

## BIOL 4540 / 6540: Bioinformatics (Spring 2023, CRN: 26258 / 26259)

### 1. Course Information

- Course number and section: BIOL 4540 A / 6540 A
- Course name: Bioinformatics
- Hours of credit: 3
- Pre-requisites or co-requisites as listed in university catalogue: Prerequisite: BIOL 1107K, BIOL 1108K, and BIOL 3200 or permission of the instructor (for BIOL 4540) or Admission into the graduate program or permission of the instructor (for BIOL 6540).
- Classroom location and room number: BC 3018, 1:00 pm – 1:50 pm, MWF

### 2. Instructor Information

- Instructor name: Dr. Jonghoon Kang
- Instructor contact: BC 2217, 229-333-7140, [jkang@valdosta.edu](mailto:jkang@valdosta.edu)
- Instructor office hours: Wednesday, 2 pm - 4 pm or by appointment

### 3. Course Description

- Course description as printed in university catalogue: A study of the theoretical principles underlying bioinformatics analysis and a hands-on analysis using publicly available databases and software. Additional topics such as epigenetics or systems biology may be included
- Required texts, resources, and materials: Why DNA? (Cambridge Univ Press)

### 4. Standards, Goals, Objectives, or Outcomes

- outcomes:

The departmental educational outcomes (listed in the university catalogue).

1. Develop and test hypotheses, collect and analyze data, and present the results and conclusions in both written and oral formats used in peer-reviewed journals and at scientific meetings.
3. Demonstrate an understanding of the cellular basis of life.
4. Relate the structure and the function of DNA/RNA to the development of form and function of the organism and to heredity.

- **Course objectives or outcomes:**
  - ✓ Recognize the importance of integrative approach in the study of biology
  - ✓ Acquire and enhance quantitative reasoning aptitude
  - ✓ Refresh knowledge on basic concepts in genomics
  - ✓ Learn basic principles in bioinformatics
  - ✓ Familiarize with public databases and analysis tools of bioinformatics

### 5. Assignments and Assessment

Exam 1:	100
Exam 2:	100
Exam 3:	100
Final:	200

Graduate students will have additional assessment of completing a term paper (100 pts).

Scale: A >= 90%, B >= 80%, C >= 60%, D >= 40%, F < 40%

6. Schedule of Activities or Assignments, including university -scheduled final exam time (all schedule is tentative and may be subject to change)

Week	Date	Topic
1	1/9 – 1/13	Introduction Research Overview Ch1 The Perennial Question
2	1/16 – 1/20	Jan 16 MLK Holiday Ch2 The Nature of Biological Information
3	1/23 – 1/27	Ch3 DNA: The Molecules Ch4 The Evolution of Biological Complexity
4	1/30 – 2/3	Ch4 The Evolution of Biological Complexity Ch5 Cooperating Genomes; Ch6 DNA, Information and Complexity Ch7 Origins of Complexity; Ch8 The Complexities of Societies Ch9 Why DNA and Not RNA
5	2/6 – 2/10	<b>Exam 1</b> Introduction to Mathematica Linear Regression Analysis using Mathematica
6	2/13 – 2/17	Linear Regression Analysis using Mathematica (Practice) Nonlinear Regression Analysis using Mathematica Nonlinear Regression Analysis using Mathematica (Practice)
7	2/20 – 2/24	Genome Organization: Database, Data Retrieval, Data Analysis by Mathematica Variables: Size, Protein Number, GC%, Other RNA, Gene, Pseudogene
8	2/27 – 3/3	Archaea, Bacteria; Viruses, Mitochondria, Chloroplasts Genome Organization (Practice) <b>Exam 2</b>
9	3/6 – 3/10	GenomeData, GenomeLookup, ProteinData (Mathematica) Sequence Retrieval to Mathematica and Information Entropy of Proteins and Nucleic Acids;
10	3/13 – 3/17	Spring Break
11	3/20 – 3/24	Bioinformatics Overview (ppt made by me) Blast – Theory Physicochemical Properties of Amino Acids
12	3/27 – 3/31	UniProt Quantitative Evolution of Orexin
13	4/3 – 4/7	Thermodynamics Protein Stability (ProTherm) Nucleic Acid Folding and Hybridization
14	4/10 – 4/14	<b>Exam 3</b> Protein-Ligand Interactions (Albumin, RNA Binding Proteins) Metabolomics
15	4/17 – 4/21	Membrane proteins
16	4/24 – 4/28	Epigenetics
17	5/3	<b>Final Exam 12:30 pm – 2:30 pm</b>

## 7. Classroom Policy

### **Accommodations Statement**

Students with disabilities who are experiencing barriers in this course may contact the Access Office (<https://www.valdosta.edu/student/disability/>) for assistance in determining and implementing reasonable accommodations. The Access Office is located in University Center Room 4136 Entrance 5. The phone numbers are 229-245-2498 (V), 229-375-5871. For more information, please visit VSU's Access Office or email: [access@valdosta.edu](mailto:access@valdosta.edu). To request reasonable accommodations for pregnancy and childbirth, contact Christina Kidd, Student Conduct Coordinator at [chkidd@valdosta.edu](mailto:chkidd@valdosta.edu). Please note, you will be required to provide documentation from an appropriately licensed medical professional indicating the requested accommodations are medically necessary.

### **Non-Discrimination and Title IX Statement**

Valdosta State University (VSU) upholds all applicable laws and policies regarding discrimination on the basis of race, color, sex (including sexual harassment and pregnancy), sexual orientation, gender identity or expression, national origin, religion, age, veteran status, political affiliation, or disability. The University prohibits specific forms of behavior that violate Title IX of the Education Amendments of 1972. Title IX of the Education Amendments of 1972 prohibits discrimination on the basis of sex in education programs and activities that receive federal funding. VSU considers sex discrimination in any form to be a serious offense. Title IX refers to all forms of sex discrimination committed against others, including but not limited to: sexual harassment, sexual assault, sexual misconduct, and sexual violence by other employees, students or third parties and gender inequity or unfair treatment based on an individual's sex/gender. The designated Title IX Coordinator for VSU is Mr. Darius Thomas. To view the full policy or to report an incident visit: <https://www.valdosta.edu/administration/student-affairs/title-ix/>

**Academic Integrity:** You know that cheating is a bad thing to do. Students caught cheating will receive a grade of F for the test in question and will be reported to the Dean of Students. You are expected to follow VSU's Academic Integrity Code.

From VSU's Academic Integrity Code (the full code is available at <https://www.valdosta.edu/academics/academic-affairs/academic-honesty-policies-and-procedures.php>)

*"Academic integrity is the responsibility of all VSU faculty and students. Faculty members should promote academic integrity by including clear instruction on the components of academic integrity and clearly defining the penalties for cheating and plagiarism in their course syllabi. Students are responsible for knowing and abiding by the Academic Integrity Policy as set forth in the Student Code of Conduct and the faculty members' syllabi. All students are expected to do their own work and to uphold a high standard of academic ethics."*

**Classroom demeanor or conduct:** Every student should make the lecture a comfortable and enjoyable learning experience. Late entry to the class room or leaving early are not desirable behaviors. Common sense should be practiced and expected.

### **Additional Information**

Strategies used to support learning: Students should take advantage of my office hours. Studying as a group (study group) should be a good idea. However, you have to complete all assignments by yourself. If cheatings are found in your works, all students involved will get a zero point in those assignments.

***I will teach you and you will learn a fascinating science, Bioinformatics. Therefore, your intellectual enhancement from taking this course will depend on both of us.***