1. **COURSE SUBJECT**	CSE/BME/MC
2. **COURSE NUMBER**	1401
3. **COURSE TITLE**	Honors Core: Computational Molecular Biology
4. **INITIATING DEPARTMENT or UNIT**	Physiology and Neurobiology (PNB)
5. **NAME OF SUBMITTER**	Daniel Schwartz
6. **PHONE of SUBMITTER**	Phone: +1 860 486 0496
7. **EMAIL of SUBMITTER**	Email: daniel.schwartz@uconn.edu
8. **CONTACT PERSON**	Robert Gallo
9. **UNIT NUMBER of CONTACT PERSON** (U-BOX)	3156
10. **PHONE of CONTACT PERSON**	Phone: 860 486 2550
11. **EMAIL of CONTACT PERSON**	Email: robert.gallo@uconn.edu
12. Is this course currently a General Education course?	Yes
13. Date of Departmental Approval (MM/DD/YYYY)	03/05/2011
14. Date of School/College Approval (MM/DD/YYYY)	03/15/2011
15. Names and Dates of additional Department and School/College approvals	CSE Dept 02/16/2011 BME Dept 02/28/2011 School of Eng 03/18/2011 MCB Dept 02/25/2011
16. Proposed Implementation Date	Term: Fall , Year: 2011
17. Offered before next printed catalog is distributed?	Yes
18. **General Education Content Area**	Content Area 3 Science and Technology
19. **Skill Code Course** Any non-W section?	
20. Terms Offered	Semester: Year:
21. Sections	Sections Taught:
22. Student Number	Students/Sections:
23. Clarification:	
24. **Number of Credits**	if VAR Min: Max: credits each term
25. **INSTRUCTIONAL PATTERN**	
26. Will this course be taught in a language other	

than English?	If yes, then name the language:
27. Please list any prerequisites, recommended preparation or suggested preparation:	
28. Is Instructor, Dept. Head or Unit **Consent Required**?	
29. Permissions and Exclusions:	
30. Is this course **repeatable for credit**?	If yes, total credits allowed: Allow multiple enrollments in same term?
31. **Grading Basis**	
32. If satisfactory/unsatisfactory grading is proposed, please provide **rationale**:	
33. Will the course or any sections of the course be taught as Honors?	
34. Additional Details:	
35. Special Attributes:	
36. **REGIONAL CAMPUS AVAILABILITY**:	

37. PROVIDE THE CURRENT TITLE AND COMPLETE CATALOG COPY **AND** REVISED TITLE AND COMPLETE CATALOG COPY

Current Title and Catalog Copy

1401. Honors Core: Computational Molecular Biology (120) (Also offered as BME 1401 and CSE 1401.) Either semester. Three credits.
Introduction to research in computational biology through lectures, computer lab exercises, and mentored research projects. Topics include gene and genome structure, gene regulation, mechanisms of inheritance, biological databases, sequence alignment, motif finding, human genetics, forensic genetics, stem cell development, comparative genomics, early evolution, and modeling complex systems. CA 3.

1401. Honors Core: Computational Molecular Biology (120) (Also offered as CSE 1401 and MCB 1401.) Either semester. Three credits. Mandoiu, Nelson
Introduction to research in computational biology through lectures, computer lab exercises, and mentored research projects. Topics include gene and genome structure, gene regulation, mechanisms of inheritance, biological databases, sequence alignment, motif finding, human genetics, forensic genetics, stem cell development, comparative genomics, early evolution, and modeling complex systems. CA 3.

1401. Honors Core: Computational Molecular Biology (120) (Also offered as BME 1401 and MCB 1401.) Either semester. Three credits.
Introduction to research in computational biology through lectures, computer lab exercises, and mentored research projects. Topics include gene and genome structure, gene regulation, mechanisms of inheritance, biological databases, sequence alignment, motif finding, human genetics, forensic genetics, stem cell development, comparative genomics, early evolution, and modeling complex systems. CA 3.

Revised Title and Catalog Copy

1401. Honors Core: Computational Molecular Biology (120) (Also offered as BME 1401, CSE 1401, and MCB 1401.) Either semester. Three credits.
Introduction to research in computational biology through lectures, computer lab exercises, and mentored research projects. Topics include gene and genome structure, gene regulation, mechanisms of inheritance, biological databases, sequence alignment, motif finding, human genetics, forensic genetics, stem cell development, comparative genomics, early evolution, and modeling complex systems. CA 3.

1401. Honors Core: Computational Molecular Biology (120) (Also offered as BME 1401, CSE 1401, and PNB 1401.) Either semester. Three credits.
Introduction to research in computational biology through lectures, computer lab exercises, and mentored research projects. Topics include gene and genome structure, gene regulation, mechanisms of inheritance, biological databases, sequence alignment, motif finding, human genetics, forensic genetics, stem cell development, comparative genomics, early evolution, and modeling complex systems. CA 3.

