**CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS**

# NEW COURSE PROPOSAL

PROGRAM AREA _____ BIOLOGICAL AND PHYSICAL SCIENCES _____

1. **Catalog Description of the Course.** *[Include the course prefix, number, full title, and units. Provide a course narrative including prerequisites and corequisites. If any of the following apply, include in the description: Repeatability (May be repeated to a maximum of ___ units); time distribution (Lecture ___ hours, laboratory ___ hours); non-traditional grading system (Graded CR/NC, ABC/NC). Follow accepted catalog format.]*

**BIOL 315. INTRODUCTION TO BIOPHYSICS (4)**
Three hours of lectures and two hours of practical activity per week.
Prerequisite : PHYS 200
Corequisite : BIOL 300
This course applies physical methods to the study of biological systems, including transport processes and membrane phenomena, bioelectric phenomena, photosynthetic systems and visual systems. Biophysical methods will include the techniques of patch clamping and optical tweezers, and the measurement of action potentials and evoked responses.
There will be an emphasis on modeling and on problem solving, with appropriate mathematics when necessary. The practical activity session will include computer modeling and simulation, and laboratory demonstrations and exercises.
Same as PHYS 315

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2. **Mode of Instruction.**

| | **Units** | **Hours per Unit** | **Benchmark Enrollment** |
|---|---|---|---|
| Lecture | ___3_____ | ____1____ | ___20_____ |
| Seminar | _____ | _____ | _____ |
| Laboratory | _____ | _____ | _____ |
| Activity | ___1_____ | ____2____ | ___20_____ |

3. **Justification and Learning Objectives for the Course.** (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) *[Use as much space as necessary]*

This course is designed to be added to the Emphasis in Cell and Molecular Biology within the Biology program. It will present an overview of biophysical systems and the methods employed to characterize them.

Through this course, students will be able to

- explain the basic concepts and principles of physics and their applications to biological systems
- apply problem-solving skills to practical problems within the life sciences
- choose appropriate biophysical methods to characterize biological systems and appreciate their limitations
- analyse complex issues in biophysics using modeling
- use a variety of simulation programs, featuring data analysis and display, to derive conclusions about experimental situations
- critically evaluate scientific and medical literature
- organize and express ideas clearly and convincingly in oral and written forms.

The course is not designed to satisfy the University Writing or Language requirements, although it will include substantial components of writing and oral presentation.

**4. Is this a General Education Course** **YES** **NO**
**If Yes, indicate GE category:**

| | |
|---|---|
| **A (English Language, Communication, Critical Thinking)** | |
| **B (Mathematics & Sciences)** | |
| **C (Fine Arts, Literature, Languages & Cultures)** | |
| **D (Social Perspectives)** | |
| **E (Human Psychological and Physiological Perspectives)** | |

**5. Course Content in Outline Form.** *[Be as brief as possible, but use as much space as necessary]*

Transport processes: Brownian motion, mean free path and collision time, Fick's Laws, diffusion and viscosity, osmosis, the kidney. Membrane permeation and potentials, mechanisms of excitability. Transport involving water, non-electrolytes and electrolytes.
The electrical properties of nerves, conductance, capacitance and dielectrics, resistance along the axon, transmission across a synapse, resting potential, passive response, action potentials, Hodgson-Huxley model for membrane current, properties of myelinated fibers, membrane channels, learning and neural networks.
Human biopotentials: the exterior potential and the electrocardiogram (ECG), the electroencephalogram (EEG), and the electromyogram (EMG).
Energy consumption, respiration, ATP synthesis, muscular movement, human performance.
The visual system, visual evoked responses.

**6. References.** *[Provide 3 - 5 references on which this course is based and/or support it.]*

R.J. Cotterill. Biophysics: An Introduction. Wiley, 2002. (ISBN 0-471-48538-1)
R. Glaser. Biophysics. Springer Verlag, 2001. (ISBN 3540670882)
P. Davidovits. Physics in Biology and Medicine. Academic Press, 2001. (ISBN 0122048407)
Biophysics Textbook Online at http://www.biophysics.org/btol/
Electrophysiology: simulations at http://pb010.anes.ucla.edu/
B.H. Brown et al. Medical Physics and Biomedical Engineering. IOP, 1999. (ISBN 0-7503-0368-9)

**7. List Faculty Qualified to Teach This Course.**

Dr. Geoff Dougherty: Physics faculty
Dr. Louise Lutze-Mann: Biology faculty

**8. Frequency.**
a. Projected semesters to be offered: Fall __X___ Spring _____ Summer _____

**9. New Resources Required.**
a. Computer (data processing), audio visual, broadcasting needs, other equipment

b. Library needs
Books listed in para.6.

c. Facility/space needs
Lab space (and access to computers) for 2 hours/week to conduct demos/experiments and computer simulations.

**10. Consultation.**
Attach consultation sheet from all program areas, Library, and others (if necessary)

**11.** If this new course will alter any degree, credential, certificate, or minor in your program, attach a program modification.

____Geoff Doughtery_____1/3/03_____
Proposer of Course Date