FOR 5364 – ADV. USING R FOR SCIENTIFIC RESEARCH

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Office Hours F 8:00-9:00 am or by appointment

MEETING DETAILS
Lectures on Wednesdays: 4:00 – 6:00 pm, FORL 103
Laboratories on Thursdays: 2:00 – 4:50 pm, FORL 103

COURSE DESCRIPTION

Analyzing data gathered from the field or from the literature allow scientists and other professionals to make inferences and conclusions, crucial to making decisions in any knowledge area. Thus, summarizing data in graphs and statistics produces a considerable part of the relevant knowledge that science and society need. Besides, as current and future generations of researchers, policymakers, and stakeholders feed on such scientific knowledge, it is crucial to have responsibility in order to avoid misinterpretation of natural phenomena. Nowadays, one of the most popular software/interfaces/programming languages to analyze data is R. This course is designed for beginners and for students that already initiated in the R language. This course provides tools and knowledge, i.e., a hands-on learning course, that will help students from any knowledge area to be independent in analyzing their data. This course does not intend to teach statistics, i.e., theory of statistics and other knowledge areas related, as well as explanation of algorithms and others.

COURSE GOALS

Using lectures, readings, class, discussions, and practice, but mainly focused on the latter, students will be able to immerse in the world of R and statistical analysis. Students will develop an appreciation for quantitative approaches applied to all sort of knowledge areas, and for programming language itself. Students will expand their understanding of the principles of statistical analysis and how to apply them to a real dataset, preferable to their own data. Moreover, students will be able to use R in a routine of data handling, data exploration, and a wide range of statistical analysis, allowing them to improve their skills in analyzing and interpreting data. The ultimate goal of this course is to provide the student the ability to better understand the routine of statistical analysis in any scientific area, opening their possibilities in answering relevant scientific questions. It is expected that from the training during the semester, students will be able to learn by themselves other sets of statistical analyses they need during their projects and job duties.
STUDENT LEARNING OUTCOMES

Upon completion of the course, students will:

a. Foundational knowledge
   - have a clear understanding of the fundamental issues in data handling in R;
   - have a clear understanding of useful statistical analysis in R applied to scientific research.

b. Application
   - be able to find the best statistical test and data visualization for the different datasets and questions they have.
   - be able to identify and interpret with criticism the statistics applied to scientific research.

c. Integration
   - identify the impact of statistical analysis leveraging the realms of scientific knowledge with impact in policies and decision making.

d. Human dimension
   - be able to identify ways in which one’s or someone else’s personal life could affect or be affected by addressing issues related to the statistical analysis.

e. Future learning
   - be familiar with several popular method journals and other sources of knowledge about statistical analysis, such as GitHub, blogs, forums, etc.
   - discovering new ways to analyze and show the data gathered from the literature and the field, being updated to the frontiers of knowledge on statistical analysis.

REQUIREMENT

The students need to bring a personal computer (not tablets) to the classroom in order to follow the course.

TEXTBOOK AND READINGS

There is no required textbook. Readings will be provided each week, such as books, blogs, forums, etc., to complement the lectures and practices. Also, students will be trained to search by themselves for the information needed to analyze data using R.

GRADERS

<table>
<thead>
<tr>
<th>Participation</th>
<th>50 points</th>
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<tbody>
<tr>
<td>Final project</td>
<td>200 points</td>
</tr>
<tr>
<td>Assignments</td>
<td>100 points</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>350 points</strong></td>
</tr>
</tbody>
</table>

GRADING

A final grade of students (A–F) will be calculated out of **350 total points**. There
will be no curve and no individual extra credit. Final grades will be assigned based on the grading scale as follows:

- $100\% > A \geq 90\%$
- $90\% > B \geq 80\%$
- $80\% > C \geq 70\%$
- $70\% > D \geq 60\%$
- $60\% > F \geq 0\%$

ASSIGNMENT DETAILS

**General course requirements:** Following the R scripts and being able to understand and interpret them are the keystones for successfully completing this course. The understanding of the material (theoretical and practical) presented and discussed in lectures is critical. Considering that the class meets twice a week – lecture and lab – it’s expected all students having perfect attendance (please see Attendance policy subsection, within Class policies section) and be well prepared for class.

**Exams:** There is no exam. This course is based on participation, a final project, and assignments.

**Participation:** Students are expected to actively participate during our lectures and practices. The grade will be determined based on the frequency of their participation as well as the thoughtfulness/utility of their contributions to class discussion.

