

## **STA 2171: Statistics for Biology**

Fall 2013, Section 3

**Lecture:** Monday and Wednesday, 12:30 PM to 1:45 PM, Oceanography and Statistics Building (OSB) 108

**Recitation:** Friday, 1:25 PM to 2:15 PM, Oceanography and Statistics Building (OSB) 110

**Prerequisites:** MAC 2311 (Calculus with Analytic Geometry I) and biology major status, or department approval

### **Instructor:**

**Name:** Ajay Gupta

**Office:** Oceanography & Statistics Building (OSB) 104F

**Office Hours:** by appointment

**Walk-In Office Hours:** TBD, in Carothers (MCB) 315

The front desk in Carothers 315 will not know where to find your instructor, but you should try cubicles right of the entrance if you do not see him helping students at the computers.

**E-Mail:** [ajgupta@stat.fsu.edu](mailto:ajgupta@stat.fsu.edu)

**E-Mail Policy:** Check your my.fsu.edu E-mail every day to stay aware of updates to class meetings and assignments. If you send the instructor or recitation instructor E-mail, include your full name and "STA 2171" somewhere in the E-mail.

### **Recitation Instructor:**

**Name:** Albert Steppi

**Office:** Bio-Unit I (BIO) 308

**Office Hours:** TBD

**E-Mail:** TBD

### **Materials and Resources:**

**(Optional) Textbook:** Samuels, Myra L., and Jeffrey A. Witmer, *Statistics for the Life Sciences*, 3rd Edition, 2002, ISBN-10: 013041316X, ISBN-13: 978-0130413161

The official textbook for the course (as set by the department) is the 4th edition of the book listed above, with ISBN-10: 0321652800 and ISBN-13: 978-0321652805. Nothing graded is assigned out of either edition, so both will suffice as reference. The 3rd edition is likely to be less expensive, though, and references to textbook sections and problems within the lecture notes will be for the 3rd edition.

**Course Website:** <http://stat.fsu.edu/~ajgupta/2171/>

**Blackboard:** Class notes, assignments, and grades will be available at campus.fsu.edu, where you should log in using your FSUID and find Statistics for Biology (STA 2171) under the Courses section.

## Course Content:

This course will provide students a background on probability and applied statistical techniques for problem-solving in business settings. It will involve calculation, but also include choosing an appropriate technique for a situation and interpreting calculated numbers. It will also require that students be able to use computer-based statistics for looking up probabilities.

At the end of this course, a student should be able to do the following:

- Explain what a statistic is, what a parameter is, and what these have to do with the problem for various situations for a biologically-related job
- Explain what a random variable is, what a probability distribution is, and how these relate to specific situations for a biologically-related job
- Apply proper techniques for creating samples and research studies
- Use summary statistics and graphs to draw conclusions about data
- Calculate common statistics that describe the center, position, and variation of data
- Calculate common parameters that describe the center and variation of random variables
- Apply rules for probability, conditional probability, and independence
- Calculate probabilities for situations involving normal or binomial probability distributions, including approximate probabilities using the Central Limit Theorem
- Calculate and interpret confidence intervals for averages and differences of unknown quantities
- Set up, calculate, and interpret significance tests for averages and differences
- Perform goodness-of-fit tests such as the chi-square tests with contingency tables
- Conduct analysis of variance for one or multiple sources of variation
- Perform several non-parametric significance tests including Fisher's Exact Test, McNemar's Test, Newman-Keuls Procedure, Wilcoxon-Mann-Whitney Test, and the Wilcoxon Signed Rank Test
- Interpret and use correlations, regression lines, and regression equations

## Tentative Schedule:

The following schedule is subject to update and refers to sections of the course textbook. For more information, please see the lecture notes on Blackboard.

