

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.

Please indicate: **New** **N** **Modify** **Delete**

Submitted by: Jennifer W Weller **Ext:** 3-8329 **Email:** jweller@qmu.edu

Effective Term (New/Modified Courses only): Fall 2007 **Final Term** (deleted courses only): _____

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

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): BINF401

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)

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:
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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:

BINF403 (1 credit) Bioinformatics and Computational Biology Lab I.

Prerequisites: Prerequisites: BIO231, IT108, IT208, STAT344.

Corequisites: BINF 401

Catalog Description: Bioinformatics labs will complement the topics are presented in the BINF 401 lecture: protein sequence, structure prediction and modeling methods; nucleic acid sequence and structure prediction and evolutionary models; gene structure prediction in prokaryotes and eukaryotes; image analysis and biomedical applications.

2. COURSE JUSTIFICATION:

Course objectives: This course is designed to expose students to how bioinformatics and computational biology hypotheses are framed and how experiments are designed to test those hypotheses while exploring the data and tools commonly used by research scientists in the field. As with any other science, practical experience with the tools and personal experience examining the data are essential to providing the student with a true understanding of the theory. In addition, exposure to the common 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 first 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: Fall 2007

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 401 Syllabus

Week	subject	Databases, tools introduced
1	Topic I: Protein sequence and structure databases	PDB, PIR and SwissProt data models, data types and record formats will be introduced – how to download, view and interpret the available data.
2	Protein folding tools comparing de novo and other methods	Folding@ home project, the PFD database, the Structure Predictor Meta Server
3	Comparative structure frameworks for two-and three-dimensional protein structure comparison	Delauney tessellation as an exemplar method
4	Topic II: Nucleic acid sequence and structure databases The NCBI and EMBL sequence databaes	The NCBI and EMBL sequence databases, their data models and record formats will be introduced, how to query for and download a target sequecne
5	Structural RNAs, energetics and phylogeny applied to conserved sequences and structures	RiboDB, the representation of structure in SMILE strings; mfold and tools for converting strings to 2-D structures
6	Sequence comparison methods will be discussed as well as some common evolutionary models used in sequence comparisons.	BLAST comparisons; motif finding tools such as PFAM: pattern-finding algorithms – limitations and assumptions, demonstrated with hands-on examples.
7	midterm	
8	Topic III: Gene structure prediction in prokaryotes and eukaryotes	Complex and fuzzy pattern-matching algorithms: work with hands-on examples
9	Prokaryotic genomes and operons.	Self-organizing maps and RescueNet; REGANOR
10	Eukaryotic genomes, introns, untranslated regions and different isoforms.	Hidden Markov Models and MHHgene; GenScan, EuGen'hom
11	Topic IV: Images of Biological Systems Images as Data vs images as summaries - For specific types of biomedical images the limits of resolution, precision and accuracy will be discussed.	Exercises will include the opening of a number of types of images, understanding headers and source directions.
12	Diagnostic images are annotated from different points of view: the image modality (radiograph, MRI, etc) and its acquisition parameters (including time), the sample source and anatomical body part depicted by the image, related non-image data	Semantic Web standards; Flickr and the Dublin Core
13	Methods of image feature analysis	Fourier transforms and spectral decomposition as examples of techniques, presented as case studies
14	Final	

1. There are no comprehensive laboratory texts in this field, this will rely on expert notes from the instructors.