CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

NEW COURSE PROPOSAL

PROGRAM AREA

1. Catalog Description of the Course. BINF 511 COMPUTATIONAL GENOMICS (3) Three hours of lecture per week.

Prerequisite BINF 500 or permission of instructor.

This course applies the theories and algorithms taught in BINF 500 to real-life genomic data sets, with an emphasis on practical applications, hands-on analysis, integrated approaches and collaboration. Lecture and laboratory will explore the computational and engineering tools for analyzing genomic data. The relationships between sequence, structure, and function in complex biological networks will be studied using quantitative modeling.

2. Mode of Instruction.

	Units	Hours per Unit	Benchmark Enrollment
Lecture	3	1	15
Seminar			
Laboratory			
Activity			

- **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 a required element of the bioinformatics emphasis for the proposed Professional Science Masters degree in Bioinformatics

Upon completion of this course, students will be able to:

- explain the structure, function, replication and evolution of eukaryotic genomes
- demonstrate knowledge of current NCBI biological databases
- work in teams to solve complex problems in genomic data informatics
- use C and/or PERL programming to interface with existing bioinformatics software packages
- identify the complementation groups in a hypothetical genetic data set
- compare a variety of methods for computing ratios and normalizing microarray data

4. Is this a General Education Course 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]

Whole genome analysis

GC content, GPC islands, genome structure, genome content, enhancer/promoter regions, small RNAs, tRNA Computational gene finding

ORFS, introns, exons, splice sites, transcription initiation, methylation, polyadenylation

Comparative (cross-genome) analysis

Prokaryotes, yeast, C. elegans, Drosophila, mouse, human

mRNA expression analysis

gene chips, microarrays, clustering, class prediction

Single nucleotide polymorphisms (SNPs)

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

Waterman, M. Introduction to Computational Biology: Maps, Sequences and Genomes. 1995. CRC Press, ISBN: 0412993910
Setubal, J. and Meidanis, J. 1997. Introduction to Computational Molecular Biology. Brooks Cole Publishing, ISBN: 0534952623
Durbin, R., Eddy, S., Krogh, A., and Mitchison, G. 1998. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids, Cambridge University Press, ISBN 0521629713

Venter et al. 2001. The Sequence of the Human Genome. Science 291: 1304-1351

- Eisen MB, Spellman, PT, Brown, PO, and Botstein, D. 1999. Cluster analysis and display of genome-wide expression patterns. PNAS 95(25): 14863
- Schena M, Shalon D, Davis RW, and Brown PO. 1995. Quantitative monitoring of gene expression patterns with a complementary DNA microarray. Science 270: 467-70.

Gusfield, D. 1997. Algorithms on strings, trees, and sequences: computer science and computational biology. Cambridge University Press, ISBN: 0521585198

Mount, D. Bioinformatics: Sequence and Genome Analysis. 2001. Cold Spring Harbor Laboratory Press, ISBN 0879696087

7. List Faculty Qualified to Teach This Course.

Computer science faculty, biology faculty, bioinformatics professionals

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
- c. Facility/space needs

None.

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.

Amy Denton

31 October 2003

Proposer of Course

Date