# MTH3063 (3 units)
# Calculus Based Statistics with R

**MWF 11:00-11:55 am RS295**


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| Instructor: | Ryan Botts, Ph.D. |
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| Office: | Science Trailer 1 |
| Office Hours: | Current Weekly Hours Posed in Canvas |



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| Text Books: | Baldi and Moore<br>*The Practice of Statistics in the Life Sciences,*<br>4th Edition with Sapling Plus<br>ISBN: 978-1-319-21327-5 |
| Statistical Software: | R and RStudio installed on your device |
| Calculator: | A scientific calculator is recommended |
| Mascot: | Spider monkey |

**University Mission:**
Point Loma Nazarene University exists to provide higher education in a vital Christian community where minds are engaged and challenged, character is modeled and formed, and service is an expression of faith. Being of Wesleyan heritage, we strive to be a learning community where grace is foundational, truth is pursued, and holiness is a way of life.

**Department Mission:**
The Mathematical, Information, and Computer Sciences department at Point Loma Nazarene University is committed to maintaining a curriculum that provides its students with the tools to be productive, the passion to continue learning, and Christian perspectives to provide a basis for making sound value judgments.

**Catalog Description:**
MTH 3063 (3 Units) Calculus Based Statistics With R
A first course in descriptive and inferential statistics for general students who have taken calculus. Topics include experimental design, sampling and sampling distributions, estimation and hypothesis testing. This course also provides a basic introduction to statistical analysis in the statistical software package R. Not applicable toward a major in Mathematics.
Prerequisite(s): MTH 144 or MTH 164 or equivalent.

**Learning Outcomes**
- Students will be able to compute measures of central tendency for data.
- Students will be able to compute measures of dispersion for data.
- Students will be able to use statistical methods to make inferences from data.
- Students will be able to apply their technical knowledge to solve problems.

**Course Format**
Mathematics is learned by doing. This course has intentionally been designed to develop both statistical understanding and practical implementation. You are encouraged to work with each other, however, you are responsible for the material and simply copying answers will be to your detriment. You will be required to install the software (R and RStudio) on your own computer or use a computer lab copy during the assigned sessions.

**Online Homework:**
This homework is designed to give you preliminary experience with the statistical concepts prior to start of lecture on the material. This will help you come to class better prepared, and with questions on the material. It will aid your instructor in identifying difficult concepts and addressing those topics in class. You have two attempts on each homework problem, you may wish to perform one attempt prior to the start of class on the material. The final attempt is due the Saturday following the class activity on the material at 11:59 pm. **YOU MUST HAVE ACCESS TO SAPLING PLUS FOR THIS MATERIAL.**

**Written Homework:**
The homework is designed to allow you to grasp the concepts of Statistics; it is not an end in itself. Assignments will be announced on Monday, and Wednesday. The work will be due on the following Monday (with a few exceptions). The problems from the text may be submitted as a hard copy or may be submitted by e-mail in Word or Excel format (but not in Google Docs). There may also be other activities that are completed as homework. Late homework will not be accepted without prior consent or a well-documented emergency beyond your control. The lowest homework score will be dropped prior to computing the final course grade.

Collected assignments must be prepared in a style suitable for grading. The following guidelines are used to determine credit:

- the organization must be easy to follow
- the work must be legible
- complete solutions must be written for problems (not just answers);
- answers must be clearly marked
- use complete sentences to answer questions

**Labs:**
The labs will be posted in Canvas and are due in Canvas at the scheduled times (by 11:59 pm on the Saturday prior to the next lab).

**Examinations and the Final Examination:**
There will be two Mid-Semester Examinations and a comprehensive Final Examination. Both Mid-Semester Examinations and the Final Examination will include problems and questions over material assigned in the text, readings and handouts, as well as material presented in class. The examination schedule is included in the daily schedule. The instructor will not accept excuses such as poor communication with parents, benefactors, surf team sponsors and/or travel agents. No examination shall be missed without prior consent or a well-documented emergency beyond your control. In such cases, all make-up exams will occur at 8:30 am on the Saturday between classes and Final Exam week. A score of zero will be assigned for an examination that is missed without prior consent or a well-documented emergency beyond your control. The Lab Final Examination will be included as 1/5th of the Final Examination score.

