

CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

COURSE MODIFICATION PROPOSAL

Courses must be submitted by October 15, 2013, and finalized by the end of the fall semester to make the next catalog (2014-15) production

DATE (CHANGE DATE EACH TIME REVISED): 10/13/13; REV 11.5.13

PROGRAM AREA(S): BIOL

Directions: All of sections of this form must be completed for course modifications. Use **YELLOWED** areas to enter data. All documents are stand alone sources of course information.

1. Indicate Changes and Justification for Each. [Mark an X by all change areas that apply then please follow-up your X's with justification(s) for each marked item. Be as brief as possible but, use as much space as necessary.]

<input type="checkbox"/> Course title	<input checked="" type="checkbox"/> X Course Content
<input type="checkbox"/> Prefix/suffix	<input checked="" type="checkbox"/> X Course Learning Outcomes
<input type="checkbox"/> Course number	<input checked="" type="checkbox"/> x References
<input type="checkbox"/> Units	<input type="checkbox"/> GE
<input type="checkbox"/> Staffing formula and enrollment limits	<input checked="" type="checkbox"/> X Other ADD GWAR designation
<input type="checkbox"/> Prerequisites/Corequisites	<input type="checkbox"/> Reactivate Course
<input checked="" type="checkbox"/> X Catalog description	
<input type="checkbox"/> Mode of Instruction	

Justification: The original course proposal was written in 2003 and because the field of bioinformatics advances rapidly, significant changes to the references, content, and learning outcomes is required to update course documentation. This course requires that students demonstrate proficiency in writing appropriate to masters-level students through several assigned literature reviews and research reports.

2. Course Information.

[Follow accepted catalog format.] (Add additional prefixes i f cross-listed)

OLD

Prefix BINF Course# 500
 Title **DNA AND PROTEIN SEQUENCE ANALYSIS** Units
 (3)
 3 hours lecture per week
☐ hours blank per week

x Prerequisites: BIOL 400 or 501
☐ Consent of Instructor Required for Enrollment
☐ Corequisites: ☐

Catalog Description (Do not use any symbols):

This course will introduce the computational aspects of biological inference from nucleic acid and protein sequences. Pairwise sequence comparison and multiple sequence alignment will be studied in detail. Additional topics include: RNA structure prediction, conserved sequence pattern recognition (sequence profile analysis), phylogenetic analysis algorithms, sequence data as a means to study molecular evolution, models and algorithms for genetic regulation, contig assembly, PAM and BLOSUM matrices, protein three dimensional structure prediction.

General Education Categories: ☐

Grading Scheme (Select one below):

x A – F

☐ Credit/No Credit

☐ Optional (Student's Choice)

Repeatable for up to ☐ units

Total Completions ☐

Multiple Enrollment in Same Semester Y/N ☐

Course Level:

NEW

Prefix BINF Course# 500
 Title **DNA AND PROTEIN SEQUENCE ANALYSIS**
 Units (3)
 3 hours lecture per week
☐ hours blank per week

x Prerequisites: BIOL 400 or 501
☐ Consent of Instructor Required for Enrollment
☐ Corequisites: ☐

Catalog Description (Do not use any symbols):

Introduces the computational aspects of biological inference from nucleic acid and protein sequences, and the access and manipulation of genomic data from public databases. Pairwise sequence comparison and multiple sequence alignment will be studied in detail. Additional topics include: RNA structures, conserved sequence pattern recognition and gene prediction, phylogenetic analysis, sequence data as a means to study molecular evolution, and human genome science. Meets graduate writing assessment requirement (GWAR).

General Education Categories: ☐

Grading Scheme (Select one below):

x A – F

☐ Credit/No Credit

☐ Optional (Student's Choice)

Repeatable for up to ☐ units

Total Completions ☐

Multiple Enrollment in Same Semester Y/N ☐

Course Level:

☐ Undergraduate
☐ Post-Baccalaureate
 x Graduate

☐ Undergraduate
☐ Post-Baccalaureate
 x Graduate

3. Mode of Instruction (Hours per Unit are defaulted)

Hegis Code(s) _____
 (Provided by the Provost Office)

