

BSC6459: Fundamentals of Bioinformatics, Fall 2021 (3 credits)

BSC6459 (Section **25H0, 25H1 and 121D**) is an introduction to the basic bioinformatics tools used in computational biology for life science research. The course will use web-based resources that analyze gene and protein sequences as pertinent data examples.

Student Learning Outcomes – After successful completion of this course, students should be able to:

- 1) Retrieve information on genes and proteins from biological and genomic databases.
 - 2) Predict genes from DNA sequences.
 - 3) Identify promoters and regulatory elements in DNA sequences
 - 4) Analyze protein sequences
 - 5) Compare protein and DNA sequences
 - 6) Visualize and analyze protein structures
 - 7) Construct and interpret simple phylogenies
-

Lectures/Computer Lab

Online semi-synchronous course: Each week there is a block of content available with specific due dates. Students may view and submit within that window, however, each module is structured to keep the group advancing together.

Instructor: Dr. Valérie de Crécy-Lagard (Grading all module quizzes and exams)
TAs: Ms. Colbie Reed (Grading all projects, Mini, Group and Final)
Mr Jonathan Rodriguez (Grading module assignments)

WebPage: <https://ufl.instructure.com/courses/433992>

Contact Information:

- **Email (the most efficient):** Use the Canvas e-mail for instructor and TAs in priority. (If you do not have access to e-learning platform and if it is an emergency, use vcrecy@ufl.edu). For resolving technical issues visit the helpdesk website (<https://helpdesk.ufl.edu>) or call 352-392-4357.
- **Zoom Office hours:**
 - Mondays, 5-6 PM EST (hosted by Dr. de Crécy)
 - Wednesdays, 6-7 PM EST (hosted by Colbie Reed)Upon conflicts caused by holidays or cancellations, rescheduling will be announced via the course site on CANVAS; if a student cannot attend the scheduled office hours, students may contact Dr. Valerie de Crecy for arrangements.

Required Textbooks: "Essential bioinformatics" 2006, Authors: Jin Xiong Publisher: Cambridge University Press, ISBN -13:978-0-521-60082-8

Additional book of reference: "Understanding Bioinformatics" 2008 by Marketa Zvelebil and Jeremy O. Baum Publisher: Garland Science, ISBN: 9780815340249

Evaluation of learning

• **Assignments**

- Each lecture will have linked short assignments (**20%**). *These are short exercises that apply the material covered in class and encourage you to read the pre-class material for the following week.*
- Group assignments and discussion (**15%**). *Weekly group assignments will be given. Examples include: 1) reading and discussing papers from the original literature on a subject related to bioinformatics or on a study that combines bioinformatics with experimental data; 2) Creating a tutorial; 3) Peer reviewing of an activity.*
- Mini-projects (**10%**). *These are assignments where students apply learning points from several modules.*
- Final Project (**10%**)

• **Quizzes and Exams**

- Quizzes (**20%**)
*Multiple choices or short answer quizzes will be given at the end of each module. The quizzes will be timed and can be taken within a specific window of time. **Academic integrity for module quizzes is maintained through the Honorlock Test Management System. Students must abide by the Honorlock proctoring rules and regulations. Cameras must be turned ON and the student's face must be visible throughout the entire duration of the exam. The students are expected to provide their own computer/laptop and secure a testing location that meets the Honorlock standards.***
- Comprehensive exams (**25%**)
Three cumulative comprehensive exams will be given in the format of application questions that require the correct use of the various bioinformatics tools covered in class as well as an understanding of the underlying biology.

- **Make-up policy.** For the **general assignments** and the **comprehensive exams**, late assignments will be penalized by deducting 25% of the grade for each day late with a maximum deduction capped at 25% of the grade. No late submissions will be accepted for **quizzes/assessments** but we will drop the lowest score for one conceptual and one practical assessment, so if you cannot avoid missing one deadline for an important reason, this failsafe is built in to the course syllabus.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

- **Grading:** Straight scale, follows the policies described here: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

94.0-100%	A
90.0-93.9%	A-
87.0-89.9%	B+
84.0-86.9%	B
80.0-83.9 %	B-
77.0-79.9%	C+
74.0-76.9%	C
70.0-73.9%	C-
67.0-69.9%	D+
64.0-66.9%	D
60.0-63.9%	D-
<60%	E

The grading scale may be adjusted slightly, based on class performance

Course organization.

Except for Module 1, the module material of a given week will be made available the Friday of the week before. The assignments will be due on the Monday night of the week after. Due dates might be different for Mini Projects and group assignments. You have two weekends for every module but do not wait for the last weekend to start or you will struggle in the class. Module 1 & 3 are a not on the same schedule as to help with starting the class and getting organized (two weeks are given for these modules).

