Statistical Modeling and Data Analysis  MATH 3345.001
Department of Mathematics & Statistics
Spring 2019

A. COURSE INFORMATION

Course number/section: MATH 3345-001
Class meeting time: MWF 9:00-9:50 AM
Class location: OCNR-258
Course Website: Blackboard (bb9.tamucc.edu)

B. INSTRUCTOR INFORMATION

Instructor: Dr. Baohua Chen
Office location: CI 306
Office hours: MW: 10:00 AM–12:30 PM
Telephone: 361-825-6019
E-mail: Baohua.chen@tamucc.edu
Appointments: Appointments outside of office hours are available by request via Email

C. COURSE DESCRIPTION

An introduction to probability/statistical modeling and data analysis techniques to investigate data. Topics include: descriptive statistics, data visualization, exploratory data analysis, probability models and simulation, sampling distributions, point and interval estimates, hypothesis tests, and multiple regressions. A wide variety of applications from the natural and social sciences will be used. Students will be expected to present and justify results orally and in writing.

D. PREREQUISITES AND COREQUISITES

Prerequisites: MATH 2413 and COSC 1330 or equivalent.

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required Textbook(s)

Introductory Statistics with Randomization and Simulation by David M Diez, Christopher D Barr, Mine Çetinkaya-Rundel, 3rd edition. This textbook is free and open-source; the digital editions can be download for free from the web address: https://www.openintro.org/stat/textbook.php. The book is available in three formats:

- PDF
- Tablet-friendly PDF
- Paperback edition from Amazon


Equipment/Software: Computer; Google Chrome installed on our specific operating system
F. **STUDENT LEARNING OUTCOMES AND ASSESSMENT**

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below.

By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Use statistical software to summarize data numerically and visually, and to perform data analysis.
2. State commonly used probability models, and tell which model(s) might apply to given experimental situations, perform probability calculations and simulation using Matlab, R or a similar language.
3. Understand the concept of a sampling distribution as it applies to the analysis of sample data, and use simulation to estimate sampling distributions.
4. Have a conceptual understanding of the unified nature of statistical inference; and perform hypothesis tests for probability model parameters using Matlab, R or a similar language.
5. Calculate point and interval estimates of probability model parameters.
6. Model numerical or categorical response variables using a single explanatory variable or multiple explanatory variables in order to investigate relationships between variables.
7. Interpret results correctly, effectively, and in context.
8. Complete one research project that employs the statistical inference or linear regression methods, explain and/or justify the results of the above work to a scientific audience orally and in writing.

G. **INSTRUCTIONAL METHODS AND ACTIVITIES**

- Instructional presentation of new material and concepts;
- Class discussion and students participation by doing problems in classes;
- Homework will be weekly assigned, generally due in the following Sunday, midnight. Questions relate to the material that is covered in class. Homework may include the programing questions which need the software to complete them.
- Labs. The objective of the labs is to give you hands-on experience with data analysis using modern statistical software. The labs will also provide you with tools that you will need to complete the project successfully. We will use a statistical analysis package called RStudio, which is a front end for the R statistical language. You will be given instructions for RStudio installation before the course begins. You are expected to have read the lab handout and loaded the dataset before the lab session. In class I will give a brief overview of the lab and learning
goals, and guide you through some of the exercises. You will complete the lab outside of class and submit it for grading by midnight on the due date.

- Project. Each group of at most four students will complete a research project at the end of term, and you will present your results in a final report and oral presentation. Your group will conduct a statistical investigation of a question interest to you. You will use data available on the internet or from faculty research. You will prepare a project proposal describing your study and obtain approval from instructor before you begin the investigation. During the last week of class, you and your group will give a 10-15 minutes oral presentation of your study. More details about the project will be talked as the semester proceeds.

- Exams: There will be four self-scheduled, closed-book exams. A scientific calculator is needed in exam.

H. MAJOR COURSE REQUIREMENTS AND GRADING

The following assessments will be given during the semester:

<table>
<thead>
<tr>
<th>Projects</th>
<th>In class semester tests</th>
<th>Homework + labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>15% each x 4 = 60%</td>
<td>15%</td>
</tr>
</tbody>
</table>

Grade will be assigned according to the following scale:

A = 90%-100%  100; B = 80-89.99%; C = 70-79.99%; D = 60-69.99%; F = below 60%.