Week	Monday	Wednesday
Aug. 26, Aug. 28	<b>2.1, 2.3, 2.8:</b> variables, data types, parameters, statistics, frequency distributions, bar charts, histograms, stemplots	<b>2.4, 2.5:</b> sample mean, median, robust statistics, quartiles, boxplots
Sep. 2, Sep. 4	no class: Labor Day	<b>2.4, 2.6, 3.2:</b> range, IQR, standard deviation, degrees of freedom, sample coefficient of variation, selection bias, SRSs
Sep. 9, Sep. 11	<b>3.3, 3.4, 3.5:</b> probability, probability rules, conditional probability, probability trees, false positives	<b>3.5, 3.7:</b> independence, random variables, probability distributions, means of random variables

<b>Week</b>	<b>Monday</b>	<b>Wednesday</b>
Sep. 16, Sep. 18	<b>2.1, 3.6, 3.7, 3.8:</b> variances of random variables, continuous vs. discrete, density curves, binomial distributions	<b>4.1, 4.2, 4.3, 4.4, 5.1, 5.2, 5.3:</b> sampling distributions, sampling distribution of the mean, normal distributions, Central Limit Theorem
Sep. 23, Sep. 25	<b>6.1, 6.2, 6.3, 6.4, 6.5, 6.6:</b> standard error of the mean, confidence intervals of means, <i>t</i> distribution, confidence intervals of proportions	Test 1
Sep. 30, Oct. 2	<b>7.1, 7.2, 7.3:</b> sampling distribution of difference of means, pooled standard error, confidence intervals of differences of means	<b>7.4, 7.6:</b> significance tests of means
Oct. 7, Oct. 9	<b>7.4, 7.5, 7.6, 7.9, 7.10:</b> significance tests of means, Type I/II Errors	<b>7.11, 8.1, 8.2:</b> Wilcoxon-Mann-Whitney Test, observational studies, case-control studies, experiments, explanatory/response variables, confounding
Oct. 14, Oct. 16	<b>8.3, 8.4, 8.5, 8.6:</b> blinding, randomization designs, replication, nesting, non-sampling error, missing data, randomized response sampling	<b>9.1, 9.2, 9.3:</b> matched pairs designs, paired <i>t</i> tests, paired <i>t</i> confidence intervals
Oct. 21, Oct. 23	<b>9.4, 9.5:</b> sign test, Wilcoxon signed rank test	<b>10.1, 10.2:</b> chi-square distribution, contingency tables, chi-square goodness-of-fit test
Oct. 28, Oct. 30	<b>10.3, 10.5, 10.6:</b> chi-square test of independence, validity of chi-square test	<b>10.4, 10.7, 10.8, 10.9:</b> Fisher's exact test, McNemar's Test, confidence intervals of differences of proportions, relative risk, odds ratio
Nov. 4, Nov. 6	review	Test 2
Nov. 11, Nov. 13	no class: Veteran's Day	<b>11.1, 11.2:</b> ANOVA tables
Nov. 18, Nov. 20	<b>11.4, 11.5:</b> F tests, validity of one-way ANOVA, Newman-Keuls Procedure, Bonferroni Method	<b>11.6, 11.8:</b> two-way ANOVA
Nov. 25, Nov. 27	<b>12.1, 12.2, 12.4:</b> linear regression, correlation, correlation coefficient	no class: Thanksgiving
Dec. 2, Dec. 4	<b>12.1, 12.2, 12.4, 12.5, 12.6:</b> linear regression, residual plots	review

## Grading:

The instructor may, by discretion, set the ranges for each letter grade to include lower grades than the ones from the tables below, but the worst possible letter grades for each range of scores are described below.

Percentage points are not rounded, but points exactly on a boundary will earn the higher of two grades from the table above. For example, someone with 100% for homework but 82% overall will get a B, and someone with 100% for homework but 81.99% overall will get a B-.