1401. Honors Core: Computational Molecular Biology (120) (Also offered as CSE 1401, MCB 1401, and PNB 1401.) Either semester. Three credits. Mandoiu, Nelson
Introduction to research in computational biology through lectures, computer lab exercises, and mentored research projects. Topics include gene and genome structure, gene regulation, mechanisms of inheritance, biological databases, sequence alignment, motif finding, human genetics, forensic genetics, stem cell development, comparative genomics, early evolution, and modeling complex systems. CA 3.

1401. Honors Core: Computational Molecular Biology (120) (Also offered as BME 1401, MCB 1401, and PNB 1401.) Either semester. Three credits.
Introduction to research in computational biology through lectures, computer lab exercises, and mentored research projects. Topics include gene and genome structure, gene regulation, mechanisms of inheritance, biological databases, sequence alignment, motif finding, human genetics, forensic genetics, stem cell development, comparative genomics, early evolution, and modeling complex systems. CA 3.

38. **RATIONALE** FOR ACTION REQUESTED

The proposed request entails cross-listing CSE/BME/MCB 1401 with the Physiology and Neurobiology Department (i.e., creating PNB 1401). The rationale for the request is threefold: i) it provides greater visibility for the course, ii) it exposes PNB students to the field of computational biology (an area of research within the department), and iii) it makes the course more sustainable by allowing Dan Schwartz, a new PNB faculty member in computational biology, to participate in teaching it.
The proposed revision is expected to add breadth to the curriculum of the PNB department. Degree requirements for students currently in the program will remain unchanged, and changes in the enrollment of other courses is not expected to be significant (total enrollment of the course is limited to 36 students across all cross-listed departments and course content area does not overlap with other courses offered within the department). There are no anticipated adverse

effects on other departments, programs, or regional campuses, and all other relevant departments (namely CSE, BME, and MCB) have been consulted and have approved the proposed cross-listing via their faculties and C&C committees.

39. **SYLLABUS:**

Online URL: (https://web2.uconn.edu/senateform/request/course_uploads/das10009-1301319600-Syllabus_BME1401_CSE1401_MCB1401_Spring11.pdf)

40. **FOR ALL GENERAL EDUCATION COURSES**

41. **ALL COURSES PROPOSED FOR A GENERAL EDUCATION CONTENT AREA MUST ANSWER THIS QUESTION.**

42. **Content Area and/or Competency Criteria: ALL General Education courses, including W and Q courses, MUST answer this question.:** Specific Criteria

a. **Arts and Humanities:**
b. **Social Sciences:**
c. **Science and Technology:**
   i. **Laboratory:**
d. **Diversity and Multiculturalism:**
   43. **International:**
e. **Q course:**
f. **W course:**

43. **RESOURCES:**

Does the department/school/program currently have resources to offer the course as proposed

If NO, please explain why and what resources are required to offer the course.

44. **SUPPLEMENTARY INFORMATION**:

ADMIN COMMENT:

quadruple_listing_request_existingCA3course_032811AP.

BME1401/CSE1401/MCB1401
Honors Core – Computational Molecular Biology
Spring 2011
Lecture: Castleman 201, Mon/Wed 11-11:50am
Lab: ITE 138, Fri 10-10:50am (section 001D) and 11-11:50am (section 002D)
Instructors:
Ion Mandoiu
Phone: 486-3784
E-mail: ion@engr.uconn.edu
Office hours: ITE 261, Mon/Wed 12-1pm
Craig Nelson
Phone: 486-5617
E-mail: craig.nelson@uconn.edu
Office hours: Beach Hall 305, Mon/Wed 1-2pm
Teaching Assistants:
Edward Hemphill
Phone: 486-1576

E-mail: edward.hemphill_iii@uconn.edu
Office hours: Mon 5-6pm, ITE 138
James Lindsay
Phone: 486-0513
E-mail: james.lindsay@engr.uconn.edu
Office hours: Tue 5-6pm, ITE 138
Marius Nicolae
Phone: 486-0513
E-mail: man09004@engr.uconn.edu
Office hours: Wed 3-4pm, ITE 219
Textbook: N. Cristianini and M.W. Hahn, *Introduction to computational genomics: a case studies approach*, Cambridge University Press, 2007. Textbook website: http://www.computational-genomics.net/.
Course outline: This course is an introduction to computational genomics through lectures, computer lab exercises, and mentored research projects. Started in 1995 by the completion of the first genome sequence of a free-living organism, *H. influenzae*, the genomic era has already led to thousands of complete genome sequences deposited in public databases and many more genome projects at various stages of completion. The huge amounts of available genome data are revolutionizing biomedical research, but fully exploiting them requires powerful computational and statistical methods. The main objective of the course is to provide students with a general understanding of the field of computational genomics, including current problems and research. Students will become familiar with fundamental molecular biology concepts and computational techniques, and will learn how to use the Matlab bioinformatics toolbox for solving problem in genomics.
Grading and course policies: Grading will be based on in-class quizzes, computer lab assignments, and team final projects, with each of the three components contributing equally to the final grade. In-class quizzes will be given at the beginning of class on Mondays. Computer assignments will be assigned on Fridays and will be due by midnight the following Wednesday. Assignments must be submitted electronically via HuskyCT (see below). *No late assignments and make-up quizzes will be allowed*. The lowest quiz and computer assignment grade will be omitted from the computation of the final grade. The last five weeks of the class will be devoted to a final project done in teams of three students. For the project you will pick a computational genomics topic not covered in lectures or labs and research it in more depth. You will be required to give weekly progress reports, submit a written final report of 15-20 pages, and give a 15-minute presentation at the end of the semester. The final project component of the grade will include participation in discussions of progress reports and final presentations of other teams.
HuskyCT: We have a HuskyCT site for the class; you can access it by logging in with your NetID and password at https://huskyct.uconn.edu/. You must use HuskyCT for submitting assignments and check it regularly for class materials, grades, problem clarifications, changes in class schedule, and other class announcements.
Academic honesty: You are expected to adhere to the highest standards of academic honesty. All submitted solutions must be your own work. You may discuss ideas and concepts with other people, but *must not share written solutions or computer code*. Use of published materials is allowed, but the sources should be explicitly stated in your submission. Violations will be reviewed and sanctioned according to the University Policy on Academic Integrity.
Students with disabilities: If you have a documented disability for which you are or may be requesting an accommodation, you are encouraged to contact the instructor and the Center for Students with Disabilities or the University Program for College Students with Learning Disabilities as soon as possible to better ensure that such accommodations are implemented in a timely fashion.