Module **Textbook** (EB= Essential Bioinformatics)

Title

Module 1 (week 1-2)

EB1

EB2

Getting started

Bioinformatics Definition and Overview

Databases Definition and Overview

M1 Group Activity and Module Assessments

Module 2 (week 3)

EB3

Information retrieval from databases I

M2 Module Assessments

M2 group activity and **Mini project 1 due (week 4)**

Module 3 (week 5)

EB3-4

EB3-4

Pairwise alignment overview

Pairwise alignment, database search

M3 Module Assessments

M3 Group Activity and **Exam 1 (week 6)**

Module 4 (week 7)

EB5-7

Multiple Sequence Alignments

M4 Group Activity and Module Assessments

Module 5 (weeks 8-9)

Week 8

EB8&17

EB8

DNA Sequence Analysis: Genome browsers

DNA Sequence Analysis: Predicting genes in prokaryotes

Week 9

EB9

EB8-9

DNA sequence analysis: Identifying eukaryotic genes, examples from plants

DNA sequence analysis: Predicting promoters and regulatory sites

M5 Module Assessments, **M5 Group Activity** and **Exam 2 (week 10)**

Module 6 (week 11)

EB8-9

EB8-9

Practical DNA Sequence Analysis

Practical Protein Analysis

M6 Module Assessments and **Mini project 2 due**

Module 7 (week 12)

EB10-11

Phylogeny Basics

M7 Module Assessments

M7 group activity and **Final project part 1 (week 13)**

Module 8 (week 14)

EB12-13

Visualizing and Comparing Protein Structures

M8 Group Activity and Module Assessments

Mini project 3, Final Project part 2, and exam 3 due (week 14)

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center (<https://disability.ufl.edu/get-started/>). It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester, if not before the semester starts.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals in their Canvas course menu under GatorEvals or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. Go to <https://sccr.dso.ufl.edu/process/student-conduct-code/> to review the Code of Conduct. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Plagiarism: Definitions, Course Policies

Students should understand behaviors that constitute plagiarism: that is, the submission of materials by a student that are not, in truth, materials generated/created/completed solely by the student. All materials submitted for a grade in this course are expected to have been initiated and completed in entirety by the student for which it is submitted. This is to be assumed as a requirement unless otherwise noted by the instructor and/or assignment specifications. An example of plagiarism would be the submission of any type of assignment files of another student (with or without their knowledge), or submission of files containing images/text of a website or other publisher that is presented without proper attribution of the material's original authors/creators. Metadata of files suspected of plagiarism will be checked. If file metadata is found to have been erased prior to submission, this constitutes evidence of behaviors that may be considered dishonest or purposefully misleading. It is the student's responsibility to ensure that their computer settings properly apply metadata to generated and edited files; this may be checked by navigating to your computer's control panel and "User Accounts" menu. Caution is advised for students using computers that are not exclusively their own property or are provided through their employment, as these settings may not be edited to reflect the student's identity. In these cases, students are expected to communicate this to their instructors to prevent any confusion. Students suspected of plagiarism or other forms of academic dishonesty will be contacted by the course instructor or teaching assistant addressing the suspected submission materials. Severe perpetrations of academic dishonesty or multiple incidences of mild/moderate academic dishonesty will result in possible disciplinary action pending review by the course instructor. Pending a determination of significant academic dishonesty, this may lead to the initiation of formal review processes for disciplinary action at the university administration level.

Some students fail to understand that when half of your paper (or more) is directly lifted from a source paper you are discussing this is plagiarism. The same lack of understanding also seems common for situations where a submission is a direct copy of another student(s) paper (knowing that if both students copied the same text, it might look like they copied each other).

Just a reminder, here is the UF code of conduct (see linked PDF below).

UF Plagiarism Policy: <http://regulations.ufl.edu/chapter4/4041.pdf>

The excerpt below is taken directly from the UF Honor Code and Student Code of Conduct and provided here for your convenience:

(e) Plagiarism Definition: A student shall not represent as the student's own work all or any portion of the work of another. Plagiarism includes but is not limited to:

1. Quoting oral or written materials including but not limited to those found on the internet, whether published or unpublished, without proper attribution
1. Submitting a document or assignment which in whole or in part is identical or substantially identical to a document or assignment not authorized by the student
1. Unauthorized use of materials or resources
1. Prohibited collaboration or consultation
1. Submission of paper or academic work purchased or obtained for an outside source

(f) Submission of Academic Work Purchased or Obtained from an Outside Source. A Student must not submit as their own work any academic work in any form that the Student purchased or otherwise obtained from an outside

source, including but not limited to: academic materials in any form prepared by a commercial or individual vendor of academic materials; a collection of research papers, tests, or academic materials maintained by a Student Organization or other entity or person, or any other sources of academic work.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see the [Notification to Students of FERPA Rights](#).

Campus Resources:

Health and Wellness

U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website (<https://umatter.ufl.edu>) to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit the Counseling and Wellness Center website (<https://counseling.ufl.edu>) or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website (<https://shcc.ufl.edu>).

University Police Department: Visit UF Police Department website (<https://police.ufl.edu>) or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website (<https://ufhealth.org/emergency-room-trauma-center>).

GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell website (<https://gatorwell.ufsa.ufl.edu>) or call 352-273-4450.

Academic Resources

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu. (<https://helpdesk.ufl.edu>)

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services. (<https://career.ufl.edu>)

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources. (<https://uflib.ufl.edu/find/ask/>)

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring. (<https://teachingcenter.ufl.edu>)

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers. (<https://writing.ufl.edu/writing-studio/>)

On-Line Students Complaints: View the Distance Learning Student Complaint Process <https://distance.ufl.edu/getting-help/student-complaint-process/>.