Existing

Proposed

	Units	Hours Per Unit	Default Section Size	Graded		Units	Hours Per Unit	Default Section Size	Graded	CS No. (filled out by Provost Office)
Lecture	<u>3</u>	<u>1</u>	<u>24</u>	X	Lecture	<u>3</u>	<u>1</u>	<u>24</u>	X	<input type="checkbox"/>
Seminar	<input type="checkbox"/>	<u>1</u>	<input type="checkbox"/>	<input type="checkbox"/>	Seminar	<input type="checkbox"/>	<u>1</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lab	<input type="checkbox"/>	<u>3</u>	<input type="checkbox"/>	<input type="checkbox"/>	Lab	<input type="checkbox"/>	<u>3</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Activity	<input type="checkbox"/>	<u>2</u>	<input type="checkbox"/>	<input type="checkbox"/>	Activity	<input type="checkbox"/>	<u>2</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Field Studies	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	Field Studies	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Indep Study	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	Indep Study	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other blank	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	Other blank	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Online	<input type="checkbox"/>			<input type="checkbox"/>	Online	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>

4. Course Attributes:

☐ **General Education Categories:** All courses with GE category notations (including deletions) must be submitted to the GE website: <http://summit.csuci.edu/geapproval>. Upon completion, the GE Committee will forward your documents to the Curriculum Committee for further processing.

A (English Language, Communication, Critical Thinking)

- ☐ A-1 Oral Communication
- ☐ A-2 English Writing
- ☐ A-3 Critical Thinking

B (Mathematics, Sciences & Technology)

- ☐ B-1 Physical Sciences
- ☐ B-2 Life Sciences – Biology
- ☐ B-3 Mathematics – Mathematics and Applications
- ☐ B-4 Computers and Information Technology

C (Fine Arts, Literature, Languages & Cultures)

- ☐ C-1 Art
- ☐ C-2 Literature Courses
- ☐ C-3a Language
- ☐ C-3b Multicultural

D (Social Perspectives)

E (Human Psychological and Physiological Perspectives)

UDIGE/INTD Interdisciplinary

x Meets University Writing Requirement (Graduation Writing Assessment Requirement)

☐ Meets University Language Requirement

☐ **American Institutions, Title V Section 40404:** ☐ Government ☐ US Constitution ☐ US History
 Regarding Exec Order 405, for more information: <http://senate.csuci.edu/comm/curriculum/resources.htm>

Service Learning Course (Approval from the Center for Community Engagement must be received before you can request this course attribute).

Online Course (Answer YES if the course is ALWAYS delivered online).

5. Justification and Requirements for the Course. *[Make a brief statement to justify the need for the course]*

OLD

This course is a required element of the core curriculum for the proposed Professional Science Masters degree in Bioinformatics

x Requirement for the Major/Minor

Elective for the Major/Minor

Free Elective

NEW

This course is a required element of the core curriculum for all emphases within the MS Biotechnology and Dual MS/MBA degrees.

x Requirement for the Major/Minor

Elective for the Major/Minor

Free Elective

Submit Program Modification if this course changes your program.

6. Student Learning Outcomes. (List in numerical order. Please refer to the Curriculum Committee's "Learning Outcomes" guideline for measurable outcomes that reflect elements of Bloom's Taxonomy: <http://senate.csuci.edu/comm/curriculum/resources.htm>. The committee recommends 4 to 8 student learning outcomes, unless governed by an external agency (e.g., Nursing).

Upon completion of the course, the student will be able to:

OLD

- Explain the algorithms used in DNA sequence alignment
- Explain the significance of scoring in DNA sequence alignment
- Write Perl scripts that perform basic manipulations of nucleic acid and protein sequence data
- Evaluate the merits and disadvantages of probabilistic and non-probabilistic tree-finding methods
- Use a profile hidden Markov model to score how well an unknown protein sequence fits a family motif
- Demonstrate facility using BLAST and PSI-BLAST.

