1. COURSE TITLE

PRINCIPLES OF MOLECULAR CELL BIOLOGY AND BIOTECHNOLOGY

1.1. Course number

18876

1.2. Content area

Biochemistry, Molecular and Cellular Biology and Biotechnology

1.3. Course type

BASIC

1.4. Course level

UNDERGRADUATE

1.5. Year

THIRD YEAR

1.6. Semester

SPRING TERM

1.7. Credit allotment

6 ECTS

1.8. Prerequisites

Having a good level of English is recommended, as well as having passed the first term courses.
Spanish students enrolled in Biochemistry, Biology, Chemistry, Environmental Sciences, Food Sciences and Human Nutrition and Dietetics Grades are not allowed to take this course. Spanish students with a technical (engineering, physics or Maths) background are best positioned to benefit from this course.

1.9. Minimun attendance requirements

Attendance to lectures, practical teaching and seminars is mandatory.

1.10. Faculty data: Coordinators

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1.11. Course objectives

The course is designed to provide an accessible introduction to the fundamental concepts of cell biology, stressing a solid foundation in the molecular and cellular principles of the basic science that underlies our current understanding of biology. The course offers a cohesive and conceptual framework of biology and is ideally suited to engage interdisciplinary students in the principles that govern this science.

1.12. Course contents

Introduction to the molecular, chemical and physical principles of cell function in the context of cutting-edge applications in bioengineering and medicine. Biological concepts include: molecular building blocks, energetics, transport, metabolism, nucleic acids, gene expression and genetics. Applications include bioenergy, synthetic biology, the human genome project, and gene circuit engineering. Labs will teach fundamental techniques of molecular biology to emphasize the experimental and analytical skills required.

Lectures, Seminars and case studies **sessions:**

TOPIC	Chapter ECB
Introduction to cells	1
Chemical components of cells and Basic Energetics	2, 3
Proteins and catalysis	3, 4
DNA, Chromosomes, and Genomes.	5
DNA Replication, Repair, and Recombination.	6
How Cells Read The Genome: From DNA to Protein.	7
Control of Gene Expression.	8
How Genes and Genomes evolve	9
Mid-term preview	
Energy from food	13
Energy Conversion: Mitochondria and Chloroplasts.	14
Membrane Structure and Cross-transport	11, 12
Intracellular organelle transport	15
Mechanisms of Cell Communication.	16
Seminar 1	
Cytoskeleton. Cell Junctions, Cell Adhesion, and Extracellular Matrix	17
Seminar 2	
The Cell Cycle and apoptosis	18
Cell division and meiosis	19
Seminar 3	
Mid-term preview	
Genome engineering	10
DNA sequencing	
Seminar 4	
Microarrays / RNAi	
Mass Spectrometry	
Computation / NCBI	
Stem Cells / Nuclear Transfer ("cloning")	
Seminar 5	

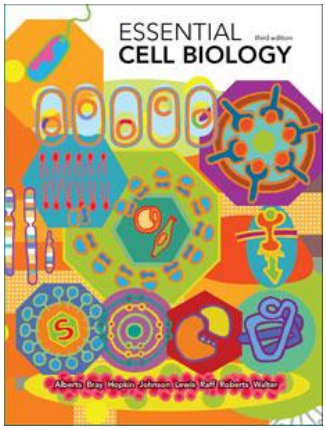
Infectious Disease / Immune System	
Seminar 6	
Cancer	
Seminar 7	
problem Set review and Final Summary	
Final Exam	

Practical teaching:

WEEK	LAB	TOPIC
1	1	Prokaryotes: bacterial growth, restriction, digestion, ligation, transformation and its evaluation
1	2	Protein expression and folding
2	3	Eukaryotes: cell culture, transfection, GFP and ß-gal visualization
2	4	Diagnosis of human genetic diseases using PCR

1.13. Course bibliography

FUNDAMENTAL READING:



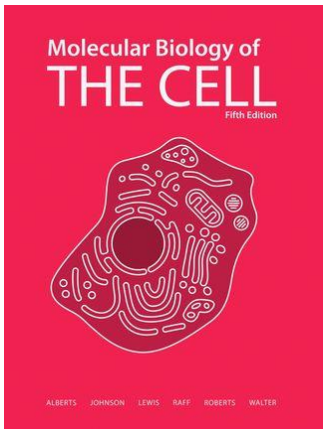
Essential Cell Biology, Third Edition

Authors: Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter

April 2009
ISBN : 978-0-8153-4129-1 and 978-0-8153-4130-7

The book is the reference manual that will be used throughout the course. It is advised that students have their own copy.

ADDITIONAL READING:

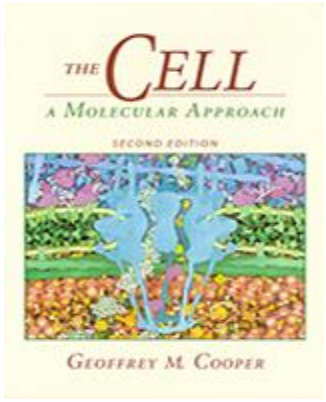


Molecular Biology of the Cell, 4th edition

Authors: Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter.
New York: Garland Science; 2002.
ISBN-10: 0-8153-3218-1ISBN-10: 0-8153-4072-9

This is a much older book, available online at:
http://www.ncbi.nlm.nih.gov/books/NBK21054/

A more recent (5th, 2007) edition is available at bookshops.



The Cell: A Molecular Approach, 5th edition

by Geoffrey M. Cooper and Robert E. Hausman

Sinauer Associates Inc, (Mar 31, 2009)
ISBN-10: 087893300X

2nd edition of this book is available online at:
http://www.ncbi.nlm.nih.gov/books/NBK9839/

2. Teaching methodology

- Lectures and seminars (three sessions of 1 hours per week) will run during fifteen weeks starting January 21, 2013. Presentations by the lecturers will be followed by discussion with the students.

- There will be 3 special sessions dedicated to review case studies and to solve problems and/or exercises. Students are expected to work on the problem sets, which will be available online a week before the review sessions.

- Practical teaching will take place in the afternoons at Laboratory-1, placed in the basement of the Biology building. Laboratories are scheduled to run in 8 sessions of three hours during two successive weeks (starting February 25th 2013).

- Office hours for individual or small group attendance are also provided, previous appointment (preferably by e-mail), for a more individualized learning.

- The student is expected to be active part of the learning procedure by critical reading the relevant chapters of the Manual "Essential Cell Biology", searching for documentation, solving exercises, providing summaries and other related activities.

3. Student workload

Activity	Workload (hours)	Homework Workload (hours)	TOTAL
Lectures	39	38	77
Seminars	7	2	9
Material and problem set review	6	18	24
Laboratory	24	10	34
Exams	6	0	6
Overall workload	82	68	150

4. Evaluation procedures and weight of components in the final grades

Lectures: Two short written exams (1-2 h), to evaluate the learning progress of the subject matters studied (lectures and seminars) by the students, will take place during week 5 and 10 of the course. A final exam (2-3 h), that will include all the topics studied in the course, will also take place at the end of the course.

Laboratories: Each student has to complete the prelab and postlab assignments and present his/her Final Laboratory Report with a conceptual summary of the lab experiments, the calculations and results obtained, and a short discussion of the applications of the techniques learned.

Summary and weight of evaluation activities:

% contribution of each evaluation activity	
Midterm and Final exams	65%
Problems, participation	10%
Laboratory	25%
TOTAL	100%

5. Course calendar

To be developed later, depending on the general Faculty scheduling of the term.