BIOL 3000: Biostatistics (Spring 2012)

1. Course Information

- Course number and section: BIOL 3000 (A)
- Course name: Biostatistics
- Hours of credit: 4
- Pre-requisites or co-requisites as listed in university catalogue: (MATH 1113 Minimum Grade: C or MATH 1113G Minimum Grade: C or MATH 1113H Minimum Grade: C) and (BIOL 1107K Minimum Grade: C or BIOL 2XM1 Minimum Grade: C and BIOL 2XML1 Minimum Grade: C) and (BIOL 1108K Minimum Grade: C or BIOL 2XM2 Minimum Grade: C and BIOL 2XML2 Minimum Grade: C) and MATH 2620 Minimum Grade: C
- Classroom location and room number: BC 2022 (for the lecture, 9:00 am - 9:50 am, MW), BC 3018 (for the lab, 10:00-11:50 am, MW)
- Department, College, University: Department of Biology, College of Arts and Sciences, Valdosta State University

2. Instructor Information

- Instructor name: Dr. Jonghoon Kang
- Instructor contact: BC 2217, 229-333-7140, jkang@valdosta.edu
- Instructor office hours: MW 12:45 pm – 1:45 pm

3. Course Description

- An introduction to univariate and multivariate analysis of data. Laboratory work will allow students to collect data typical of the diverse disciplines in biology and subject those data to appropriate biometrical analyses, using a calculator or computer. Students will be required to keep a detailed lab notebook of the statistical methods studied and also complete a term project and a scientific report. Two 2-hour laboratory periods per week.
- Required texts, resources, and materials: "Statistics in Plain English" by Timothy C. Urdan from Routledge Academic; 3 edition (2010)
- Required out-of-class activities: Reading assigned lecture notes, presentation materials, and textbook. Performing assigned projects.

4. Standards, Goals, Objectives, or Outcomes

- outcomes:
The General Education Outcomes
(http://www.valdosta.edu/academic/VSUGeneralEducationOutcomes.shtml).
5. Students will demonstrate knowledge of scientific and mathematical principles and proficiency in laboratory practices. They will understand the basic concepts and principles underlying scientific methodology and be able to collect, analyze, and interpret data. They will learn a body of scientific knowledge and be able to judge the merits of arguments about scientific issues. They will be able

to perform basic algebraic manipulations and to use fundamental algebraic concepts to solve word problems and equations. They will be able to use basic knowledge of statistics to interpret and to analyze data. They will be able to evaluate arguments based on quantitative data.

7. Students will demonstrate the ability to analyze, to evaluate, and to make inferences from oral, written and visual materials. They will be skilled in inquiry, logical reasoning, and critical analysis. They will be able to acquire and evaluate relevant information, analyze arguments, synthesize facts and information, and offer logical arguments leading to creative solutions to problems.

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.

- Course objectives or outcomes:
  - ➢ Learn basic terminology and techniques in statistics.
  - ➢ Application of basic statistics to biology.
  - ➢ Learn computational tools (Excel and MiniTab) used in statistical analysis.
  - ➢ Interpretation of biology through numbers.
  - ➢ Understanding and presentation of primary research article.
  - ➢ Demonstrate competency in the statistics part in standard tests such as MFT, GRE, and MCAT.

5. Assignments (explicitly aligned with the goals, objectives, or outcomes)

- General description of the assignments: Students are required to read the textbook to be covered before coming to the class. In the beginning of a new chapter you will be given a quiz. Some additional materials will be posted on the Blazeview and you need to study them before coming to class. There will be four in-class tests and one final test. You are also required to present a research article.
- Policies for missed assignments, make-up assignments, late assignments, and/or extra credit: If you miss any assignment due to medical or family-related emergency you can have make-up assignments as long as you prove the valid reason of your absence (doctor's notes). **Otherwise no make-up tests!** And you will get a zero point for the missing part.

