BI 104, Digital Biology

Location: Henry Hall Lab 2
Meeting times: Tu, 1:30 – 2:20PM
Instructor: Michael Dohm, PhD
Office: Henry Hall 6; Office Hours Mon 10:30 – 11:20 AM; By appointment
E-mail: mdohm@chaminade.edu

Required textbook: No required textbook; readings provided by the instructor and made available via the course's Moodle website (http://letgen.org/chaminade).

Course description: Biological and biomedical inquiry is increasingly dependent on computers. Survey of the role of text mining and biological databases, bioinformatics, modeling, and visualization of biological data in investigations of biological phenomena. Digital Biology (BI104) is a one semester, one credit hour, seminar course to introduce students to the impact of advances in computing and imaging technology on our understanding of biology. The central themes of Digital Biology are how biology can be represented as information systems and how biological information is captured, described, and communicated by digital (discrete) information. Traditional approaches to knowledge acquisition in biology, from microscopes to genome sequencing, now are entirely dependent on computing technology. BI104 recognizes that the health professions and all areas of research biology and biotechnology continue to be fundamentally transformed by the application of computing. Through didactic sessions and student-centered discussions of selected case studies, BI104 students will learn available techniques to search, view, interact, and interpret biological data derived from digital sources.

Course Learning Outcomes. At the conclusion of BI104, students will:

1. Describe the relationship between DNA and information systems in biology.
2. Describe the enabling technological factor in a number of seminal scientific discoveries.
3. Describe the organization and major information types found in, and demonstrate usage of, the major repositories of biological data that are available on the world wide web, including genomic, transcriptomic, metabolomic and proteomic data sets.
4. Explain the 'systems perspective' using the connections between metabolic pathways and global climate as an example.
5. Demonstrate an understanding of the computational component of structural biology, including the process of generation and interpretation of an atomic level protein model and the use of such models in rational drug design.
6. Demonstrate an understanding of the major sub-cellular and organismal imaging technologies, the computational processes that are used to generate, manipulate and interpret such images, and the resulting novel biological insights.

Course requirements: Grading will be based on student's points earned from a total of 200 points, attendance (20 points), 5 assigned homework assignments (16 points each), and two exams (50 points each). Homework includes in-class group discussions on real cases from biology research to take-home assignments in which students explore databases to extract new knowledge. Exams focus on lecture and assigned materials and include multiple choice, True/False, and short answer formats. There is no comprehensive final; instead, the second exam will be taken on the scheduled final exam date.

Grading summary

What	When	What's it worth
Attendance	Each week; 4 pts off for each unexcused absence after the 2nd absence	**20**
Five Homework 16 pts each	Every 1 - 2 weeks	**80**
Two Exams 50 pts each	Exam 1, end of 8th week Exam 2, given on assigned final exam date	**100**
	Total points =	**200**

Final grade: Your letter grade will be based on the following point distribution.

Points earned	Percent of total	Letter grade
180 – 200	90 – 100%	A
160 – 179	80 – 89%	B
140 – 159	70 – 79%	C
120 – 139	60 – 69%	D
≤ 119	≤ 60%	F

Reminders and notices:

1. We meet only once per week. Regular attendance is expected and essential for your progress in this class. There will be no textbook; instead, we will provide short readings for background. The readings are not intended to be exhaustive, thus the goal of lecture and discussion will be to provide the needed context to remove barriers to your understanding of the material.
2. Class begins each time exactly at 1:30PM – please be on time. Chronic tardiness will be viewed as absence from class.
3. Please refrain from eating in class and wear proper attire. Although BI104 is a lecture class, we meet in a laboratory. You are therefore required to follow all rules of Natural Science & Mathematics policy pertaining to the laboratory setting.
4. No make up exams will be granted in the event of an unexcused absence. If a student cannot attend a class in which an exam has been scheduled, the student must notify the instructor no later than the class prior to the scheduled exam. In the event of illness, a Doctor's note will be expected.
5. Your final grade will We will take attendance each meeting.
6. You are encouraged to work together; however, all graded material must be your own. You are also expected to have read and to abide by the "Student Rules of Conduct" which are available in your copy of Chaminade University's Student Handbook.
7. *Policy on Cell Phones and Music Devices.* The use of music devices and cell phones is prohibited during all Natural Science and Mathematics classes at Chaminade, unless specifically permitted by your instructor. The use of cell phones and music devices in any class is discourteous and may lead to suspicion of academic misconduct. Students who cannot comply with this rule will be asked to leave class and may be subject to laboratory safety violation fines. Please refer any questions to the Dean of Natural Sciences and Mathematics.
8. *ADAAA Accommodations.* Regarding accommodations for extra time or other requests about how quizzes or exams are administered; Please be aware that I can only accommodate your requests if you have a documented ADAAA agreement with Chaminade University on file at the Counseling Center. If you need to seek such accommodations, please contact Dr. June Yasuhara at 725-4845 or by e-mail at jyasuhar@chaminade.edu as soon as possible.

Course content with tentative schedule

Week	*Dates*	*Lecture Topic*
1	17 Jan	Biology as an information system
2	24 Jan	Biology as an information system, continued
3	31 Jan	Science as a way of knowing, knowledge guided by technology **Homework 1**: Student discovery exercise: key technologies that advanced the field
4	7 Feb	Databases and Genomics: putting everything in place **Homework 2:** Finding a gene
5	14 Feb	Genomics continued
6	21 Feb	Review
7	28 Feb	**Exam 1**
8	6 Mar	Protein modeling: from atoms to function **Homework 3:** designer drugs
9	13 Mar	Protein modeling continued
10	20 Mar	Imaging in molecular biology I: optics and dyes **Homework 4:** What we share makes us human, what we do not, makes us …?
11	27 Mar	Spring break – No class
12	3 Apr	Imaging in molecular biology II: Microscopy
13	10 Apr	Imaging in molecular biology III: Software analytics ⅄ some out of class time may be required
14	17 Apr	Imaging in molecular biology IV: labeling cells **Homework 5:** Making visual parts of a cell ⅄ some out of class time may be required
15	24 Apr	Presentations from Weeks 10 - 14
16	2 May	**Exam 2**