Tentative Course Schedule

Date Text Biology Topics Computer Science Topics Computer Lab
Wed
Jan 19 Preface Course structure. What is computational genomics?
Evolution and DNA sequence.
Fri
Jan 21 Ch 1 Lab1: Introduction to
Matlab & Databases
Mon
Jan 24 Ch 1 Anatomy of a genome Computer algorithms
Wed
Jan 26 Ch 1 Structure and function of
DNA, replication
Probabilistic models and

statistical sequence analysis
Fri
Jan 28 Ch 1 Lab2: Exercise 1.1-1.3
Mon
Jan 31 Ch 2 Transcription, translation,
genetic code Gene Finding
Wed
Feb 2 Ch 2
Anatomy of a gene:
enhancers, promoters,
UTR's, and ORF's
Hypothesis Testing
Fri
Feb 4 Ch 2 Lab3: Exercise 2.1-2.3
Mon
Feb 7 Ch 3 Homology, orthology, and
paralogy
Global and local sequence
alignment
Wed
Feb 9 Ch 3 Gene duplication and
deletion Multiple sequence alignment
Fri
Feb 11 Ch 3 Lab4: Exercise 3.1-3.4
Mon
Feb 14 Ch 5 Mutation, polymorphism Genetic distance, modeling
sequence evolution
Wed
Feb 16 Ch 5 Mitochondrial DNA &
Human evolution Phylogenetic trees
Fri
Feb 18 Ch 5 Lab5: Exercise 5.1-5.3
Mon
Feb 21 Ch 6 Evolution and Natural
Selection
Quantifying natural
selection
Wed
Feb 23 Ch 6 HIV & the immune system Estimating Ka/Ks
Fri
Feb 25 Ch 6 Lab6: Exercise 6.1-6.3
Mon
Feb 28 Ch 7 SARS and viral evolution Structure and representation
of phylogenetic trees
Wed
Mar 2 Ch 7 Virus-host interactions Tree inference – distance
matrices, neighbor joining
Fri
Mar 4 Ch 7 Lab7: Exercise 7.1-7.3
Mon
Mar 7 Spring recess
Wed
Mar 9 Spring recess
Fri
Mar 11 Spring recess
Date Text Biology Topics Computer Science Topics Computer Lab

Mon
Mar 14 Ch 9 Gene Expression Measuring gene expression
with microarrays
Wed
Mar 16 Ch 9 Yeast, diauxic shift, cell
cycle Data clustering
Fri
Mar 18 Ch 9 Lab8: Exercise 9.1-9.3
Mon
Mar 21 Ch 10 Circadian clock Motif representation and
scoring
Wed
Mar 23 Ch 10 Mechanisms of gene
regulation Motif finding
Fri
Mar 25 Ch 10 Lab9: Exercise 10.1-10.3
Mon
Mar 28 --
Wed Final project topic selection
Mar 30 --
Fri
Apr 1 -- Submit FP topic; start
literature review
Mon
Apr 4 --
Wed Progress report (15' presentation) on literature review
Apr 6 --
Fri
Apr 8 --
Submit literature review;
start defining analysis
strategy
Mon
Apr 11 -- Progress report (15' presentation) on
Wed analysis strategy
Apr 13 --
Fri
Apr 15 -- Submit analysis strategy;
start data analysis
Mon
Apr 18 -- Progress report (15' presentation) on preliminary data analysis
Wed results
Apr 20 --
Fri
Apr 22 --
Submit preliminary
results; start final project
presentation
Mon
Apr 25 --
Wed 25' final project presentation
Apr 27 --
Fri
Apr 29 -- Submit final report