Biochemistry 3BP3: Practical Bioinformatics in the Genomics Era

Contact Information

Instructor
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Teaching Assistants
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Course Website
Course information will be posted on Avenue to Learn. If this course is not visible on your Avenue page, please contact Dr. McArthur.

Course Information

Course Description
Introduction to bioinformatics theory, tools, and practice with an emphasis upon high-throughput DNA sequencing technologies. Areas of emphasis include gene sequence analysis, functional prediction, genome assembly and annotation, gene expression analysis, gene regulation analysis, genome databases, microbial genomics. Includes introduction to the command line, software development, and cloud computing.

Fall 2019
Mondays – Mixed Lectures, Lab, Tutorials 11:30 am – 12:20 pm
Wednesdays – Mixed Lectures, Lab, Tutorials 8:30 am – 12:20 pm (with break)
All lab, lectures, & tutorials in Kenneth Taylor Hall (KTH) room B121.

Course Objectives
By the end of this course the student should have practical skills with a number of bioinformatics techniques common in a modern research laboratory, familiarity with online databases and their use, and a knowledge of the use of genomics data for hypothesis testing.

Prerequisites
One of BIOCHEM 2B03 (or ISCI 2A18 A/B), BIOCHEM 3G03, BIOLOGY 2C03, MOLBIOL 2C03
Textbook
This course does not use a textbook, but instead will involve assigned readings from the primary scientific literature.

Calculator
Only the McMaster standard calculator (Casio fx-991MS) will be allowed during all tests and exams. It is available at the Campus Store.

Grade Breakdown and Due Dates
New topics will be introduced by lecture on Mondays. This will be followed by labs and additional lectures during the following Wednesday session. Most weeks there will be an in-class assignment worth 5% (a total of 7 such assignments). An additional essay assignment will be larger, worth 15%, and will be completed outside of class. Throughout the term, each student will give a single 10 minute “Flash Update” presentation on an assigned topic worth 10%. There will be a final multiple choice exam worth 40%, covering the entirety of the course.

<table>
<thead>
<tr>
<th>Item Graded</th>
<th>% of Final Grade</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Assignments (7)</td>
<td>35%</td>
<td>weekly</td>
</tr>
<tr>
<td>10 minute Presentation</td>
<td>10%</td>
<td>varies</td>
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<tr>
<td>Essay Assignment</td>
<td>15%</td>
<td>December 4, 2019</td>
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<tr>
<td>Final Exam</td>
<td>40%</td>
<td>TBD</td>
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Work Submission
All assignments are to be submitted to the drop box on Avenue to Learn by 11:59 pm on the date the assignment is due or Wednesdays at 12:20 pm if an in-class assignment. Please submit your assignment as a WORD file unless otherwise specified. No additional time will be provided for technical difficulties.

Final Exam
This course will have a final multiple choice exam, covering the entirety of the course, scheduled by the registrar’s office during the December exam period. Please refer to the registrar’s website for the exam schedule, when released.

Late Work
Late penalties will be assessed at 10 % per day, including weekends. After 4 days, the assignment will not be accepted and a grade of 0 will be assigned.
**Missed Work**
If you are absent from the university for a minor medical reason, lasting fewer than 3 days, you may report your absence, one per term, without documentation, using the McMaster Student Absence Form (www.mcmaster.ca/msaf/). Absences for a long duration or for other reasons must be reported to the Associate Dean of Science office, with documentation, and relief may not necessarily be granted. After filling out the MSAF you must immediately contact your course instructor (normally within 2 working days) by email to learn what relief may be granted for the work you have missed and relevant details for submission or location of make-up test. Please note that the MSAF may not be used for term work worth 25% or more, nor can it be used for the final exam.

**Remarking Work**
If you would like to have any work regraded, please adhere to the Department of Biochemistry and Biomedical Sciences Regrading Policy available at the following website under regarding requests: http://fhs.mcmaster.ca/biochem/undergraduate/forms_and_procedures.html

**Course Schedule**

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topics</th>
<th>Activities &amp; Assignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Bioinformatics</td>
<td>tour sequencing core</td>
</tr>
<tr>
<td>2</td>
<td>Genome Databases</td>
<td>tour SHARCNET, 3 student presentations</td>
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<tr>
<td>3</td>
<td>Sequence Similarity Searching</td>
<td>lab, 3 student presentations</td>
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<tr>
<td>4</td>
<td>Evolutionary Biology</td>
<td>lab, 3 student presentations</td>
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<tr>
<td>5</td>
<td>Beyond Networks, Ontologies</td>
<td>lab, 3 student presentations</td>
</tr>
<tr>
<td>6</td>
<td>Linux &amp; DNA Sequencing</td>
<td>demo, 3 student presentations</td>
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<tr>
<td>7</td>
<td>- Mid-Term Recess -</td>
<td>n/a</td>
</tr>
<tr>
<td>8</td>
<td>Genome Assembly</td>
<td>lab, 3 student presentations</td>
</tr>
<tr>
<td>9</td>
<td>Molecular Epidemiology</td>
<td>lab, 3 student presentations</td>
</tr>
<tr>
<td>10</td>
<td>Gene Expression Analysis</td>
<td>demo, 3 student presentations</td>
</tr>
<tr>
<td>11</td>
<td>RNA-Seq, ChIP-Seq, etc.</td>
<td>lab, 3 student presentations</td>
</tr>
<tr>
<td>12</td>
<td>Microbiome, Analytics</td>
<td>guest speakers, 3 student presentations</td>
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<tr>
<td>13</td>
<td>Big Data</td>
<td>3 student presentations</td>
</tr>
<tr>
<td>14</td>
<td>DNA Sequencing Advances</td>
<td>3 student presentations</td>
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**Assignment & Presentation Marking Schemes**
In-class assignments will involve short or multiple-choice questions based on an assigned bioinformatics analyses. These questions can be answered via A2L or by text and figures within a supplied WORD file that is to be submitted to the drop box on Avenue to Learn by 11:59 pm on the date the assignment is due or Wednesdays at 12:20 pm if an in-class assignment. The Essay Assignment is to be submitted to the drop box on Avenue to Learn by 11:59 pm on December 4, 2019. Throughout the term, each student will give a single 10 minute presentation on an assigned topic. The marking rubric is available on Avenue to Learn.
Academic Integrity
You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at:

http://www.mcmaster.ca/academicintegrity

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit had been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

Course Online Content
In this course we will be using Avenue to Learn as our online resource. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster email accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have questions or concerns about such disclosure, please discuss this with the course instructor.

Student Accessibility
Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities.

Changes to the Course Outline
The instructor and University reserve the right to modify elements of the course during the term. The University may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and opportunity to comment on changes. It is the responsibility of students to check their McMaster email accounts and course websites weekly during the term and to note any changes.