If a student has a homework grade of 80% or higher, then percentage points will be converted to letter grades as follows:

A	92+	B+	88-90	B-	80-82	C	72-78	D+	68-70	D-	60-62
A-	90-92	B	82-88	C+	78-80	C-	70-72	D	62-68	F	0-60

If a student has a homework grade less than 80% but 50% or higher, then percentage points will be converted to letter grades as follows:

C	72+	C-	70-72	D+	68-70	D	62-68	D-	60-62	F	0-60
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If a student has a homework grade less than 50%, then percentage points will be converted to letter grades as follows:

F	0+
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### Components of Grade:

Homework: 30%, Quizzes: 50%, Tests: 20%

#### Tests:

Students will take 3 tests: Test 1 (10 questions), Test 2 (30 questions), and the Final Exam (50 questions). All exams are taken at home, on Blackboard. All exams are multiple choice, A to D. All test questions are weighted equally for the Tests portion of the overall grade.

Test 1 covers the material from Weeks 1-4. Test 2 covers the material from Weeks 5-10. The final exam covers Weeks 1-15, with a higher share of questions from Weeks 12-15.

#### Quizzes:

Each week in Friday's recitation, except for Week 11 (which has no new content, and thus no quiz), students will take a quiz in recitation that has 10 multiple-choice questions worth 10 points each, and a written answer section worth 50 points. All quizzes are weighted equally in students' overall grade.

#### Homework:

Homework will be assigned on Blackboard and due 2 days after the relevant class at 11:59 PM. The student can resubmit the homework any number of times before the deadline without a penalty. The student will receive the highest grade of those from multiple submissions for the same assignment.

The student also has the opportunity to do an identical homework assignment on Blackboard within the 72 hours following the due date, which will earn 90% of the credit that would have been earned. No credit will be given for later submissions, unless excused by the instructor.

## **Policies:**

**Attendance:** First-day attendance is mandatory, by university rules. Missing the first day will result in a student getting dropped from the class. Afterward, attendance is not required, and is not graded except in that a student must be present to submit quizzes and tests.

**In-Class Behavior:** Students should attempt to come in quietly if arriving late, and expect to stay until the instructor or recitation instructor deems a class period over.

**Missing Grades and Grade Appeals:** Students are responsible for checking their grades on Blackboard, and providing notice of a missing grade or a written statement appealing the grade within 6 days of the grade posting.

**Extra Credit:** The only extra credit is for identifying an error in the homework, quizzes, or tests. The reward is given at the instructor's discretion.

**Feedback:** Students should visit Blackboard's grades section to find details on how they scored by question on the homework, quizzes, and tests. Multiple-choice results will only have scores on Blackboard provided automatically. The Scantron form and electronic copies of a student's responses are available by that student's request.

**Academic Honor Code:** Students are expected to uphold the Academic Honor Code published in The Florida State University Bulletin and the Student Handbook. The Academic Honor System of The Florida State University is based on the premise that each student has the responsibility (1) to uphold the highest standards of academic integrity in the student's own work, (2) to refuse to tolerate violations of academic integrity in the university community, and (3) to foster a high sense of integrity and social responsibility on the part of the university community.

During quizzes and tests, students are allowed to use homework solutions, lecture notes, any type of calculator, and anything else that does not violate the following rules. Students are not allowed to communicate with others about the answers to (or how to solve) the instructor's quiz or test problems (from any course). Students are not allowed to use answers to (or explanations about how to solve) the instructor's quiz or test problems (from any course). The above references to the instructor's quiz and test problems do not apply to a student finding out how to solve problems in quizzes and tests that are already completed and were taken by the student himself or herself.

**Students with Disabilities:** Students with disabilities needing academic accommodation should; (1) register with and provide documentation to the Student Disability Resource Center; (2) bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class. For more information about services available to FSU students with disabilities, contact the:

Student Disability Resource Center, Dean of Students Department  
108 Student Services Building, Florida State University  
Tallahassee, FL 32306-4167  
(850)644-9566 (voice), (850) 644-8504 (TDD), SDRC@admin.fsu.edu

## **Syllabus:**

This syllabus is subject to change with advance notice. The most recent copy of the syllabus can be found on Blackboard.