I. COURSE NUMBER AND TITLE: Introduction to Bioinformatics

Course/section Number(s):
BMME  8053   DE1 (CRN 23614)
OCMB  9911   DE1 (CRN 25061)
MEVS  5606   DE2 (CRN 25062)

Days: Course material will be provided weekly for students to work at their own pace
Building & Room: Online

II. INSTRUCTOR:
Joan Pontius, Ph.D.
Email:jpontius@nova.edu
Office Hours: by appointment

III. COURSE DESCRIPTION:

The primary goal of this course is to introduce the student to the field of bioinformatics and the skills needed to manipulate datasets from biological studies. Computer exercises will include working in the UNIX/LINUX environment, interpretation of DNA sequence analyses, and gaining a familiarity with online bioinformatics resources. There will be an emphasis on hands on practice through the guidance of the instructor.

IV. COURSE LEARNING OUTCOMES:

At the conclusion of this course the student will:

1. be able to use UNIX and Perl to efficiently extract data from tab delimited text files.
2. be able to locate appropriate online databases for accessing genomic data and metadata.
3. be able to recognize and describe file formats used for bioinformatics.
4. be able to propose the appropriate bioinformatics analysis for a project.
5. be able to assess the analytical strengths and weaknesses of published studies.

These are directly related to the Program Learning Outcomes for Marine Biology, Coastal Zone Management and Marine Environmental Science.

V. REQUIRED TEXTS AND MATERIALS:

1. The student will need a computer with privileges to install software. Use of an Apple is recommended. If the student has a PC, it will need to have Cygwin to allow access to a UNIX interface. Instructions for installing Cygwin will be provided in the course.
3. Weekly reading assignments and instructional videos will be provided during the course.

VI. COURSE SCHEDULE AND TOPIC OUTLINE:

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture Topic or Deadline</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>August 24 -30</td>
<td>Course Introduction and getting set up</td>
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<tr>
<td>2</td>
<td>August 31 – Sept 6</td>
<td>What are the challenges of Bioinformatics and Big Data?</td>
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<tr>
<td>3</td>
<td>September 7 – 13</td>
<td>Accessing files and directories using UNIX</td>
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<td>4</td>
<td>September 14 – 20</td>
<td>The National Center of Biotechnology Information (NCBI)</td>
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<td>5</td>
<td>September 21 – 27</td>
<td>Genome Browsers</td>
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<tr>
<td>6</td>
<td>September 28 – Oct 4</td>
<td>Sequence Alignment</td>
</tr>
<tr>
<td>6</td>
<td>September 30</td>
<td>Due date for status update of Student Project</td>
</tr>
<tr>
<td>7</td>
<td>October 5 - 11</td>
<td>Scheduled online face-to-face mid-term Exam</td>
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<tr>
<td>7</td>
<td>October 5 – 11</td>
<td>Project Management</td>
</tr>
<tr>
<td>8</td>
<td>October 12 – 18</td>
<td>Ontologies and Expression</td>
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<tr>
<td>9</td>
<td>October 19 – 25</td>
<td>Copy Number Variations and SNPs</td>
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<tr>
<td>10</td>
<td>October 26 – November 1</td>
<td>Protein structure, function and assays</td>
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<tr>
<td>11</td>
<td>November 2 – 8</td>
<td>Phylogenomics</td>
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<tr>
<td>12</td>
<td>November 9 – 13</td>
<td>Proctored Final exam</td>
</tr>
<tr>
<td>12</td>
<td>November 11</td>
<td>Student project due</td>
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</table>

Note: This is a tentative schedule that is subject to change. Students will be provided a minimum one week notice of any change.

VII. GRADING CRITERIA

Students will be assessed on a variety of criteria:

- Assignments 30%
- Discussion Board 30%
- Course Project 20%
- Exams 20%
- 100%

The grading scale is the following:
- 94% = A
- 90-93% = A-
- 87-89% = B+
- 83-86% = B
- 80-82% = B-
- 77-79% = C+
- 73-76% = C
- 70-72% = C-
- 60-69% = D
- <60% = F

The Assignments, Discussion Board, Course Project and Exams are summarized as follows:

**Assignments**
- Every week students will be assigned a computer exercise and will need to provide the instructor the assignment via their Blackboard account.
Before the last week of the course, each student will have to provide to the instructor three questions that they feel would be good final exam questions.

Grading for each assignment will be worth three points:
- The assignment was completed.
- The assignment was completed on time.
- The assignment demonstrated understanding of the subject matter and technical skill.

