George Mason University–Office of the Registrar **Undergraduate Course Approval Form**

Please complete this form and attach a copy of the syllabus and catalog description for new courses. Forward the form and attachments to your departmental curriculum committee for approval, and then to your College/School curriculum committee, or Dean's office, for final approval. The approved form should then be forwarded to the Academic Scheduling Office, MS 3D1. This is for ***undergraduate course approval only***. Please see the Provost Office/Graduate Council website to obtain a copy of the Graduate Course Approval Form and for details about the graduate course approval process.

Note: Colleges and Schools are responsible for submitting new or modified catalog descriptions (35 words or less, using catalog format) to Creative Services by deadlines outlined in the yearly Catalog production calendar.

Please indicate: **New**___N___ **Modify**_____ **Delete**_____

Department/Unit: Bioinformatics and Computational Biology **Course Subject/Number:** BINF 404

Submitted by: ___Jennifer W Weller_____ **Ext:** ___3-8329___ **Email:** ___*jweller@gmu.edu*_____

Course Title: __Bioinformatics and Computational Biology Lab II_____

Effective Term (New/Modified Courses only)**:** _Spring 2008_ **Final Term** (deleted courses only)**:**_____

Credit Hours: (Fixed) _1__ (Var.) _____ to _____ **Grade Type** (check one)**:** _X__ Regular graduate (A, B, C, etc.)
_____ Satisfactory/No Credit only
_____ Special graduate (A, B, C, etc. + IP)

Repeat Status* (check one)**:** _X_ **NR**-Not repeatable ____ **RD**-Repeatable within degree ____ **RT**-Repeatable within term
***Note: Used only for special topics, independent study, or internships courses** **Total Number of Hours Allowed:** _____

Schedule Type Code(s): 1. LAB_ **LEC**=Lecture **SEM**=Seminar **STU**=Studio **INT**=Internship **IND**=Independent Study
2.____ **LAB**=Lab **RCT**=Recitation (second code used only for courses with Lab or Rct component)

Prereq _ Coreq _X_ (Check one)**:**____ BINF402_____

Note: Modified courses - review prereq or coreq for necessary changes; Deleted courses - review other courses to correct prereqs that list the deleted course.

Description of Modification (for modified courses)**:**_____

Special Instructions (major/college/class code restrictions, if needed)**:**_____

***Approval Signatures*:**

Department or Unit: _____ **Date:** _____
(Signature)

College/School Committee: _____ **Date:** _____
(Signature)

George Mason University **Undergraduate Course Coordination Form**

Approval from other units:

Please list those units outside of your own which may be affected by this new, modified, or deleted course. Each of these units should approve this action prior to its being submitted to the COS Curriculum Committee for approval.

Unit: BIO (relevant course: 580)	Head of Unit's Signature:	Date:
Unit:	Head of Unit's Signature:	Date:
Unit:	Head of Unit's Signature:	Date:
Unit:	Head of Unit's Signature:	Date:
Unit:	Head of Units Signature:	Date:

COS Curriculum Committee approval: _____ Date: _____

Course Proposal Submitted to the Curriculum Council
by
The College of Science

1. COURSE NUMBER AND TITLE:
BINF404 (1 credit) Bioinformatics and Computational Biology Lab II.

Prerequisites: BINF 401,403
Corequisites: BINF 402

Catalog Description: Laboratories will introduce students to research bioinformatics tools relevant to lecture topics such as: the correspondence of measured fragments to parent biomolecules, inference methods for gene and protein networks, predicting system outputs given specified inputs.

2. COURSE JUSTIFICATION:

Course objectives: This course is designed to give students hands-on experience with current tools used in bioinformatics research and give them an understanding of the underlying assumption, limitations and appropriate use of the tools. Practical experience applying the tools to both provided and student-acquired datasets will ensure that students truly understand the theory. Active practice with the accepted standard tools of the trade will better fit our graduates to compete for positions at biotechnology and pharmaceutical companies.

Course Necessity: Bioinformatics and computational biology are rapidly expanding research areas in both academic and commercial settings. The majority of life scientists are now required to understand the tools used to model biomolecules but the breadth of the field prevents a specialist in another discipline from having familiarity with more than the essentials for his own research. This course will allow students to experience the range of possibilities and make informed choices when faced with deciding on the best tools to achieve research or development goals. There is no existing undergraduate laboratory course at GMU that covers these research methods in a context that links the field effectively.

Course Relationship to Existing Programs: This course is proposed as the laboratory component matching the second of a two-semester lecture series intended to anchor an undergraduate minor in bioinformatics for a Biology (or closely related biosciences field) major. It is part of the first undergraduate program to be developed by the Bioinformatics and Computational Biology department. Interest in these lectures will determine to what extent a more extensive set of undergraduate courses is developed.

Course Relationship to Existing Courses: The only existing undergraduate course at GMU with a similar title is BINF 354 (Foundations in Mathematical Biology), which was developed by professors at the Krasnow Institute, without reference to any of the professors in the Bioinformatics and Computational Biology department, when we were still a program in SCS. BINF 354 is a research methods course with emphasis on the concepts and techniques required in neurosciences research, and while some of the fundamental methods are in common the application is quite different, thus there is overlap with the proposed course(s). A second course, BIOL 580 (Computer Applications for the Life Sciences), might be suitable for senior undergraduates, and is listed in the GMU catalog, however this course has not been taught in several years and in fact we were approached to develop a syllabus for and teach this course in Spring 2007.

3. SCHEDULING AND PROPOSED INSTRUCTORS:

Semester of Initial Offering: Spring 2008

Proposed instructors: Three-week commitments from each professor in Bioinformatics and Computational Biology (Vaisman, Seto, Weller, Kinser in semester 1, Weller, Klimov, and Willett in semester 2).

4. TENTATIVE SYLLABUS: See attached.

BINF 402 Syllabus

Week	subject	Tools and tasks
1	Topic I: Genomics Platforms Sequence data	Interpreting DNA electropherograms; Phred, Phrap and Consed
2	Microarray data	Design tools (Picky), analysis tools (DRAGON)
3	Proteomics Data	Mass spec data and its interpretation, mapping to sequences; the ProteomeCommons
4	Topic 2: Inferring Biological Pathways Representing Genetic data	Linkage analysis and regulatory networks; LD Mapping, VitaPad and GeneVis
5	Representing Enzymatic pathways	Using EcoCyc and KEGG; PathwayTools
6	Representing Chemical reactions and the metabolome	Metabolome and BioPathways databases and the CORINA and ROTATE tools
7	midterm	
8	Topic 3: Simulation Methods for Dynamics of BioMolecules The basics of molecular dynamics	CHARMM and NAMD examples
9	How to obtain and interpret results from molecular dynamics simulations	Exercise involves setting up, running and interpreting a MD simulation using
10	The foundations of the Monte Carlo algorithm	Examples of MC simulations for biomolecular systems
11	Topic 4: Systems Biology Core metabolic and Signalling pathways	An exercise in diagramming the selected pathways for the targeted biomolecule using Gepasi
12	Primary and secondary pathway databases records	KEGG and EcoCyc records
13	Pathway representation	Using the Ingenuity package
14	Pathway dynamics	Using the Gepasi and Copasi packages

Required text: comprehensive lab texts do not exist for this level of this field, the notes and expertise of the instructors will guide the content.