Subject:	**Physics and Chemistry of Biosystems**
Semester:	**Spring**
Credits ECTS:	**2,5**
Professors:	**Dr. Francesc Mas Pujadas**
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Department / Faculty:	**Dept. Química Física,**
	Faculty of Chemistry
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Objectives: study the physics and chemistry processes at cellular level emphasizing in the bioenergetics involve in the cellular metabolism and the membrane transport phenomena. Give a brief introduction to the study of intermolecular forces between biomacromolecules, membranes and other nanometric structures.

Recommendations/ Requirements:

Equivalent background in Physics, Chemistry or Pharmacy.

CONTENTS: Topics

A IRREVERSIBLE PROCESSES (0.5 ECTS)

1. Review of thermodynamical systems in equilibrium

2. Irreversible Processes. Concepts in entropy production

3. Thermodynamic of irreversible processes : Linear Regime.

4. Coupling between irreversible processes: Stoichiometry within the coupling events.

B) MEMBRANE TRANSPORT: BIOENERGETIC (1.25 ECTS)

1. Equilibrium conditions in biological membranes: Osmosis. Passive transport

2. Membrane Potencials: Origin and type.

3. Osmotic equilibrium (Donnan). Dialysis

4. Resting membrane potential.

5. Active Transport: Membrane transporters
6. Action Potential: Excitation. Nerve impulse transmission.
7. Mitochondrial convertion of energy. Oxidative phosphorylation. Quimiosmotic Hypothesis.

C) INTERMOLECULAR FORCES.

1. Review of electrostatic forces between ions and dissolution dipoles.

2. Van der Waals forces.

3. Forces between particles. Microscopic theory of Hamaker

4. Function of Dielectric response. Introduction to the Lifshitz theory

5. Instrumental Techniques for force measument

6. Biological applications.

Plan:

Lecture sessions:	22 hours.
Other work:	14 hours.
Study:	33 hours.

References

A Thermodynamic of irreversible processes.
-A. KATCHALSKY, P.F. CURRAN, "Nonequilibrium Thermodynamics in Biophysics", Harvard University Press, Cambridge (MA), 1965.
-D. JOU, "Introducció a la Termodinàmica de Processos Biològics", Institut d'Estudis Catalans, Barcelona, 1985. (Existeix traducció castellana per Ed. Labor, Barcelona, 1989).

B Biophysics
-K.E. van HOLDE, "Bioquímica Física", Col. Exedra, Alhambra, Madrid, 1979.
-R. PLONSEY, R.C. BARR, "Bioelectricity. A quantitative Approach", 2a. ed., Kluwer Ac., Plenum Pub., N.Y., 2000.
-R. GLASER, "Biofísica", Ed. Acribia, Zaragoza, 2003.

C Intermolecular forces.
-J.N. ISRAELACHVILI, "Intermolecular and surface forces", 2a. ed., Academic press, London, 1992.
-D.F. EVANS, H. WENNERSTRÖM, "The Colloidal Domain, where Physics, Chemistry, Biology and Technology meet", 2a. ed., Wiley, N.Y., 1999.