspects of analytical biotechnology and related techniques.

Preparing the Course

The student is totally responsible for preparing the lecture topics using the textbook. He/she is expected to read assignments before class meetings, contribute positively to class discussions, write clear and concise responses to assignments, and complete any homework or project assigned.

Presentations:

Students will be asked to give presentations on specific topics related to the course material. They should be able to respect the time of the presentation, explain clearly the subject matter, and answer questions.
Scientific reports: The report can be related to one or more research papers or appropriate reviews that students will prepare their report form. It should provide information on all aspects of the topic. The paper should be written in the format of a scientific paper.

Evaluation Procedures

The assessment of student progress and performance will be done through homework assignments, projects, presentations, and examinations throughout the semester.

Two examinations, one to two hours each, are scheduled during the semester. Students will have one-week notice on these. In addition, a comprehensive final two-hour examination ends the semester.

Students are required to write a short research paper on a specific topic related to the course, which should be chosen upon consultation with the instructor.

Evaluation Procedure	Grade Contribution
Quizzes & class participation	**20 %**
First hour exam	**10 %**
Projects	**20 %**
Laboratory	**25 %**
Lecture Final exam	**25 %**

Outlined course chapters

- Restriction enzymes molecular cloning
- Genetic engineering in bacteria and yeasts
- DNA sequencing & PCR
- Prokaryotic & eukaryotic gene expression and regulation
- Bacteriophage genes and cycles regulation
- Ribognome
- Molecular diagnosis
- Recombinant vaccines
- Downstream processing in biotechnology
- Genome management and analysis
- Functional genomics
- Analytical biotechnology

Laboratory Practical Sessions

Laboratory sessions will cover

- Restriction enzymes cloning procedures
- Bacteria culture and manipulation
- Preparation of competent for artificial transformation by plasmids
- Plamids extraction, agarose gel visualization and restriction enzymes mapping
- UV mutagenesis in different *E. coli* mutant strains
- Expression of recombinant, IPTG inducible, proteins in *E. coli*
- Cell lysis and affinity chromatography column purification
- SDS PAGE for protein visualization
- Mini Mu lysogenic and lytic cycles in *E. coli*

Outline of Course Lectures:

WEEK	Date (M & W)	TOPIC
1	24 Jan	Restriction enzymes and molecular cloning
2	29 Jan	Genetic engineering in bacteria and yeasts
	31 Jan	Prokaryotic & eukaryotic gene expression and regulation
3	5 Feb	Prokaryotic & eukaryotic gene expression and regulation
	7 Feb	Prokaryotic & eukaryotic gene expression and regulation
4	12 Feb	Bacteriophage genes and cycles regulation
	14 Feb	Bacteriophage genes and cycles regulation
5	19 Feb	Recombinant vaccines
	21 Feb	Recombinant vaccines
6	26 Feb 28 Feb	Ribognome Ribognome
7	4 March	Ribognome

	6 March	Genome management and analysis
8	11 March	Genome management and analysis
	13 March	**First Exam**
9	15-23 March	*Mid semester Break!*
10	25 March	Functional genomics
	27 March	Functional genomics
11	01 April	Functional genomics
	03 April	Functional genomics
12	08 April	Downstream processing in biotechnology
	10 April	Downstream processing in biotechnology
13	15 April	Projects presentations
	17 April	Analytical biotechnology
14	22 April	Analytical biotechnology
	24 April	DNA sequencing & PCR, medical applications
15	29 April	Molecular diagnosis
WEEK	Date (M & W)	TOPIC
16	4 May	Molecular diagnosis
	08 May	Review
17	May 11, 12, 13, 14 and 15	Comprehensive Final examination: (to be announced)

IMPORTANT NOTES:

- *The student is responsible for knowing university policies and procedures.*
- *This syllabus is tentative and subject to change.*
- *A student who misses an exam without valid reason is given a zero.*

Best wishes for a successful course!