**Grade Components:**

| Grade Component | Percent |
|---|---|
| Two Examinations at 15% each | 30 |
| Final Exam | 35 |
| Labs | 15 |
| Online Homework | 10 |
| Written Homework | 10 |
| Total | 100 |

**Grading Scale:**
Grades are based on the number of points accumulated throughout the course with the following exception. A student must pass at least one of Examination 1, Examination 2, or the Final Examination in order to pass the class. That is, a score of 60% must be achieved on one of the Examinations, or else the final grade will be an F regardless of all other point totals. Approximate minimal percentages required to obtain a given grade are:

| Grading Scale in percentages | A | B | C | D |
|---|---|---|---|---|
| + | | (87.5, 90.0) | (77.5, 80.0) | (67.5, 70.0) |
| | [92.5, 100] | [82.5, 87.5] | [72.5, 77.5] | [62.5, 67.5] |
| – | [90.0, 92.5) | [80.0, 82.5) | [70.0, 72.5) | [60.0, 62.5) |

**Attendance:**
Attendance is expected at each class session. In the event of an absence you are responsible for the material covered in class and the assignments given that day.

Regular and punctual attendance at all classes is considered essential to optimum academic achievement. If the student is absent from more than 10 percent of class meetings, the faculty member can file a written report which may result in de-enrollment. If the absences exceed 20 percent, the student may be de-enrolled without notice until the university drop date or, after that date, receive the appropriate grade for their work and participation. See Attendance Policy in the in the Undergraduate Academic Catalog.

**Class Enrollment:**
It is the student's responsibility to maintain his/her class schedule. Should the need arise to drop this course (personal emergencies, poor performance, etc.), the student has the responsibility to follow through (provided the drop date meets the stated calendar deadline established by the university), not the instructor. Simply ceasing to attend this course or failing to follow through to arrange for a change of registration (drop/add) may easily result in a grade of F on the official transcript.

**Academic Accommodations:**
While all students are expected to meet the minimum standards for completion of this course as established by the instructor, students with disabilities may require academic adjustments, modifications or auxiliary aids/services. At Point Loma Nazarene University (PLNU), these students are requested to register with the Disability Resource Center (DRC), located in the Bond Academic Center. (DRC@pointloma.edu or 619-849-2486). The DRC's policies and procedures for assisting such students in the development of an appropriate academic adjustment plan (AP) allows PLNU to comply with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Section 504 (a) prohibits discrimination against students with special needs and guarantees all qualified students equal access to and benefits of PLNU programs and activities. After the student files the required documentation, the DRC, in conjunction with the student, will develop an AP to meet that student's specific learning needs. The DRC will thereafter email the student's AP to all faculty who teach courses in which the student is enrolled each semester. The AP must be implemented in all such courses.

If students do not wish to avail themselves of some or all of the elements of their AP in a particular course, it is the responsibility of those students to notify their professor in that course. PLNU highly recommends that DRC students speak with their professors during the first two weeks of each semester about the applicability of their AP in that particular course and/or if they do not desire to take advantage of some or all of the elements of their AP in that course.

**Academic Honesty:**
Students should demonstrate academic honesty by doing original work and by giving appropriate credit to the ideas of others. Academic dishonesty is the act of presenting information, ideas, and/or concepts as one's own when in reality they are the results of another person's creativity and effort. A faculty member who believes a situation involving academic dishonesty has been detected may assign a failing grade for that assignment or examination, or, depending on the seriousness of the offense, for the course. Faculty should follow and students may appeal using the procedure in the university Catalog. See the catalog for definitions of kinds of academic dishonesty and for further policy information.

**Final Exam: Monday December 10, 2019 10:30 am – 1:00 pm**
The final exam date and time is set by the university at the beginning of the semester and may not be changed by the instructor. This schedule can be found on the university website and in the course calendar. No requests for early examinations will be approved. Only in the case that a student is required to take three exams during the same day of finals week, is an instructor authorized to consider changing the exam date and time for that particular student.

**The Final Exam is a comprehensive examination.**

**Copyright Protected Materials:**
Point Loma Nazarene University, as a non-profit educational institution, is entitled by law to use materials protected by the US Copyright Act for classroom education. Any use of those materials outside the class may violate the law.

**Credit Hour:**
In the interest of providing sufficient time to accomplish the stated course learning outcomes, this class meets the PLNU credit hour policy for a 3 unit class delivered over 15 weeks. Specific details about how the class meets the credit hour requirements can be provided upon request.

