Title - Syllabus

Course Description

Bioinformatics is a young and fast evolving field that combines knowledge and skills in biology, mathematics, computer science, and other disciplines. Generally speaking, bioinformatics is the discipline that studies computational approaches to address biological questions. Many biological problems are being studied in bioinformatics, such as those in genomics, proteomics, biological imaging, and system biology. This course will use classical bioinformatics materials to study the process of computational development. Current advances in selected research directions will be exposed through research articles. Students will be using critical thinking skills to identify strengths and weaknesses of various approaches.

Goals

The purpose of the course is to help students to realize the complex nature of biological problems and to develop computational approaches. This course will not focus on how to use existing software tools for CS-majors. It will focus on understanding computational approaches behind the tools.

Class Materials

This course will implement the Learning Management System (LMS) Blackboard along with ODU's Personal Learning Environment (PLE). The PLE is mainly for content delivery and Blackboard will be used for posting announcements, submitting assignments, and discussion forums.

Instructor Information

- Jing He
- Phone: (757) 683-7716
- Email: jhe@cs.odu.edu
- Office: E&CS 3319

Instructional Materials

Each module has specific instructional materials that often involve online resources, research papers, video and lecture slides developed by the instructor. It is recommended to follow the topics and materials in each module. You may find many helpful resources from the internet and/or from the following reference books.

Reference books:
Course Objectives

At the end of this course, students will be able to:

1. Realize fundamental concepts, cellular processes, and experimental techniques
2. Realize the formulation of a biological problem into a computational problem in pairwise sequence alignment
3. Describe and implement the dynamic programming approach in global and local alignments
4. Recognize strength and weaknesses in computational approaches developed for pairwise sequence alignment, database search, multiple sequence alignment, and genome alignment
5. Solve the alignment for short sequences
6. Realize protein folding and the principle of approaches
7. Design and implement a computational approach for a selected biological problem in the final project

How the Course Works

This online course employs several methods of delivery and learning activities. The online version of this course is composed of modules divided into topics. There will be homework assignments and exams, with additional requirements for students who register as CS823. Additional learning help is available as “learning checks” and the discussion forum.

Master schedule

The master schedule is the schedule that contains due dates of all assignments, exams, the project, and presentations (for 823 students only). This schedule is an important resource to look up all activities. Certain reminders will be posted in Blackboard. Please visit Blackboard weekly.

Instruction videos

Videos of lectures are available for Module 2 to Module 6. They are accessible under the section titles of those modules

Resources

The Resource link of each module contains important materials such as PPT slides, research papers, and other materials that are used in assignments and lectures.

Contents
The following topics will be covered:

1. Introduction to molecular biology concepts and techniques  
   - basic concepts such as cell, nucleic acids, amino acids, protein, proteoms, transcription and translation process  
   - major experimental techniques such as recombinant DNA, structural determination, DNS sequencing, DNA microarrays, mass spectrometry
2. Sequence comparison and motifs  
   - Global sequence alignment  
   - Local sequence alignment  
   - FASTA and BLAST  
   - Multiple sequence alignment  
   - Genome scale sequence comparison
3. Protein structure  
   - Protein secondary structure prediction  
   - Protein tertiary structure prediction

Prerequisites and Coding Expectations

There are no specific prerequisite courses. However, CS-majors are expected to use one kind of programming language to implement approaches for biological problems. It is up to the student which programming language to choose. Students with a non-CS background should contact the instructor at the beginning of the semester regarding registration and the final project.

Grading Criteria

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<tr>
<th>Activities</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework assignments</td>
<td>30%</td>
</tr>
<tr>
<td>Exams (2, mid-term and final)</td>
<td>30%</td>
</tr>
<tr>
<td>Project (Individual)</td>
<td>40%</td>
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Homework and projects should be submitted through Blackboard. Late submission will result in 5% per day reduction of the total score.

Special grading requirements for CS 823

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<tr>
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<td>20%</td>
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<tr>
<td>Presentation</td>
<td>10%</td>
</tr>
<tr>
<td>Exams (2, mid-term and final)</td>
<td>30%</td>
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<td>-------------------------------</td>
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<td>Project (Individual)</td>
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Students who are in the PhD program or currently are doing research often register the course as CS823. For 823 students, an additional presentation is required and is graded. The presentation is often about a paper that is determined by both the student and the instructor. The student will provide an initial list of two papers (see deadline in Schedule). The instructor will follow up and to determine a paper with the student. Once papers are selected, Zoom sessions will be scheduled for the presentations (see deadline in Schedule). They are recorded and accessible for all students in this course. For students who register the course as CS823, it is recommended to start the process at the beginning of the semester.