Discussion Boards:
- Each week, the instructor will provide a topic for students to discuss on the Blackboard discussion board.
- Each discussion will be worth five points based on the following:
  - The student posts a primary response to the discussion topic.
  - The student posts a secondary response by commenting on another student’s primary response.
  - The student responds to comments on their primary response.
  - The student expresses ideas professionally, articulately and appropriate to the discussion topic.
  - The student interacts with the discussion board in a timely manner, with the primary response posted before Wednesday and all responses before the Monday of the next week.

Course Project
- The first half of the course, the students will be assigned a dataset. The students will use the skills gained in the course to generate a summary of the contents of the dataset and will need to provide a concise written description of how the summary was generated. This summary will be due at the midterm.
- The second half of the course, the students will develop a proposal for strengthening their dataset. The format for this proposal will be described in a lecture describing project management. This proposal will be due before the end of the course.
- Each of the two course project assignments will be worth 3 points:
  - The project is completed on time.
  - The project demonstrates the student’s ability to describe highly technical subject matter as a clear, readable document.
  - The project demonstrates the student’s knowledge of the course’s subject matter and mastery of technical skills.

Exams
- The midterm exam will be a scheduled, online, one-on-one, verbal exam with the instructor, using Zoom or some other internet application.
- The final exam will be a proctored, written exam, and will include exam questions that students have provided as their course assignment.
- The two exams will be weighted equally.

VIII. COURSE REQUIREMENTS AND POLICIES:

Section 3.8.4 from the Oceanographic Center Catalog:
As a requirement for accreditation, regular attendance is necessary. Each professor has the responsibility to enforce class attendance. To fulfill this requirement, students must have logged in, accessed, and/or interacted with the majority of online course requirements (e.g. assignment submissions, asynchronous discussion) by the first week of the session or they may be withdrawn from the course by the instructor through the Program Office. For this reason, if students anticipate or encounter any reason why they may be unable to engage with their online coursework for an extended period during a term, they must communicate this to their instructor and the Program Office as soon as possible. Students do have the option of requesting an Incomplete; if this is granted by their instructor, they then have 3-months from the end of the term date to submit the required course work as decided with the instructor. An incomplete grade agreement form must be completed and filed with the distance education office. An instructor reserves the right to request original written documentation to substantiate any such absences. A falsified excuse is cause for disciplinary action. An Incomplete course graded I must be completed in one semester or the grade is changed to F. All students are referred to the section 3.5.4, of the Oceanographic Center catalog (http://nova.edu/ocean/forms/nsuoc-2014-2015-catalog.pdf) for details on course withdrawals and refunds.
INSTRUCTIONAL APPROACH

This course will resemble a workshop in that it will focus on practical computer exercises and discussion, rather than the emphasis on reading and testing found in more traditional courses. Each week will include a Discussion Board topic, lectures, computer exercises and vocabulary terms. The computer exercises will test the student's skill in manipulating data sets, the discussion board will be used to assess analytical skills and understanding of the topics, and the mid-term and final exams will test the student's vocabulary. The course project will entail each student selecting and working with a dataset throughout the course, and providing a summary of the dataset at the end of the course.

ATTENDANCE

The course will be presented asynchronously and as such, students have flexibility for when they access the material and do the exercises within each week. However, students are expected to complete the assignments before the week's end and course material will only be made available at the beginning of week. Each week will include a topic of discussion and the students will be graded on their discussion on the class's Discussion Board.
ACADEMIC HONESTY

In order to ensure the highest standards of academic honesty and ethical behavior, the NSU policies on cheating and plagiarism will be strictly enforced. See the NSU Student Handbook for more information at http://www.nova.edu/cwis/studentaffairs/forms/ustudenthandbook.pdf. I am empowered by the policy to penalize a student suspected of academic dishonesty, plagiarism, or otherwise misrepresenting work and I will do so and report that student to the Dean of the OC. Nova Southeastern University has contracted with turnitin.com to provide plagiarism detection services, and I will submit any suspicious documents to this service.

EXPECTATIONS

It is my hope that this course will easy to understand and engaging. For this to happen, the instructor will need constant feedback from the student to know what topics of the course need further clarification. As the lectures in this course are progressive, students are expected to complete the work for each week so that they will be prepared for the next. As a large portion of this course involves work on the student's computer, a risk is that a student will have problems installing required software or downloading a dataset. This can lead to a huge loss of time for the student and, as much of the course involves group interactions, will be detrimental to the class. Thus it is imperative when a student has computer problems, to notify the instructor and work together to find an efficient solution. For this reason, unreported computer problems will not be accepted as an excuse for not completing assignments.

