Code: 1441 **Molecular Microbiology**
Degree: 2nd cycle – Food Science and Engineering
Stream: Food Quality and Safety
Curricular Year: 1st **Semester Course: 1st**
Credits: 6 ECTS **Optional**
Language: Portuguese/English
Responsible: Maria Luísa Lopes de Castro e Brito
Other lecturer(s): Manuel José de Carvalho Pimenta Malfeito Ferreira
Web Site: http://www.isa.utl.pt/home/node/3873

1. Contact hours:
Lecture/Practical 42 **Praticals/Laboratory** 28 **Total** 84

2. Objectives:

- To comprehend the transfer of sequence information between sequential information-carrying biopolymers, in living organisms (Central Dogma of Molecular Biology)
- To understand basic aspects of gene regulation
- To know different gene transfer systems
- To be aware of examples of application of Genetic Engineering to Food Engineering
- To understand the flow of energy in microbial cells, recognizing specificities of the bacterial cell
- To identify examples of metabolic regulation with relevant industrial applications

3. Programme:

Didatic Unit 1 – The flow of genetic information
1.1. Introduction of the course and working method
1.2. Gene structure in prokaryotes and in eukaryotes
1.3. DNA replication and repair
1.4. The role of RNA
1.5. Transcription and the genetic code
1.6. Protein biosynthesis
1.7. Regulation of gene expression
1.8. Mutation
1.9. Genetic recombination in bacteria
Didatic Unit 2 – Molecular Biology as the basis for Genetic Engineering
2.1. Isolation of DNA, handling and analysis of nucleic acids.
2.2. Examples of application of Genetic Engineering to Food Engineering: production of genetically modified microorganisms (GMMs); strain improvement; production of GE ("Genetically Engineered") enzymes
Didatic Unit 3 – Bioenergetics and metabolic regulation
3.1. Basic aspects of transport in microorganisms. Molecular characteristics of protein carriers.
3.2. Electron transport chains and ATP synthesis in mitochondria and bacteria. Solute transport and energy transduction in bacteria.
3.3. Metabolic regulation and determination of enzymatic activities.
3.4. Physiological perspective of some metabolic pathways.

4. Bibliography:

Main Bibliography

Glick, B. R., Pasternak, J. J. (1998). *Molecular Biotechnology - Principles and Applications of Recombinant DNA*. ASM Press, Washington, D. C. [BISA Z30- 408].
Nicholl, D. S. T. (1994). *An Introduction to Genetic Engineering*. Cambridge University Press. (available at Microbiology Lab).
Ohman, D. E. (1988). *Experiments in gene manipulation*. Prentice Hall, Inc., Englewood Cliffs, New Jersey (available at Microbiology Lab).
Sambrook, J., Fritsch, E. F., Maniatis, T. (1989). *Molecular Cloning: a Laboratory Manual*, 2nd edn. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory (available at Microbiology Lab).

Smith and Wood, (1991). *Molecular Biology and Biotechnology* (Molecular and Cell Biochemistry), Chapman & Hall (available at Microbiology Lab).
Vieira, Arnaldo (2001) *Engenharia Genética, Princípios e Aplicações*, LIDEL, Lisboa, pp. 168 [BISA Z30-443].
Raghevendran V, Nielsen J, Olsson L. 2005. Teaching microbial physiology using glucose repression phenomenon in baker's yeast as an example. Biochemistry and Molecular Biology Education. 33. 404-410

Other Bibliography

Brito, L. (1996). *Análise Molecular em Leuconostoc oenos*. Tese de Doutoramento, Universidade Técnica de Lisboa [Z32-241].
Gardner, Simmons and Snustad (1991). *Principles of Genetics*, 8th edition, John Wiley & Sons, Inc. (available at Microbiology Lab).
Howe, Christopher (1995). *Gene Cloning and Manipulation*. Cambridge University Press. (available at Microbiology Lab).
Harris D A. 1998. Bioenergetics at a glance. Blackwell Science

5. Assessment:

The students could not miss more than 7 sessions in the semester, and 3, 2 and 2 sessions in DUs 1, 2 and 3, respectively.
The students will answer 3 questionnaires and will perform 3 seminars. The final mark in the discipline will be obtained by a weighted average in which the questionnaires mark and the seminars mark will represent 50% of the final mark, respectively. If this mark is ≥ 12, and in each questionnaire the mark is ≥ 8, the students will be dispensed from the final examination.
If the student go to the final examination, the final mark in the discipline will be obtained by a weighted average, in which the examination mark and the continuous evaluation mark will represent 60% and 40% of the final mark, respectively.

6. Estimated Workload:	168	Hours
7. Last Update:	19/7/2010	