For students who register the course as 823, it is encouraged to conduct projects that are related to their research. Although the default project provided is an option for 823 students, conducting a research-related project is often challenging and rewarding. 823 students are encouraged to communicate with the instructor in the first month of the semester to discuss about it (see deadline in Schedule). A project needs to be described and agreed on by both the student and the instructor before the start of the project. Each research project will be presented during the last week of the semester and all students are welcome to attend.

**Student Responsibilities**

**CS Majors/Non-CS Majors Requirements**

Although most students taking this course are CS majors, special arrangement can be accommodated to include non-CS majors.

There are no specific prerequisite courses. However, CS majors are expected to use one kind of programming language to implement approaches for biological problems. It is up to the student which programming language to choose.

**Time Management**

Students are expected to spend 10 hours per week on the course materials and assignments. Out of 10 hours, students are expected to spend approximately 3 hours per week to read the material and another 3 hours/week for the homework and discussions.

**Utilizing Online Components**

Refer to the START HERE section within the Blackboard menu.

**Communication**

Any course-related announcement will be posted in Blackboard. Some of the reminders will be through emails as well. Students are required to access Blackboard regularly and keep an eye on due dates and other announcement.
Course Policies

Online Classroom Conduct (Netiquette)

Students are expected to follow good Netiquette rules. Netiquette is the accepted behavior for online participation. The following is a list of general guidelines for this course:

- Check your grammar and spelling
- Keep your comments focused on the topic
- Strive to write succinctly and clearly
- Share your knowledge and include supportive evidence for your comments
- Do not use all capital letters as that is viewed as shouting
- Avoid flaming—disrespectful language is unacceptable

Select the link to find more information on Netiquette.

Blackboard

This course will be taught in conjunction with Blackboard. Registered students will receive announcements, assignments, instruction, feedback, and credit (points) through the Blackboard interface. Submit all assignments through Blackboard. This will be the principal medium for all course communication. Your grade on exams and assignment will be posted on the blackboard.

Assignments

An electronic copy must be submitted through the blackboard. A backup of all work is to be maintained on a separate place at all times. Late submission will result in 5% per day reduction of the total score.

Attendance

Since this is an on-line course, there is no mandatory attendance policy. However, students are expected to actively participate in the discussions, homework submissions, and journal writing. Regardless of class attendance you are responsible for all material covered. The nature of this course requires your participation. If a student misses a class, he or she is responsibility for the material missed. No make-ups will be given for tests unless an official excuse letter is received. Each of these components is graded and counted towards the final grade.

Tests and Make-ups

Tests will be based on the material in the text, class lectures & articles

The same information for homework will apply for tests and make-up work: If a situation has occurred that requires your time and attention which will prevent submitting your work on time, please notify your instructor 24 hours before the scheduled due date.

Course Disclaimer

Every attempt is made to provide a syllabus that is complete and that provides an accurate overview of the course. However, circumstances and events may make it necessary for the instructor to modify
the syllabus during the semester. This may depend, in part, on the progress, needs, and experiences of the students.

**University Policies**

**Honor Pledge**

"I pledge to support the honor system of Old Dominion University. I will refrain from any form of academic dishonesty or deception, such as cheating or plagiarism. I am aware that as a member of the academic community, it is my responsibility to turn in all suspected violators of the honor system. I will report to Honor Council hearings if summoned."

By attending Old Dominion University you have accepted the responsibility to abide by this code. This is an institutional policy approved by the Board of Visitors. For more information please visit the Honor Council.

**Educational Accessibility**

Old Dominion University is committed to ensuring equal access to all qualified students with disabilities in accordance with the Americans with Disabilities Act. The Office of Educational Accessibility (OEA) is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations.

- If you experience a disability which will impact your ability to access any aspect of my class, please present me with an accommodation letter from OEA so that we can work together to ensure that appropriate accommodations are available to you.
- If you feel that you will experience barriers to your ability to learn and/or testing in my class but do not have an accommodation letter, please consider scheduling an appointment with OEA to determine if academic accommodations are necessary.

The Office of Educational Accessibility is located at 1021 Student Success Center and their phone number is (757)683-4655. Additional information is available at the [OEA Website](#).

**University Email Policy**

The Old Dominion University e-mail system is the official electronic mail system for distributing course-related communications, policies, announcements and other information. A University e-mail user ID and password are necessary for authentication and access to numerous electronic resources (Blackboard, faculty websites, etc.).

**Withdrawal**

A syllabus constitutes an agreement between the student and the course instructor about course requirements. Participation in this course indicates your acceptance of its teaching focus, requirements, and policies. Please review the syllabus and the course requirements as soon as possible. If you believe that the nature of this course does not meet your interests, needs or expectations, if you are not prepared for the amount of work involved - or if you anticipate that the class meetings, assignment deadlines or abiding by the course policies will constitute an unacceptable hardship for you - you should drop the class by the drop/add deadline, which is located in the ODU Schedule of Classes. For more information, please visit the Office of the Registrar.