General aims
The aim of the course is to apply the principles of physics to biological systems to answer some fundamental questions about their structure and function, for example, how ordered structures in life arise out of apparent chaos and how various biomolecules perform their functions. During the course, we will review and develop some of the required tools from statistical physics, thermodynamics, electrostatics and physical chemistry.

Text and reference books
The course will be based on the text: Biological Physics by Philip Nelson (copies are available at the Co-op bookshop). Other useful references are:
Methods in Molecular Biophysics by Igor Serdyuk et al.
Biophysics by Roland Glaser
All three books will be put in closed reserve in SciTech Library.
Lecture notes will be available on the web page: www.physics.usyd.edu.au/~serdar/bp.

Lectures
Lecturer: A/Prof. Serdar Kuyucak, Rm 351, A28 Tel: 903 65306, email: serdar@physics.usyd.edu.au
Times: Mon (9 am), Tue (1 pm) and Wed (9am) (Note that lectures will start on Wednesday, April 22)
Venue: Lecture Theatre 2.

Assignments & assessment
Assessment will be based on a final examination (70 marks), a group project (20 marks) and an assignment (10 marks). The assignment is due on May 18 and the group project on June 5.

Course outline
- Introduction: Paradigm shift in molecular biology; physics is needed to move from qualitative pictures to quantitative dynamical description of biomolecular processes.
- Week 4: Chemical forces: Chemical potential, chemical reactions, dissociation, self assembly of lipids, micelles and bilayers. Conformations of biomolecules: Helix-coil transition, protein folding.
- Week 5: Enzymes and molecular machines: Enzyme reactions and kinetics, Michaelis-Menten rule, Brownian ratchet model for molecular motors, molecular motors in muscles (myosin and actin).
- Week 6: Machines in membranes: Nernst potential, Donnan equilibrium, ion pumps. Nerve impulses: excitable cells, ion channels, action potential, cable equation, Hodgkin-Huxley mechanism.