The ability to discuss the course topics is crucial, which is why an emphasis is placed on the weekly grading of discussions on the Discussion Board. The writing on Discussion Boards and in written assignments is expected to demonstrate knowledge of the subject matter as well as excellent communication skills.

This is an introductory course and as such students will not leave the course as experts in the field, but more with an understanding of what skills are needed to succeed in Bioinformatics.

IX: UNIVERSITY-WIDE POLICY STATEMENTS

A. Academic Misconduct: Academic misconduct appears in a variety of forms (including plagiarism). It is a violation of NSU academic policy and may be punished in a variety of ways, from failing the assignment and/or the entire course to academic probation, suspension or expulsion. If you have questions about what constitutes academic misconduct before handing in an assignment, see your instructor or the NSU Student Handbook at http://www.nova.edu/cwis/studentaffairs/forms/ustudenthandbook.pdf.

B. ADA Policy: Nova Southeastern University provides accommodations for students with documented disabilities. If you have a disability for which you believe you require accommodation, please contact Academic Services (http://www.nova.edu/disabilityservices/, 954-262-7189).

C. Last Day to Withdraw: Due to the compressed nature of this course you will be able to obtain a full refund of your tuition up to Date Changes per TERM. There will be no refund after that date. None of the lab fee is refundable; however you will own the airline ticket that was purchased for you. It is your responsibility to formally withdraw by completing the appropriate forms to obtain a refund (http://www.nova.edu/ocean/coursepolicy.html). A request for tuition refund must be made in writing at the time of withdrawal. Refunds will be made solely at the option of the university and will be based on the legitimacy of the reason for withdrawal. Should you fail to appropriately withdraw from this course, and then earn a grade below your expectations, I will do what I can to see that the grade is reported on your transcript. I will NOT backdate paperwork so that you can avoid earning a grade lower than you like.

D. Email Policy: All email communications between students and faculty must be conducted via NSU email accounts (http://www.nova.edu/common-lib/policies/emailcomm.policy.html). This requirement will assist NSU in communicating more effectively and protecting your privacy. Emails sent to faculty from non-NSU accounts will be returned to the sender with instructions to resend the communication from your NSU account. To set up an NSU email account or to get help with an existing account, go to https://www.nova.edu/
sbin/account_request. Also, the computer help desk is available to assist you with questions regarding your NSU email account. It can be reached at 954-262-HELP (4357).

E. Student Course Evaluations: Student comment and feedback evaluating each college class is an important tool to evaluate program effectiveness. Participation in this process is a responsibility of each student.

F. Grading System
From the Oceanographic Center Catalog Section 3.9.1, the following system is used to grade academic performance:

<table>
<thead>
<tr>
<th>GRADE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
</tr>
<tr>
<td>B</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>C</td>
<td>Marginal Pass</td>
</tr>
<tr>
<td>D</td>
<td>Poor</td>
</tr>
<tr>
<td>F</td>
<td>Failure</td>
</tr>
<tr>
<td>W</td>
<td>Withdrawal: Given after the third class week or termination by the instructor for non-completion of the course by the student.</td>
</tr>
<tr>
<td>I</td>
<td>Incomplete: Given when most (80 percent), but not all, work has been completed.</td>
</tr>
<tr>
<td>Au</td>
<td>Audit</td>
</tr>
<tr>
<td>P</td>
<td>Pass</td>
</tr>
</tbody>
</table>

Professors may use + or – in grading. **However, the grading scale ranges from A to D-, no A+ or F+ are awarded.** A grade of incomplete (I) must be requested from the instructor, have the Associate Dean’s approval, and be accompanied by a **completed contract specifying outstanding course requirements and completion dates.** Completion of the course graded incomplete must occur within one semester (or 3 months) of the end of the course and the incomplete be changed to a different grade. If the course is not completed in 3 months, or the student has not withdrawn and received a W, the incomplete will automatically be converted to a grade of F. Under unusual circumstances students may request a time-extension to complete the course. Such requests must be submitted to, and approved by, the Associate Dean of Academic Programs prior to the end of the 3-month time limit. **There are no exceptions to this rule.** Securing the completed and signed incomplete contract forms is the responsibility of the student.