PATHOLOGY 9577B / BIOLOGY 9919B

APPLIED BIOINFORMATICS
Department of Pathology and Laboratory Medicine / Department of Biology
Schulich School of Medicine & Dentistry
University of Western Ontario

COURSE COORDINATOR(S):
Drs. Vera Tai, Art Poon
vtai4@uwo.ca; apoon@uwo.ca

GRADUATE PROGRAM COORDINATOR:
Tracey Koning
tkening@uwo.ca

COURSE EXPECTATIONS:
Western students are expected to follow the Student Code of Conduct. This Code sets out the standards of conduct expected of students and holds individuals responsible for the consequences of their actions. Failure to fulfill these responsibilities may result in the withdrawal of privileges or the imposition of sanctions.

☒ All course materials created by the coordinator(s)/instructor(s) are copyrighted and cannot be distributed or sold.
☒ Recordings are not permitted (audio or video) without explicit permission.
☒ Permitted recordings are not to be distributed.

INTEGRITY PLEDGE:
Academic honesty and integrity are an important part of being a scholar in the Department of Pathology and Laboratory Medicine at Western University. By enrolling in this course, students are obliged to:

☒ fully observe the rules governing exams, tests/quizzes, and assignments regarding resource material, electronic aids, copying, collaborating with others, or engaging in any other behaviour that subverts the purpose of the exam/test/quiz or assignment and the directions of the course instructor.
☒ submit work done specifically for the assignment, and not to borrow work either from other students, or from assignments for other courses.
☒ give full and proper credit to sources and references, and to acknowledge the contributions and ideas of others relevant to academic work.
☒ to complete ‘individual assignments’ individually, and neither to accept nor give unauthorized help to others.
☒ to report any observed breaches of academic honesty.
**COURSE DESCRIPTION:**

This course will train students to process biological data sets by developing basic ‘command-line’ and script-based computing skills. Topics covered may include the UNIX file system, basic UNIX commands, running programs and building pipelines, abstraction and control flow in Python, regular expressions, and data exploration and visualization in R.

The objectives of this course are to provide students with diverse backgrounds in biology or the biomedical sciences and no prior experience with programming with a basic foundation in “applied bioinformatics”, e.g., processing data sets with open-source programs through a command line interface.

**LEARNING/COURSE OBJECTIVES:**

Upon completion of this course, students will:

1. understand the role of bioinformatics in modern biological and biomedical research
2. manage files with a user account in a remote UNIX-like computing environment
3. run programs on the command line with arguments, and control data streams
4. analyze genomic sequence data using various bioinformatic tools
5. understand how to reduce a complex problem down to the simplest steps
6. parse text files in Python and extract and manipulate variables
7. interpret Python error messages and debug scripts
8. write concise and informative comments and documentation within and outside a script
9. import and manipulate data frames in R
10. explore data by drawing and customizing plots using the base R graphics package
11. generate visualizations of three or more variables using projections and dimensionality reduction methods in R

**COURSE MATERIAL/RESOURCES:**

There is no textbook for this course. For course readings, we refer students to a small number of online resources that can be accessed at no cost, including materials that are developed and maintained by the course instructors:

Course readings on data exploration and visualization with R by Art Poon, [http://filogeneti.ca/ApplBioinf/](http://filogeneti.ca/ApplBioinf/)

Fundamentals of Data Visualization by Claus O. Wilke, [https://serialmentor.com/dataviz/](https://serialmentor.com/dataviz/)

**TECHNICAL REQUIREMENTS:**

- Stable internet connection
- Laptop or computer
MODE AND COURSE DELIVERY:

Live (synchronous)

This course will be completely online. Virtual sessions will be synchronous (live) - recordings will be made available in case of network issues. Students may be expected to complete work, prior to attending sessions.

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<thead>
<tr>
<th>Mode</th>
<th>Dates</th>
<th>Time</th>
<th>Attendance</th>
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<tbody>
<tr>
<td>Virtual synchronous¹</td>
<td>T</td>
<td>1:30 pm – 3:30 pm</td>
<td>Yes²,³</td>
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<td>Th</td>
<td>1:30pm – 3:30pm</td>
<td>Yes²,³</td>
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¹A schedule will be posted for weekly remote sessions; ²Attendance and participation is required; ³Course material may be recorded and posted on OWL, students may be evaluated on the content.

