

BSC6459: Fundamentals of Bioinformatics, Sections: 0001, MHD1, MMB1, REC1 (3 credits)

BSC6459 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. While much of the course focuses on prokaryotic organisms, many of the concepts, tools, and skills can be applied to eukaryotic systems as well.

Student Learning Outcomes – After successful completion of this course, students will 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.
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Course Format

This is a fully 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.

Instructors:

Dr. Lexi Ardissonne (Modules 1, 2, 5b)	lexi88@ufl.edu
Dr. Meixia Zhao (Modules 3, 4, 5a)	meixiazhao@ufl.edu
Dr. Xin Wang (Modules 6, 7, 8)	wangx3@ufl.edu

*This course was originally developed by [Dr. Valerie de Grey-Lagard](#). You will see her in several lecture and tutorial recordings. HOWEVER, **she is NOT one of the course instructors so please do not contact her for course related contents.**

Teaching Assistants: TBD

Course Page (Canvas): <https://ufl.instructure.com/courses/508801>

Contact Information:

- **Email (the most efficient):** Use the Canvas e-mail in priority. If you do not have access to the e-learning platform and/or if an emergency, you may contact the instructors via email listed above.

Office Hours: hosted on Zoom through the [“Zoom Conferences”](#) section of Canvas course page.

- Mondays, 10 am - 12 pm EST, hosted by the instructor leading the current module.
- Wednesdays, 6-7 pm EST, hosted by TAs.

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 any instructor for arrangements.

Technical Issues:

Visit UF's Helpdesk website (<https://helpdesk.ufl.edu>) or call 352-392-HELP (4357). This service is open 24 hours a day, 7 days a week. Do not let technical issues prevent you completing required course work!

Required Textbooks:

- “Essential Bioinformatics” 2006, Authors: Jin Xiong Publisher: Cambridge University Press, ISBN-13:978-0-521-60082-8

Most of the course Modules have assigned readings from this textbook (see Timeline table below). This book presents the fundamental concepts and methodologies used in bioinformatics, which have not drastically changed in the last 20 odd years.

Additional Resources:

- *Course Wiki page:* https://vdclab-wiki.herokuapp.com/en/courses/BSC6459_Introduction_to_Bioinformatics
This is intended to be a bioinformatics resource during and *after* your participation in the course. It mirrors the course structure, but also includes several additional resources beyond that presented in Canvas that may be helpful to students' broader interests in bioinformatics.

Evaluation of Learning

• **Assignments**

- **Warm-up and Participation Activities (20%).** *Each module has several short, low-stakes warm-ups and activities. These are intended to encourage students to read pre-class materials to better prepare for the module and give students a chance to apply the material covered in class before taking module assessments and comprehensive exams.*
- **Group assignments and discussions (15%).** *Students will be randomly assigned to groups of 7-12 and will be given **4 group assignments** over the semester. 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. Students are required to post their submission prior to seeing their peers' submissions and provide at least two substantive comments on their peers' posts.*

• **Projects**

- **Mini projects (10%).** *There are **two mini project assignments** where students apply learning points from several modules.*
- **Final Project (10%).** *Like the mini-projects, students will be required to apply all learning points gained over the entire course to respond to a culmination assignment. This typically takes the form of a brief essay that combines literature search, various bioinformatic applications, and scientific reasoning.*

• **Assessments and Exams**

- **Assessments (20%).** *Multiple choices or short answer quizzes will be given at the end of **each module**. Assessments will be **timed** and must be taken within the time frame of their corresponding module. There are two types of assessments:*
 - *Conceptual (5%), which tests basic understanding of core concepts presented in each module, and*
 - *Practical (15%), where students will be required to apply various bioinformatic tools presented in the module.****Academic integrity for module assessments 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. There are further instructions in the "Start Here" module of the course to make sure this is setup prior to the first assessments.***
- **Exams (25%).** ***Three cumulative** comprehensive exams will be given in the format of application questions that require the correct use of the various bioinformatic tools covered in class as well as an understanding of the underlying biology.*

Make-up policy

- For the **Assignments and Projects**, late submissions will be penalized 5% of the grade for each day late with a maximum deduction capped at 25% of the grade. No assignments will be accepted more than 7 days past its specified due date.
- No late submissions will be accepted for **Assessments and Exams**. The lowest score for one conceptual and one practical assessment will be dropped. This drop is built into the grading scheme to help students in the case where it is either unavoidable for them to complete an Assessment by the deadline (for whatever reason) or they perform poorly on a given assessment. No Exams will be dropped.
- If a student has an unforeseen life event that will cause significant delay of coursework submissions, please contact the instructors to determine if and how accommodations can be made.
- 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

