COURSE INSTRUCTORS:

Christina Zheng, Ph.D., Assistant Professor, Division of Bioinformatics and Computational Biology, Department of Medical Informatics and Clinical Epidemiology
E-mail: zheng@ohsu.edu
Office hours: By appointment

TIME AND LOCATION:
Monday and Wednesday, 12-1:30, RJH 4320

TEXTBOOKS:
Required
Compeau, P and Pevzner P. Bioinformatics Algorithms An Active Learning Approach 2nd Edition
Note: We will augment this text with papers from primary literature for topics not covered in the text.

Additional Reading (Not required)
Di Pierro, Massimo. Annotated Algorithms in Python: with Applications in Physics, Biology, and Finance 2013


For non-computer scientists: Jones NC and P Pevzner. An Introduction to Bioinformatics Algorithms (Computational Molecular Biology) 2004

PREREQUISITES: Initial coursework in algorithms or consent of instructors.

COURSE DESCRIPTION: The course will be a problem-driven examination of the algorithmic and quantitative issues in computational biology. The course assumes basic background in algorithms. The emphasis is on algorithm development and application to biological problems, particularly those from multi-
omics studies. This will enable the student to evaluate algorithms, as well as assess computational considerations for development and implementation. Topics include: global and local alignment, Scoring functions, suffix trees, Next Generation Sequencing Algorithms, Genome Alignment, Database search, Phylogeny, Multiple sequence alignment, motif finding, secondary structure, proteomics and genome rearrangements. In addition, we will discuss problem solving on large clusters and distributed systems.

METHODS OF EVALUATION: Students will be evaluated on homework assignments (25%), a mid-term exam (25%) and a final programming project (50%).

ACADEMIC INTEGRITY: The students will be responsible for following the OHSU guidelines for academic integrity. You may discuss the general concepts and principles behind an assignment with other students. In fact, you are encouraged to do this whenever possible, because it is often a valuable way to reinforce ideas, and to learn new perspectives. However, in doing assignments, each student is expected to develop, write up, and hand in an individual solution and, in doing so, develop a sufficient understanding of the problem and solution so as to be able to explain it adequately to the instructor. Under no circumstances should a student copy or consult the solution of another student, or copy a solution from any other source, including the Internet.

See http://www.ohsu.edu/xd/education/library/research-assistance/plagiarism.cfm?WT_rank=1# for information on code of conduct for OHSU and http://www.ohsu.edu/xd/education/teaching-and-learning-center/for-students/index.cfm for more information on citing sources and recognizing plagiarism.

STUDENT ACCESS: OHSU is committed to providing equal access to qualified students who experience a disability in compliance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, and the ADA Amendments Act (ADA-AA) of 2008. If you have a disability or think you may have a disability (physical, sensory, chronic health, psychological, learning, or other) please contact the Office for Student Access at (503) 494-0082 or studentaccess@ohsu.edu to discuss eligibility for academic accommodations. Information is also available at www.ohsu.edu/student-access. Because accommodations may take time to implement and cannot be applied retroactively, it is important to have this discussion as soon as possible. All information regarding a student’s disability is kept in accordance with relevant state and federal laws.

GRADING POLICY: Graduate Studies in the OHSU School of Medicine is committed to providing grades to students in a timely manner. Course instructors will provide students with information in writing at the beginning of each course.
that describes the grading policies and procedures including but not limited to evaluation criteria, expected time needed to grade individual student examinations and type of feedback they will provide.

Class grades are due to the Registrar by the Friday following the week of finals. However, on those occasions when a grade has not been submitted by the deadline, the following procedure shall be followed:

1) The Department\textsuperscript{1} /Program Coordinator\textsuperscript{2} will immediately contact the Instructor requesting the missing grade, with a copy to the Program Director and Registrar.

2) If the grade is still overdue by the end of next week, the Department\textsuperscript{1} /Program Coordinator\textsuperscript{2} will email the Department Chair directly, with a copy to the Instructor and Program Director requesting resolution of the missing grade.

3) If, after an additional week the grade is still outstanding, the student or Department\textsuperscript{1} /Program Coordinator\textsuperscript{2} may petition the Office of Graduate students for final resolution.

\textsuperscript{1} For courses that are run by a specific department.
\textsuperscript{2} For the conjoined courses (course number is preceded by CON_ that are run by Graduate Studies.

COPYRIGHT INFORMATION

Every reasonable effort has been made to protect the copyright requirements of materials used in this course. Class participants are warned not to copy, audio, or videotape in violation of copyright laws. Journal articles will be kept on reserve at the library or online for student access. Copyright law does allow for making one personal copy of each article from the original article. This limit also applies to electronic sources.

To comply with the fair use doctrine of the US copyright law, Sakai course sites close three weeks after grades are posted with the Registrar. Please be sure to download all course material you wish to keep before this time as you will have no further access to your courses.

INCLEMENT WEATHER POLICY

When the weather forecaster is calling for ice or snow, call the OHSU Alert Line, 503 494-9021, for information regarding weather conditions that may affect operations at OHSU. This hot line will offer specific recorded messages for road conditions on OHSU’s Marquam Hill and West campuses (option 1), and for patients (option 2), students (option 3) and employees (option 4).

If extreme weather conditions present potentially unsafe situations, the provost of the university may choose to delay or cancel classes, or alter office and research activities. If classes are canceled or delayed, residents and students who have patient care responsibilities must meet those obligations.
For more information, please view the website [http://www.ohsu.edu/xd/about/visiting/weather/index.cfm](http://www.ohsu.edu/xd/about/visiting/weather/index.cfm) or call the above hotline.

### 2015 Topic Schedule (Subject to change)

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture topic M/W</th>
<th>Extra Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Lecture, Logistics, Algorithms background, Complexity Analysis, Data Structures, Pseudo code examples</td>
<td>Python Tutorial</td>
</tr>
<tr>
<td>2</td>
<td>Genome orientation, Dynamic Programming + Edit Distance</td>
<td>Unix / Shell Tutorial</td>
</tr>
<tr>
<td>3</td>
<td>Global + Local Alignment, Multiple Sequence Alignment</td>
<td>Installing Software</td>
</tr>
<tr>
<td>4</td>
<td>Indexes: Suffix Trees and Arrays; Indexes: BWT</td>
<td>HPC: HTCondor</td>
</tr>
<tr>
<td>5</td>
<td>Graphs/DAG; NGS Technology</td>
<td>Midterm Review</td>
</tr>
<tr>
<td>6</td>
<td>NGS read alignment; DNA-seq:Variant Calling</td>
<td>Basics of Parallel Computing</td>
</tr>
<tr>
<td>7</td>
<td>RNA-seq; De-Nov RNA-seq</td>
<td>HPC: Hadoop + MapReduce</td>
</tr>
<tr>
<td>8</td>
<td>Chip-Seq; Motif Finding</td>
<td>Workflows</td>
</tr>
<tr>
<td>9</td>
<td>Proteomics; Gene Prediction</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Gene Rearrangement; Network Inference</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Projects Presentations</td>
<td></td>
</tr>
</tbody>
</table>