Remote sessions may be scheduled through Zoom Cloud Meetings, Microsoft Teams, Cisco Webex, or other online/cloud meeting platform.

All course material will be posted to OWL: http://owl.uwo.ca. Any changes will be indicated on the OWL site and discussed with the class.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. Western Technology Services can also be contacted by phone at 519-661-3800 or ext. 83800.

Google Chrome or Mozilla Firefox are the preferred browsers to optimally use OWL. Students interested in evaluating their internet speed, please click here.

EVALUATION:

<table>
<thead>
<tr>
<th>Component</th>
<th>% of final grade</th>
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<tbody>
<tr>
<td>Paper review</td>
<td>10</td>
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<tr>
<td>Assignments</td>
<td>40</td>
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<tr>
<td>Oral presentations</td>
<td>15</td>
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<tr>
<td>Oral exam</td>
<td>20</td>
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<td>Final project</td>
<td>15</td>
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MISSED WORK AND LATE ASSIGNMENTS:

☒ If a student misses an assignment, a presentation or other course deadline, they will be subject to the penalties outlined in this course syllabus, unless they have made prior arrangements with the course coordinator and instructor.

☒ The total possible grade of an assignment or a presentation will be reduced by 10% for each full or partial day (including weekend days) the assignment is handed in (or presentation is completed) beyond the due time or beyond a negotiated extension date.

☒ Missed quizzes or exams will be assigned a mark of 0%, unless accommodation has been requested and alternate arrangement have been made prior to the deadline.

ADDITIONAL INFORMATION & STATEMENTS

Statement on Use of Electronic Devices:
Tablets and computers are permitted in the class/learning sections. Students are also permitted to use their own computers when delivering a presentation in class.

For all tests, quizzes, and exams taken in-person, it is the policy of the Schulich School of Medicine & Dentistry that any electronic devices, i.e., cell phones, tablets, cameras, or iPod are strictly prohibited.

Students support:
Students who are in emotional/mental distress should refer to Mental Health@Western for a complete list of options about how to obtain help.

Academic offenses:
Scholastic offences are taken seriously, and students are directed to read the appropriate policy; specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_grad.pdf

All required papers and reports may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers and reports submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers/reports subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

All source code submitted by students for assignments, quizzes, exams or projects are subject to manual review by the course instructors for evidence of plagiarism. Source code found to be duplicated from external sources must be properly attributed (such as a URL and comment);
otherwise it will be considered to be plagiarism. Students will not be penalized for attributed code from other sources, but that code will also not be counted towards the student’s evaluation.

**Academic accommodation:**
Students seeking accommodation must make timely, formal requests and provide relevant medical or psychological documentation sufficient to allow the University to determine whether they qualify for academic accommodation and what kind of accommodation might be required. Students should consult SAS website for the required documentation and kinds of accommodation ([http://www.sdc.uwo.ca/ssd/academic_accommodation/index.html](http://www.sdc.uwo.ca/ssd/academic_accommodation/index.html)).

**Absence for non-medical reasons:**
Absences (presentations and assignments) may be permitted for compassionate reasons. However, documentation is required and must be submitted by the student directly to the course coordinator. The coordinator will determine if accommodation is warranted.

**Accessibility Statement:**
Please contact the course coordinator if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact [Student Accessibility Services (SAS)](http://www.sdc.uwo.ca/ssd/academic_accommodation/index.html), provided by the Student Development Centre (SDC) at Western for specific questions.

**Copyright and Audio/Video Recording Statement:**
Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws. You must always ask permission to record another individual and you should never share or distribute recordings.

**Correspondence Statement:**
The centrally administered e-mail account provided to students will be considered the individual’s official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner. You can read about the privacy and security of the uwo email accounts [here](http://www.sdc.uwo.ca/ssd/academic_accommodation/index.html).