I. COURSE CONTENT/TENTATIVE SCHEDULE

- **Important Dates:** [http://www.tamucc.edu/academics/calendar/2018_fall.html](http://www.tamucc.edu/academics/calendar/2018_fall.html)

  - Jan. 14 First Day of Classes
  - Jan. 21 Martin Luther King, Jr. Holiday
  - Jan. 22 Last day to register or add a class
  - Mar. 11-15 Spring Break
  - April 5 Last Day to Drop a Class
  - May 1 Last Day of Classes
  - May 2 Reading Day
  - May 6 Final Exam

- **Tentative Schedule**

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Chapter</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1 (Jan. 14)</td>
<td>Ch. 1</td>
<td>Introduction to Statistics, randomization case study</td>
</tr>
<tr>
<td>Weeks 2 (Jan. 21)</td>
<td>Ch. 1</td>
<td>Exploratory data analysis</td>
</tr>
<tr>
<td>Week 3 (Jan. 28)</td>
<td>Ch. 1</td>
<td><strong>Review and Exam 1</strong></td>
</tr>
<tr>
<td>Week 4 (Feb. 4)</td>
<td>Ch. 2</td>
<td>Probability</td>
</tr>
<tr>
<td>Week 5 (Feb. 11)</td>
<td>Ch. 3</td>
<td>Distribution of random variables</td>
</tr>
<tr>
<td>Week 6 (Feb. 18)</td>
<td>Ch. 4</td>
<td><strong>Review and Exam 2</strong></td>
</tr>
<tr>
<td>Week 7 (Feb. 25)</td>
<td>Ch. 5</td>
<td>Foundation for inference</td>
</tr>
<tr>
<td>Week 8 (Mar. 4)</td>
<td>Ch. 5</td>
<td>Inference for numerical data</td>
</tr>
<tr>
<td>Week 9 (Mar. 11)</td>
<td>Ch. 6</td>
<td>Spring Break</td>
</tr>
<tr>
<td>Week 10 (Mar. 18)</td>
<td>Ch. 6</td>
<td>Inference for categorical data</td>
</tr>
</tbody>
</table>
Week 11 (Mar. 25) Review and Exam 3
Week 12 (April 1) Ch. 7 Linear regression
Week 13 (April 8) Ch. 8 Multiple and logistic regression
Week 14 (April 15) Review and Exam 4
Week 15 (April 22) Project
Week 16 (May 29) Project presentation (All work due)

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

• Attendance/Tardiness
  Your participation is an important part of the learning process. We are all going to learn this material together, so we need to have everyone present and working. If you cannot attend a particular class, we would appreciate the courtesy of advanced notice and explanation for your absence. The instructor is NOT responsible for informing absent students what was covered in previous classes, homework or any other announcements. Excellent attendance records will help your grade in that borderline course-grade decisions will be influenced by these records.

• Late Work and Make-up Exams
  (1) There is no makeup for any homework, projects, exams unless you could provide proper documentation from either medical doctors or any court orders. If you do not have a valid written excuse and you miss a test, you will NOT be allowed to make up the test and you will score a zero for that test. To request a make-up test, a valid written excuse must be provided within ONE DAY after the missed test. The make-up test must be taken in three days after the scheduled test time.

  (2) **Makeup test will be given once per student** with appropriate documentation provided. Please save the opportunity for the emergencies.

• Cell Phone /Laptop Use
  Cell phone using is prohibited in any circumstances.
  Laptops, or any form of a new technology device is NOT allowed in the classroom during lecture and exam. Any use of cell phone or wireless device during a test carries the presumption of cheating. A grade of ZERO will be awarded.

• Food in Class
  Please do not eat during class. This can distract others from learning, and part of my job is to provide a class atmosphere that aids student learning.

• Participation
  Strong, consistent class participation is expected from all students.
K. COLLEGE AND UNIVERSITY POLICIES

- **Academic Integrity (University)**
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with your academic advisor, the Financial Aid Office, and me, before you decide to drop this course. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in you being dropped from the class. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards
as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

  If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816. http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an
appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.