**Final project:** Masters Students must deliver a final project. For the final project is required that the student provides one short manuscript (100 points) and a poster (100 points). The manuscript will consist of six sections: 1. Title, 2. Aim(s) (Question, Hypothesis, Predictions), 3. Material and Methods (Sampling Design and Statistical Analysis), 4. Results (Text, Figures, Tables), 5. Discussion/Conclusions (interpretations and inferences, i.e., contextualization with the literature), 6. References. The instructor encourages students to use the writing lab offered by AARC tutoring (sfasu.edu/aarc). The manuscript must be provided one week prior to the presentation (11/29/2023). Besides the manuscript, each student will present a poster based on the manuscript in our last meeting (12/06/2023). The poster should briefly present the purpose of the project (theoretical background of the study), methodology (sampling design and statistical analysis), results and inferences, and finally a brief discussion (interpretation) and conclusion. The instructor and student will work on revisions of both manuscript and poster during the lab sections. If the student needs additional time to discuss the manuscript or the poster, the student needs to schedule an appointment with the professor. The student is responsible to discuss their assignments with the instructor weeks before the deadline. It is desirable that the manuscript and poster focus on the project of the student. In case the student does not have dataset, it can be provided by the students’ supervisor or by the instructor. The data must be previously discussed with the instructor until the sixth week of the course (10/04/2023). *If some student wants to use data provided by the instructor, s/he will need to contact the instructor until the fourth week of the course (09/20/2023).* Importantly, students must have their data/project approved by the instructor before they begin to work on their project and presentation.

**Assignments:** Some small assignments will be proposed during the course, and they will be evaluated. It can include readings, searches, questions, tasks, and others.
Tentative Lecture Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Day</th>
<th>Topic</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>08/30</td>
<td>R what? First contact with R</td>
</tr>
<tr>
<td>2</td>
<td>09/06</td>
<td>Data visualization (basics)</td>
</tr>
<tr>
<td>3</td>
<td>09/13</td>
<td>Descriptive statistics</td>
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<tr>
<td>4</td>
<td>09/20</td>
<td>Statistical inference</td>
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<tr>
<td>5</td>
<td>09/27</td>
<td>Transcribing data</td>
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<tr>
<td>6</td>
<td>10/04</td>
<td>Data handling with R</td>
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<tr>
<td>7</td>
<td>10/11</td>
<td>Linear models I</td>
</tr>
<tr>
<td>8</td>
<td>10/18</td>
<td>Linear models II</td>
</tr>
<tr>
<td>9</td>
<td>10/25</td>
<td>Generalized linear models I</td>
</tr>
<tr>
<td>10</td>
<td>11/01</td>
<td>Generalized linear models II</td>
</tr>
<tr>
<td>11</td>
<td>11/08</td>
<td>Comparing groups I</td>
</tr>
<tr>
<td>12</td>
<td>11/15</td>
<td>Comparing groups II</td>
</tr>
<tr>
<td>13</td>
<td>11/22</td>
<td>Thanksgiving</td>
</tr>
<tr>
<td>14</td>
<td>11/29</td>
<td>Data visualization (advanced), Projects, and/or Special Topic</td>
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<tr>
<td>15</td>
<td>12/06</td>
<td>Students' presentation</td>
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§ Laboratory sections will follow the topics addressed in the lectures. There is no lab section on 11/23 and 12/07.

Class Policies

Notes: Although lecture slides and R scripts will be provided, students are highly recommended to take their own notes at each lecture. Much information is complemented by the instructor beyond slides, and this will be very helpful to students, in order to obtain maximum learning. The students must occupy the front rows of the classroom.

Attendance policy: Punctually attendance at all lectures is a requirement for this course. Justified absences will be accepted with the proper documentation (e.g., documented medical excuse). Each unexcused absence from a lecture will result in a reduction of 10% in the total number of points accumulated during the entire course. Note that absence from class also results in the inability to follow the course content. In the case of excused absences, the student must contact the instructor and/or other students to accomplish the lost activities.

Communicating to your professor: Email will be the primary means of communication for the course, so please do not use D2L - Bright space to communicate with the instructor. The student must check the email often in order to keep up to date with the class instructions and announcements. Grades cannot be discussed via e-mail at any time due to federal law. The instructor will speak to the student in person instead of during office hours (please see above). DO NOT involve a third party who is not affiliated in any official capacity with SFASU (e.g., friend, roommate) in any matters pertaining to your enrollment in this course. Your instructor is legally prohibited from discussing most course/grade-related issues with third parties according to the Family Educational Rights and Privacy Act (FERPA) (20 U.S.C. § 1232g; 34 CFR Part 99).
Completing assignments: It is the responsibility of students to complete assignments independently and in a timely manner. Deadlines must be accomplished as a premise of the assignments. Any doubt/disagreement/discordance must be talked about with the instructor with appropriate anticipation in order to avoid delays or misunderstandings of any nature.

Forestry Style Manual: The Forestry Style Manual should be used to guide the students in how to communicate with the instructor and to complete assignments.