**Written Homework Problem List**

| Assignment Number | Chapter | Written Homework |
|---|---|---|
| 1 | 1 | 23,25,26,27,28,29,32 |
| | 2 | 26,27,32,35,36,38,39 |
| 2 | 3 | 26,32 |
| | 4 | 26,31 |
| | 5 | 8,9,10,11,13,29 |
| 3 | 6 | 25,26,27,32,33,41 |
| | 7 | 24,29,30,34 |
| 4 | 9 | 26,27,30,35 |
| | 10 | 26,33,34,47 |
| | 11 | 19,21,24,28,34 |
| 5 | 13 | 32,36,45 |
| 6 | 14 | 30,40,41,46 |
| 7 | 15 | 25,27 |
| 8 | 17 | 39,40,41 |
| 9 | 18 | 21,22,26 |
| | 24 | 22 |
| 10 | 19 | 29,33,40 |
| | 20 | 28,33 |
| 11 | 22 | 23,25 |

| | Sun | Mon | Tues | Wed | Thurs | Fri | Sat |
|---|---|---|---|---|---|---|---|
| September | 1 | **Labor Day** | 3 | 4<br>Introduction Overview of Hybrid Course<br>Buy Online Text (including resources)<br>Lab 1: *Your First Commands** | 5 | 6<br>Open Lab | 7<br>Read 1: Picturing Distributions<br>2: Describing Distr. with #s<br>Online HW 1 (1st Try) |
| | 8 | 9<br>Activities 1: Picturing Distributions<br>2: Describing Distr. with #s<br>Introduction 3: Scatterplots & Correlation<br>4: Regression<br>HW Assigned 1 and 2 (Written) | 10 | 11<br>Open *R* Lab | 12 | 13<br>Open Lab | 14<br>Read 3: Scatterplots & Correlation<br>4: Regression Analysis<br>Online HW 3 and 4 (1st Try)<br>Due:<br>Online HW 1 (2nd try)<br>*Lab* 1: *Your First Commands* |
| | 15 | 16<br>Activities 3: Scatterplots & Correlation<br>4: Regression<br>Introduction 5: Two-Way Tables<br>7: Samples and Obs. Studies<br>HW Assigned 3 and 4 (Written) | 17 | 18<br>Lab 2: *Summarizing Data**<br>HW Due 1 and 2 (Written)<br>*Lab Assigned* *Summarizing Data* | 19 | 20<br>Open Lab | 21<br>Read 5: Two-Way Tables<br>7: Samples and Obs. Studies<br>Online HW 5 and 7 (1st Try)<br>Due:<br>Online HW 3 and 4 (2nd try) |
| | 22 | 23<br>Activities 5: Two-Way Tables<br>7: Samples and Obs. Studies<br>Introduction 8: Designing Experiments<br>9: Introducing Probability<br>HW Assigned 5 and 7 (Written) | 24 | 25<br>Open *R* Lab<br>HW Due 3 and 4 (Written) | 26 | 27<br>Open Lab | 28<br>Read 8: Designing Experiments<br>9: Introducing Probability<br>Online HW 8 and 9 (1st Try)<br>Due:<br>Online HW 5 and 7 (2nd try)<br>*Lab:* 2: *Summarizing Data* |
| | 29 | 30<br>Activities 8: Designing Experiments<br>9: Introducing Probability<br>Introduction 10: General Rules of Prob.<br>11: Normal Distributions<br>HW Assigned 8 and 9 (Written) | 1 | 2<br>Lab 3: *Summarizing Relationships**<br>HW Due 5 and 7 (Written)<br>*Lab Assigned* *Summarizing Relationships* | 3 | 4<br>Open Lab | 5<br>Read 10: General Rules of Probability<br>11: Normal Distributions<br>Online HW 10 and 11 (1st Try)<br>Due:<br>Online HW 8 and 9 (2nd try) |
| October | 6 | 7<br>Activities 10: General Rules of Probability<br>11: Normal Distributions<br>Introduction 14: Introduction to Inference<br>HW Assigned 10 and 11 (Written) | 8 | 9<br>Open *R* Lab<br>HW Due 8 and 9 (Written) | 10 | 11<br>Open Lab | 12<br>Read 14: Introduction to Inference<br>Online HW 14 (1st Try)<br>Due:<br>Online HW 10 and 11 (2nd try)<br>*Lab* 3: *Summarizing Relationships* |
| | 13 | 14<br>Activities 14: Introduction to Inference<br>Introduction 15: Inference in Practice<br>17: Inference about a Pop. Mean<br>HW Assigned 14 (Written) | 15 | 16<br>Lab 4: *Is This Data Normal?**<br>HW Due 10 and 11 (Written)<br>*Lab Assigned* *Is This Data Normal?* | 17 | 18<br>Open Lab | 19<br>Read 15: Inference in Practice<br>17: Inference about a Pop. Mean<br>Online HW 15 and 17 (1st Try)<br>Due:<br>Online HW 14 (2nd try) |
| | 20 | 21<br>**Review for Exam** | 22 | 23<br>**Exam 1**<br>HW Due 14 (Written) | 24 | 25<br>Fall Break | 26 |