Upon completion of the course, the student will be able to:

NEW

- describe the techniques used to collect sequence and gene expression data.
- identify appropriate biological databases for specific analyses.
- query databases and search for molecular sequences.
- identify sequences homologous to a known sequence using BLAST.
- describe the regulation of gene expression and the applications of gene expression profiling.
- use sequence alignment and tree building tools.
- explain the principles used to predict and to model protein structures from amino acid sequences.
- Communicate scientific information effectively in written format

7. Course Content in Outline Form. (Be as brief as possible, but use as much space as necessary)

OLD

Markov chains and hidden Markov models
Pairwise alignment
Profile hidden Markov models for sequence families
Multiple sequence alignment methods
Phylogeny reconstruction and assessment
Evolutionary models
RNA structure analysis
Gene prediction
Protein classification and structure prediction

NEW

Biological databases
Pairwise sequence alignment
Basic local alignment search tool (BLAST)
Advanced BLAST and searching techniques
Multiple Sequence Alignment
Phylogenetic Analysis
Short nucleotide sequences
Bioinformatic approaches to genes and gene expression
Eukaryotic genes and gene-finding methods
RNA resources
Protein databases
Human genome

Does this course content overlap with a course offered in your academic program? Yes ☐ No ☒

If YES, what course(s) and provide a justification of the overlap. ☐

Does this course content overlap a course offered in another academic area? Yes ☐ No ☒

If YES, what course(s) and provide a justification of the overlap. ☐

Overlapping courses require Chairs' signatures.

8. Cross-listed Courses (Please note each prefix in item No. 1) *Beyond three disciplines consult with the Curriculum Committee.*

- A. List cross-listed courses (Signature of Academic Chair(s) of the other academic area(s) is required).
- B. List each cross-listed prefix for the course:
- C. Program responsible for staffing: Biology

9. References. [Provide 3-5 references]

OLD

Durbin, R., Eddy, S., Krogh, A., and Mitchison, G. 1998. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids, Cambridge University Press.
Ewens, W. and Grant, G. 2001. Statistical Methods in Bioinformatics. Springer-Verlag.
Mount, D. Bioinformatics: Sequence and Genome Analysis. 2001. Cold Spring Harbor Laboratory Press.
Tisdall, J. Beginning Perl for Bioinformatics. 2001. O'Reilly and Associates.

NEW

Agostino, Michael. 2013. Practical Bioinformatics. Garland Science
Pevsner, Jonathan. 2009. Bioinformatics and Functional Genomics (2nd edition). John Wiley & Sons, Inc.
Lesk, Arthur M. 2011. Introduction to Genomics (2nd ed.). Oxford University Press.
Lesk, Arthur M. 2008. Introduction to Bioinformatics (3rd edition). Oxford University Press.
Campbell, A. Malcolm and Laurie J. Heyer. 2007. Discovering Genomics, Proteomics and Bioinformatics (2nd ed.). Pearson/Benjamin Cummings

10. Tenure Track Faculty qualified to teach this course.

Amy Denton, Erich Fleming

11. Requested Effective Date or First Semester offered: Fall 2014

12. New Resource Requested: Yes ☐ No ☒

If YES, list the resources needed.

A. Computer Needs (data processing, audio visual, broadcasting, other equipment, etc.)

B. Library Needs (streaming media, video hosting, databases, exhibit space, etc.)

C. Facility/Space/Transportation Needs:

D. Lab Fee Requested: Yes ☐ No ☐ (Lab fee requests should be directed to the Student Fee Committee)

E. Other.

13. Will this course modification alter any degree, credential, certificate, or minor in your program? Yes ☒ No ☐

If, YES attach a program update or program modification form for all programs affected.

Priority deadline for New Minors and Programs: **October 1, 2013** of preceding year.

Priority deadline for Course Proposals and Modifications: **October 15, 2013**.

Last day to submit forms to be considered during the current academic year: **April 15th**.

Amy Denton

10/13/13

Proposer(s) of Course Modification

Date

Type in name. Signatures will be collected after Curriculum approval.

Approval Sheet

Course: BINF 500

If your course has a General Education Component or involves Center affiliation, the Center will also sign off during the approval process.

Multiple Chair fields are available for cross-listed courses.

The CI program review process includes a report from the respective department/program on its progress toward accessibility requirement compliance. By signing below, I acknowledge the importance of incorporating accessibility in course design.

Program Chair		
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Signature

Date

Program Chair		
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Signature

Date

Program Chair		
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Signature

Date

General Education Chair		
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Signature

Date

Center for Intl Affairs Director		
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Signature

Date

Center for Integrative Studies Director		
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Signature

Date

Center for Multicultural Engagement Director		
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Signature

Date

Center for Civic Engagement and Service Learning Director		
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Signature

Date

Curriculum Chair		
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Signature

Date

AVP		
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Signature

Date