Academic integrity: The Code of Student Conduct and Academic Integrity outlines the prohibited conduct by any student enrolled in a course at SFA. It is the responsibility of all members of all faculty, staff, and students to adhere to and uphold this policy. Articles IV, VI, and VII of the new Code of Student Conduct and Academic Integrity outline the violations and procedures concerning academic conduct, including cheating, plagiarism, collusion, and misrepresentation. Cheating includes, but is not limited to: (1) Copying from the test paper (or other assignment) of another student, (2) Possession and/or use during a test of materials that are not authorized by the person giving the test, (3) Using, obtaining, or attempting to obtain by any means the whole or any part of a non-administered test, test key, homework solution, or computer program, or using a test that has been administered in prior classes or semesters without permission of the Faculty member, (4) Substituting for another person, or permitting another person to substitute for one’s self, to take a test, (5) Falsifying research data, laboratory reports, and/or other records or academic work offered for credit, (6) Using any sort of unauthorized resources or technology in completion of educational activities.

Plagiarism is the appropriation of material that is attributable in whole or in part to another source or the use of one’s own previous work in another context without citing that it was used previously, without any indication of the original source, including words, ideas, illustrations, structure, computer code, and other expression or media, and presenting that material as one’s own academic work being offered for credit or in conjunction with a program course or degree requirements.

Collusion is the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any provision of the rules on academic dishonesty, including disclosing and/or distributing the contents of an exam.

Misrepresentation is providing false grades or résumés; providing false or misleading information in an effort to receive a postponement or an extension on a test, quiz, or other assignment for the purpose of obtaining an academic or financial benefit for oneself or another individual or to injure another student academically or financially.

Extra credit: There will be NO PERSONAL extra credit or bonus point opportunities under any circumstance or for any reason. However, the instructor reserves the right to assign class bonus points at any time.

Acceptable Student Behavior: Classroom behavior should not interfere with the instructor’s ability to conduct the class or the ability of other students to learn from the
instructional program (see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be tolerated. Students who disrupt the learning environment may be asked to leave class and may be subject to judicial, academic, or other penalties. Offenses may be penalized with a reduction of 10% of the student’s final grade. Examples of disruptive behavior are, but not limited to, entering class late, misuse of cellphone and other gadgets, taking pictures or recording videos and audio, debauchery, noises, etc. This prohibition applies to all instructional forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Students who do not attend class regularly or who perform poorly on class projects/exams may be referred to the Early Alert Program. This program provides students with recommendations for resources or other assistance that is available to help SFA students succeed.

Responsible Use of Technology: It is expected that all students will only use cell phones, PDAs, laptop computers, MP3 players, and other technology outside of class time or when appropriate in class. Answering a cell phone, texting, listening to music, or using a laptop computer for matters unrelated to the course may be grounds for dismissal from class or other penalties.

Withheld Grades Semester Grades Policy (A-54): Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the coursework because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course to compute the grade point average. For additional information, go to https://www.sfasu.edu/policies/course-grades-5.5.pdf.

Students with Disabilities: To obtain disability-related accommodations, alternate formats, and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services promptly may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices/.

Firearms and the concealed carry policy: University Policy 13.9 deals with firearms and the concealed carry policy. Students with concealed carry licenses that choose to carry on campus are required to follow all Texas laws and University policies and it is their responsibility to understand and comply accordingly. See: http://www.sfasu.edu/policies/13.9-Firearms-Explosives-and-Ammunition.pdf

Student Wellness and Well-Being

SFA values students’ overall well-being, mental health, and the role it plays in academic and overall student success. Students may experience stressors that can impact both
their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, emotional well-being, alcohol and other drugs, identities, finances, etc. If you are experiencing concerns, seeking help, SFA provides a variety of resources to support students’ mental health and wellness. Many of these resources are free, and all of them are confidential.

On-campus Resources:
The Dean of Students Office (Rusk Building, 3rd floor lobby)
www.sfasu.edu/deanofstudents
936.468.7249
dos@sfasu.edu

SFA Human Services Counseling Clinic Human Services, Room 202
www.sfasu.edu/humanservices/139.asp
936.468.1041

The Health and Wellness Hub “The Hub”
Location: corner of E. College and Raguet St.

To support the health and well-being of every Lumberjack, the Health and Wellness Hub offers comprehensive services that treat the whole person – mind, body and spirit. Services include:

• Health Services
• Counseling Services
• Student Outreach and Support
• Food Pantry
• Wellness Coaching
• Alcohol and Other Drug Education
www.sfasu.edu/thehub
936.468.4008
thehub@sfasu.edu

Crisis Resources:

• Burke 24-hour crisis line: 1.800.392.8343
• National Suicide Crisis Prevention: 9-8-8
• Suicide Prevention Lifeline: 1.800.273.TALK (8255)
• johCrisis Text Line: Text HELLO to 741-741