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| **October** | 27 | 28<br>Activities 15: Inference in Practice<br>17: Inference about a Pop. Mean<br>Introduction 18: Comparing Two Means<br>24: One-Way Analysis of Var.<br>HW Assigned 15 and 17 (Written) | 29 | 30<br>**Exam 1 Returned**<br>Open *R* Lab | 31 | 1<br>Open Lab | 2<br>Read 18: Comparing Two Means<br>24: One-Way Analysis of Var.<br>Online HW 18 and 24 (1st Try)<br>Due:<br>*Lab 4: Is This Data Normal?*<br>Online HW 15 and 17 (2nd try) |
| | 3 | 4<br>Activities 18: Comparing Two Means<br>24: One-Way Analysis of Var.<br>Introduction 19: Inf. about a Pop. Prop.<br>HW Assigned 18 and 24 (Written) | 5 | 6<br>Lab 5: *Sum. Data By Groups**<br>HW Due 15 and 17 (Written)<br>*Lab Assigned* *Sum. Data By Groups* | 7 | 8<br>Open Lab | 9<br>Read 19: Inference Pop. Prop.<br>Online HW 19 (1st Try)<br>Due:<br>Online HW 18 and 24 (2nd try) |
| **November** | 10 | 11<br>Activities 19: Inference about a Pop.Prop.<br>Introduction 20: Comparing Two Prop.<br>HW Assigned 19 (Written) | 12 | 13<br>Open *R* Lab<br>HW Due 18 and 24 (Written) | 14 | 15<br>Open Lab | 16<br>Read 20: Comparing Two Prop.<br>Online HW 20 (1st Try)<br>Due:<br>Online HW 19 (2nd try)<br>Lab 5: Sum. Data By Groups |
| | 17 | 18<br>Activities 20: Comparing Two Prop.<br>Introduction 21: Chi-Square Test ($\chi^2$)<br>HW Assigned 20 (Written) | 19 | 20<br>Lab 6: *The Central Limit Theorem**<br>HW Due 19 (Written)<br>*Lab Assigned* *The Central Limit Theorem* | 21 | 22<br>**Review for Exam**<br>Open Lab | 23<br>Due:<br>Online HW 20 (2nd try) |
| | 24 | 25<br>**Exam 2** | 26 | 27<br>Thanksgiving Recess | 28 | 29 | 30<br>Read 21: Chi-Square Test ($\chi^2$)<br>Online HW 21 (1st Try) |
| **Decembe** | 1 | 2<br>Activities 21: Chi-Square Test ($\chi^2$)<br>HW Assigned 21 (Written) | 3 | 4<br>**Exam 2 Returned**<br>Lab 7: *Hypothesis Tests and CI's**<br>HW Due 20 (Written)<br>*Lab Assigned* *Hypothesis Tests and CI's* | 5 | 6<br>Open Lab | 7<br>Due:<br>Online HW 21 (2nd try)<br>*Lab 6: The Central Limit Theorem* |
| | 8 | 9<br>Open *R* Lab | 10 | 11<br>**Lab Final Exam**<br>HW Due 21 (Written) | 12 | 13<br>**Review for Final Exam** | 14<br>Due:<br>*Lab 7: Hypothesis Tests and CI's* |
| | 15 | 16 | 17 | 18<br>**Final Exam**<br>10:30-1:00 | 19 | 20 | 21 |