University of Alaska Southeast

STAT 400 -JD1 Spring 2023

Statistical Computing with R

Brief Introduction: This course should be considered a web-equivalent of a correspondence course. Students are expected to work on assigned reading and R exercises, and submit their work electronically. Consequently, you are expected to be adequately comfortable with computers, sufficiently motivated and able to work independently, and able complete assignments in a timely fashion.

Another point to keep in mind is that this course is listed as a 2 (0+4) credit lab course (where 0 represents the number of "lecture hours" per week, and 4 represents the number of "lab" hours per week). Everyone is expected to devote *around* 4 hours a week on their computers for this course (and possibly up to 2 additional hours a week for further reading as needed) – be aware that some of you may need extra time and others may find they are able to complete tasks in *much* less time.

Please be sure to go through the README document posted right above the *Course Content* link on the course website for more on time-commitments expected. This document provides miscellaneous course information, including format and submission requirements for assignments.

The "instructor" will be available to answer questions – either virtually (Blackboard), or face-to-face (EG 114 on campus), by email or by telephone (by appointment only).

Individuals located in Juneau may coordinate group study sessions with others at the Juneau Campus Learning Center, or come to work/discussion sessions in EG 114 on Tuesdays and Thursdays from 5:00—6:00 pm.

Additional course related information will be posted, and periodically updated, on the course website under the menu item *Course Content*.

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Instructor Information:

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Course Prerequisite: MATH S151 and STAT S200 with C (2.00) or higher, and upper division standing.

Catalog Course Description: An in-depth introduction to the fundamentals of programming with R, the free open-sourced statistical software. Emphasizes development of skills in preparing user-defined functions and code via topics introduced in traditional elementary statistics courses. Includes descriptive statistics, graphical and numerical methods for exploring univariate and bivariate data, interval estimates, one- and two-sample hypothesis tests, one-factor ANOVA, correlation, simple regression, bivariate least squares curve fitting, contingency tables, and nonparametric methods.

Recommended Resource Books: The following book is recommended resource for this course, particularly if you plan to continue on in your use of R.

> Newer editions of **The R Book** by Michael Crawley. For those who plan to go on to more advanced applications of R, this book will serve as an excellent resource. It contains a very broad coverage of applications of R.

Here is another book that you may find useful, particularly for elementary applied statistics.

> **R Companion to Elementary Applied Statistics**, Christopher Hay-Jahans, CRC Press, 2018 (ISBN: 9781138329164) For those who anticipate using R for elementary applications, including graphics and common elementary statistical methods, this book will prove useful.

This being said, the weekly notes and accompanying R script files will provide adequate details on using R.

Course Website: Additional material, in the form of weekly brief notes, assignment packets and supplementary notes, will be posted in the *Course Content* section of the course website.

Technology: The public domain statistical software package R will be used for this course. Most UAS computers have R installed on them. You are strongly encouraged to install R on your personal computers. Go to the R-Project website, http://www.r-project.org/, to do this. Some of you may choose to install and work in *R Studio* (also free), this is fine – but, you will be responsible for learning how to work in R Studio, there is a fairly comprehensive help-manual for this.

Important Note: Internet access and Adobe Acrobat Reader (or an equivalent pdf reader) are *both* required for this course.

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Learning Outcomes: Upon successful completion of this course, students will be able to:

1. Perform elementary and complex operations with numeric, character, and logical vectors. Extend these methods to matrices, data frames, lists and arrays.
2. Construct and apply simple and compound conditional statements, as well as simple and nested looping structures.
3. Apply built-in low- and high-level graphical functions to the construction of basic and enhanced graphical images.
4. Design original and well-documented code, including user-defined functions, to implement complex numerical and/or statistical methods.

Assessment of Competencies: Student assessment will be conducted by way of:

1. Twelve *Homework Assignments* based on assigned reading.
2. One *Term Project* requiring the preparation of a program using R code that will perform an appropriate collection of tasks to aid in some form of data analysis, or a computational task of suitable complexity.

Points for each of the above will be assigned based on *clarity*, *completeness*, *correctness*, *style* and *elegance* (in programming). A rubric and sample assignment is provided in the document named *About the Assignments*.

Procedure: Learning how to use R effectively requires working with it, so expect to spend a fair amount of time on your computer.

Exercises: All content for this course is to be delivered by way of exercises in twelve assignments sets, to be posted in *Course Content* section of the course website.

Be aware that this is an asynchronous course, and each of you is expected to complete assignments at a different rate – an assignment-by-assignment deadline will not be enforced in this course. However, *timely completion of work is strongly encouraged*. A reasonable (and strongly recommended) self-enforced deadline for each of the twelve assignments is one week. The best 10 assignment scores will count toward 80% of the overall course grade. The last time/date to submit assignments is 12:00 noon on Friday, April 14.

Be aware that the last day to withdraw from courses (with a W) is March 31. Individuals who have not submitted *any* work over the 6 weeks prior to March 31 (and most likely, have submitted *less than* 6 assignments total) will be dropped from the course for "non-attendance." It is important to remember that not completing *at least* 8 assignments with an average score of *at least* 80% by the final assignments due date (April 14) will make it very difficult to pass the course.