6. Assessment or Evaluation Policy

- Explanation of how much each assignment contributes to the overall grade for the class:

  Total Score = 150 (Quiz) + 400 (In Class Exam) + 200 (Final) + 200 (Lab Test) + 50 (Presentation) = 1000

- Explanation of how grades are assigned: A >= 90%, B >= 80%, C >= 70%, D >= 60%, F < 60%

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

Date	Class	Lab
1/7	Introduction	Visual presentation of elements: Graph
1/9	Ch 1	Amino acids: Molecular weight, Charge, Amino acid explorer
1/14	Ch 1 & 2	Proteins: Biological functions
1/16	Ch2	Proteins: number of amino acids, Mean, Median, Mode, RNA pol II.
1/21	MLK day	No lab
1/23	Ch 3	Measures of Variability. Field trip (How many years did they work?)
1/28	Ch 4	Normal distribution. Protein stability: Statistical features
1/30	Ch 5	z Scores. Proteins: Counts of amino acids. Protein as a catalyst
2/4	Ch 5	z Scores. Statistical features of glycolysis: Distribution of free energy values
2/6	**EXAM 1**	Statistical features of TCA cycle
2/11	Ch 6	Standard errors. Physical chemistry of biological redox reactions
2/13	Ch 7	Statistical significance. Statistical feature of the electron transport chain
2/18	Ch 7	**Lab Test 1**
2/20	Ch 8	Correlation. Statistics in manuscript preparation: Scientific Report (journal)
2/25	Ch 9	t Tests. GSP 1
2/27	Catch-up	GSP 2
3/4	**EXAM 2**	GSP 3
3/6	Ch 10	ANOVA. USP 1, 2
3/11	Ch 10	ANOVA. USP 3, 4
3/13	Ch 11	Factorial analysis of variance. USP 5, 6
3/18	Spring break	
3/20	Spring break	
3/25	Ch 11	Factorial analysis of variance. USP 7, 8
3/27	Ch 12	Repeated-measure of ANOVA. USP 9, 10
4/1	Ch 12	Repeated-measure of ANOVA. USP 11, 12
4/3	**EXAM 3**	USP 13, 14
4/8	Ch 13	Regression. USP 15, 16
4/10	Ch 13	Regression (nonlinear forms). USP 17, 18
4/15	Ch 14	Chi-square test. USP 19
4/17	Ch 15	PCA
4/22	Ch 15	PCA and K-means clustering
4/24	**EXAM 4**	**Lab Test 2**
4/29	Review	Wrap-up
5/2	**Final (8-10am)**	

GSP: Graduate student presentation; USP: Undergraduate student presentation

8. Classroom Policies

- Attendance and tardiness: Any absence policy should conform to the university policy. University Attendance Policy from the VSU catalogue:
  "The University expects that all students shall regularly attend all scheduled class meetings held for instruction or examination. When students are to be absent from class, they should immediately contact the instructor. ***A student who misses more than 20% of the scheduled classes of a course will be subject to receive a failing grade in the course.***"

- Accommodations Statement:
  From VSU's Access Office http://www.valdosta.edu/access/facresources.shtml):
  "Students requesting classroom accommodations or modifications due to a documented disability must contact the Access Office for Students with Disabilities located in Farber Hall The phone numbers are 245-2498 (V/VP) and 219-1348 (TTY). "

- 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 http://www.valdosta.edu/academic/AcademicHonestyPoliciesandProcedures.shtml :
  "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 is bad behavior. Common sense should be practiced and expected.

- Communication: All VSU-related correspondence should be conducted via VSU email addresses for both student and instructor and via the Blazeview.

9. Additional Information (at instructor's discretion)

- Expectations for competencies such as writing, technology skills, or performance: Students should be able to describe biological phenomena at the molecular or cellular level in terms of number and statistics.

- Instructional philosophy: I believe reading one book ten times is better than reading ten books one time each. This is the case for this course.

- Strategies used to support learning: Students should take advantage of my office hours. Studying as a group (study group) should be a good idea.