

## COURSE SYLLABUS

### CMPT 830: BIOINFORMATICS AND COMPUTATIONAL BIOLOGY

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#### Catalogue Description

Provides an in-depth algorithms-based introduction to major concepts and techniques in bioinformatics. Topics include algorithms for structure prediction and similarity, sequence similarity and alignment, metabolic and regulatory pathways, sequence assembly, comparative genomics, expression analysis, database searching, artificial life and biological computation.

**Prerequisite(s):** Either a previous bioinformatics course, or at least 6 credit units of previous course work in each of Computer Science, Statistics, and the life sciences. Should you not have these, please ask the instructor.

**Class Time and Location:** Tuesday, Thursday, 10:00-11:20, Thorvaldson Building S386 (Spinks Extension)

#### Instructor Information

**Instructor** Ian McQuillan

**Contact:** Email: mcquillan@cs.usask.ca,

Phone: 966-2900

Location: Thorv S423 (in the Spinks Addition),

#### Course Objectives

The course objectives include gaining comfort with interdisciplinary study, computer science and mathematics applied to the life sciences, learning to use online tools and databases, learning small programming tasks as applied to bioinformatics, and understanding bioinformatics algorithms.

The following topics indicate the tentative areas to be covered:

- Introduction to bioinformatics,
- Algorithms,
- Perl,
- Sequence alignment,
- Phylogenetic trees,
- Protein structure,
- RNA secondary structure,
- Microarrays,
- Mass spectrometry,
- Hidden Markov models,
- L systems,
- Information theory in natural computing.

## Student Evaluation

### Grading Scheme

There will be 2 or 3 assignments, to be completed on an individual basis.

There will be a final (take-home) exam whose date has yet to be scheduled.

There will be a project to be done individually. The topic must be relevant to bioinformatics, chosen by the student and approved by the instructor. The project will consist of both an oral presentation and a written paper.

Assignments	25%
Class Project	40%
Final Exam	35%
Total	100%

### Textbook Information

There will be no required textbook for the class. Certain books which are good suggested reading would be:

- *Understanding Bioinformatics* by Zvelebil and Baum, 2007, published by Garland Science.
- *An Introduction to Bioinformatics Algorithms* by Jones and Pevzner, 2004, published by MIT Press.
- *Introduction to Computational Molecular Biology* by Setubal and Meidanis, PWS Publishing, 1997. Call No. QH506 .S4893 1997.
- *Algorithms on Strings, Trees, and Sequences: Computer Science and Computational Biology* by Gusfield, Cambridge University Press, 1997. Call No. QA76.9 .A43G87.
- *Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins* by Baxevanis and Ouellette, Wiley-Interscience, 2005. Call No. QP620.B575 2005.
- *Fundamental Concepts of Bioinformatics* by D. E. Krane and M. L. Rayner, 2003, Benjamin Cummings. This book is also on Reserve, with Call No. QH324.2 .K72 2003.

## Policies

### Missed Examinations

1. "Students who have missed an exam or assignment must contact their instructor as soon as possible. Arrangements to make up the exam may be arranged with the instructor. Missed exams throughout the year are left up to the discretion of the instructor if a student may make up the exam or write at a different time. If a student knows prior to the exam that she/he will not be able to attend, they should let the instructor know before the exam."
2. "Final exams - a student who is absent from a final examination through no fault of his or her own, for medical or other valid reasons, may apply to the College of Arts and Science Dean's office. The application must be made within three days of the missed examination along with supporting documentary evidence. Deferred exams are written during the February mid-term break for Term 1 courses and in early June for Term 2 and full year courses."

## Incomplete Course Work and Final Grades

When a student has not completed the required course work, which includes any assignment or examination including the final examination, by the time of submission of the final grades, they may be granted an extension to permit completion of an assignment, or granted a deferred examination in the case of absence from a final examination. Extensions for the completion of assignments must be approved by the Department Head, or Dean in non-departmentalized Colleges, and may exceed thirty days only in unusual circumstances. The student must apply to the instructor for such an extension and furnish satisfactory reasons for the deficiency. Deferred final examinations are granted as per College policy.

**In the interim, the instructor will submit a computed percentile grade for the course which factors in the incomplete course work as a zero, along with a grade comment of INF (Incomplete Failure) if a failing grade. In the case where the instructor has indicated in the course outline that failure to complete the required course work will result in failure in the course, and the student has a computed passing percentile grade, a final grade of 49% will be submitted along with a grade comment of INF (Incomplete Failure).**

If an extension is granted and the required assignment is submitted within the allotted time, or if a deferred examination is granted and written in the case of absence from the final examination, the instructor will submit a revised computed final percentage grade. The grade change will replace the previous grade and any grade comment of INF (Incomplete Failure) will be removed. For provisions governing examinations and grading, students are referred to the University Council Regulations on Examinations subsection of the Calendar.

(2011 University of Saskatchewan Calendar/Academic Courses Policy)

## Academic Honesty

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals subsection of the University Secretary Website and avoid any behaviour that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct, <http://www.usask.ca/secretariat/student-conduct-appeals/StudentAcademicMisconduct.pdf>, as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals, <http://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf>.

Academic honesty is also defined and described in the Department of Computer Science Statement on Academic Honesty:

<http://www.cs.usask.ca/undergrad/honesty.php>.

For more information on what academic integrity means for students see the Student Conduct & Appeals subsection of the University Secretary Website at:

<http://www.usask.ca/secretariat/student-conduct-appeals/forms/IntegrityDefined.pdf>

## Examinations with Disability Services for Students (DSS)

Students who have disabilities (learning, medical, physical, or mental health) are strongly encouraged to register with Disability Services for Students (DSS) if they have not already done so. Students who suspect they may have disabilities should contact DSS for advice and referrals. In order to access DSS programs and supports, students must follow DSS policy and procedures. For more information, check

<http://www.students.usask.ca/disability/>,

or contact DSS at 966-7273 or [dss@usask.ca](mailto:dss@usask.ca).

Students registered with DSS may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through DSS by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by DSS.