Term Project: Over the last three weeks of the semester (which includes finals week) each of you will focus on completing your term project. Relevant details on Term Project requirements are posted on the course website in the *Course Content* section. The Term Project is due no later than 12:00 noon on Friday, May 5.

Auke Bay Campus Study Groups: These are optional sessions for Juneau-based students, to be held in EG 114. These sessions can also be attended virtually through Blackboard. Discussions pertaining to *significant* questions/issues arising in these sessions *may* be recorded, and links to these recording will be posted in the *Discussion Recordings* folder within the *Course Content* folder.

Student Responsibilities: Do and submit all work assigned by the above-mentioned due dates. Be aware that additional side-reading on statistics may be necessary for some.

Computing the Course Grade: Points will be distributed as follows:

Homework Assignments**:**	Best 10 scores worth	80% of overall score
Term Project**:**	worth	20% of overall score

Letter grades will be assigned according to the overall percentage scale shown below. In assigning a final course grade, the symbols +/- will be used to signify, for example, a "High" vs. a "Low" B, based on overall performance with respect to "qualitative" criteria mentioned in the section on Assessment of Competencies.

F < 60 60 ≤ D < 70 70 ≤ C < 80 80 ≤ B < 90 A ≥ 90

Incompletes: An *incomplete (I)* is a temporary grade used to indicate that the student has *satisfactorily completed (C or better) the majority of the work in a course*, but for personal reasons beyond the student's control has not been able to complete the final requirements of the course.

Please be aware an incomplete will not be granted if the above condition is not met. Students *wishing* to drop this course should do so themselves. Failure on the part of the student to drop (or withdraw from) the course in a timely manner does not provide grounds for an incomplete.

Learning Center: The Learning Center is located on the lower level of the Egan Library. The Learning Center is an excellent place to receive drop-in tutoring, or find classmates for group study-sessions (strongly encouraged for this class). Go to http://www. alaska.edu/tlc/ for the Learning Center hours of operation.

Be aware that not every tutor will be able to provide help on statistics. Check with your instructor and the Learning Center staff for times when statistics help will be available.

Important Dates: Here are some important dates to keep in mind.

Jan. 17	----------Classes begin
Jan. 27	----------Last day to drop, change credit or audit status
Mar. 13 – 17	---------- Spring Break Holiday
Mar. 31	----------Last day to withdraw
May 2 - 6	---------- Finals Week

Student Ratings: Students are strongly encouraged to participate in the anonymous course evaluation which will occur during the last few weeks of class. Constructive feedback from written comments in these evaluations are used to improve future class offerings.

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Disability Services: If you experience a disability and would like information about accommodations, please contact Disability Services, located at the Student Resource Center in the Mourant building. Phone # 907-796-6000. You can also visit the Disability Services homepage at http://www.uas.alaska.edu/dss.

UAS Mask Policy: Juneau-based students, just in case there is a Covid resurgence, please refer to the Face Coverings Policy on UAS Campuses webpage at https://uas.alaska.edu/pub/maskpolicy for any updates. Also, please stay at home if you are sick. Focus on getting well.

Title IX: All students have the right to be free from all forms of gender and sex-based misconduct (sexual harassment, sexual assault, dating violence, domestic violence, or stalking).

Please report any incidence of gender or sex-based discrimination to the UAS Title IX Office: 907-796-6036 or email uas.titleix@alaska.edu.

More information and resources are available at: https://www.uas.alaska.edu/titleix.

Non-Discrimination Statement: The University of Alaska is an affirmative action/equal opportunity employer and educational institution. The University of Alaska does not discriminate on the basis of race, religion, color, national origin, citizenship, age, sex, physical or mental disability, status as a protected veteran, marital status, changes in marital status, pregnancy, childbirth or related medical conditions, parenthood, sexual orientation, gender identity, political affiliation or belief, genetic information, or other legally protected status. The University's commitment to nondiscrimination, including against sex discrimination, applies to students, employees, and applicants for admission and employment. Contact information, applicable laws, and complaint procedures are included on UA's statement of nondiscrimination available at www.alaska.edu/nondiscrimination.

UAS Juneau Acknowledgment: Our campus resides on the unceded territory of the Áak'w Ḵwáan on Lingít Aaní, also known as Juneau and Douglas, Alaska. We acknowledge that Lingít Peoples have been stewards of the land on which we work and reside since time immemorial, and we are grateful for that stewardship and incredible care. We also recognize that our campus is adjacent to the ancestral home of the T'aaḵú Ḵwáan, and houses neighboring X̱aadas and Ts'msyen peoples. We commit to serving their peoples with equity and care. We recognize the series of unjust actions that attempted to remove the Áak'w Ḵwáan from their land, which includes forced relocations and the burning of villages. We honor the relationships that exist between Lingít, X̱aadas, and Ts'msyen peoples, and their sovereign relationships to their lands, their languages, their ancestors, and future generations. We aspire to work toward healing and liberation, recognizing our paths are intertwined in the complex histories of colonization in Alaska. We acknowledge that we arrived here by listening to the peoples/elders/lessons from the past and these stories carry us as we weave a healthier world for future generations.