The grading scale follows the policies described here: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.asp>

93.0-100%	A
90.0-92.9%	A-
87.0-89.9%	B+
83.0-86.9%	B
80.0-82.9 %	B-
77.0-79.9%	C+
73.0-76.9%	C
70.0-72.9%	C-
67.0-69.9%	D+
63.0-66.9%	D
60.0-62.9%	D-
<60%	E

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

Course Organization & Timeline

Typically, module material will be made available on a Friday morning and all required module submissions (i.e. warm-ups, participation activities, and assessments) will be due by 11:59p of the second Monday after (giving students 11 full days to complete a given module). Students have two weekends for every module. **Do not wait for the last weekend to start or you will struggle in the class.** A week and a half is given for Module 1 to help with starting the class and getting organized. *No extension will be given for a module's due date that falls on a holiday. Students are expected to plan accordingly.

Due dates for Exams, Mini and Final Projects, and Group Assignments will NOT coincide with module due dates (refer to table below). There are gap weeks built into the course to allow students to focus and spend time on these submissions.

Time schedule is subject to change to accommodate unpredictable events.

Module Dates Instructor	Title	Corresponding Textbook Chapters	Exams	Projects	Group Disc.
M1 8/22 to 9/2* Ardissone	Getting Started				
	Bioinformatics & Databases	Ch.1 & Ch.2 (p.10-18)			Group Activity 1 & 2 opens 8/29
M2 8/30 to 9/9 Ardissone	Information Retrieval from Databases	Ch.2 (p.18-26)		Mini project 1 opens 8/30	Initial post due 9/9
Gap week 9/9 to 9/13	Complete Mini Project 1			Mini project 1 due 9/20	Peer response due 9/15 (Sunday)
M3 9/13 to 9/23 Zhao	Pairwise Alignment & Database Searching	Ch. 3&4			Group Activity 3 opens 9/13 Initial post due 9/23 Peer response due 9/29 (Sunday)
M4 9/20 to 9/30 Zhao	Multiple Sequence Alignment	Ch. 5-7			Group Activity 4 opens 9/20 Initial post due 9/30 Peer response due 10/6 (Sunday)
M5a 9/27 to 10/7 Zhao	DNA Analysis Part 1	Ch. 17 & 8 (p.97-103)	Exam 1 opens 10/4		
Gap week 10/7 to 10/11	Complete Exam 1 (covers thru M5a)		Exam 1 due 10/14		
M5b 10/11 to 10/21 Ardissone	DNA Analysis Part 2	Ch. 8 (p.103-112) & Ch. 9			
M6 10/18 to 10/28 Wang	Practical DNA & Protein Analysis		Exam 2 open 10/25	Mini project 2 opens 10/18	
Gap week 10/28 to 11/1	Work on for Exam 2 (covers thru M6) & Mini Project 2			Mini project 2 due 11/8	
M7 11/1 to 11/11* Wang	Phylogeny Basics	Ch. 10 & 11	Exam 2 due 11/4		Group Activity 7 opens 11/1 Initial post due 11/11 Peer response due 11/17 (Sunday)
M8 11/8 to 11/18 Wang	Visualizing & Comparing Structures	Ch. 12-15	Exam 3 opens 11/14		
Wrapping up 11/13 to 12/9	Complete: Exam 3 (covers thru M8) Final Project & Discussion		Exam 3 due 11/24	Final project & discussion opens 11/13 Final project due 12/2 Final project discussion due 12/9	

Every module will have assignments, quizzes, assessments, and group activities, unless otherwise indicate in the module, and are due by 11:59p of the date in **bold**

Any late submissions MUST be submitted by 11:59p December 9th in order to allow enough time for grading. Any submissions received after this time will not be graded and counted as a 0 towards the final grade.

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: https://flexible.dce.ufl.edu/media/flexible.dce.ufl.edu/documents/uf_policy_student_conduct.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
2. 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
3. Unauthorized use of materials or resources
4. Prohibited collaboration or consultation
5. Submission of paper or academic work purchased or obtained from 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 at 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 do not discourage the use of any Artificial Intelligence Software (AI), but we want to remind students that AI does not have constructive answers to non-trivial science questions and are incapable of logical constructions. To preserve equity between AI users and non-AI users, only the logic of your answers will be judged, and not your phrasing, assuming your answer is intelligible to the person grading you.

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/>.