MATH 5328.001
Structure of Probability and Statistics
Department of Mathematics and Statistics
Fall 2019

A. COURSE INFORMATION

Course number/section: MATH 5328.001 CRN 13777
Class meeting time: Thursday 7:00PM-9:30PM
Class location: BH-201, and online components
(Course Schedule)
Course Website: TAMU-CC Blackboard https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. Celil Ekici
Office location: CI-312
Office hours: Monday, Wednesday, Thursday 9:00AM-11:00AM
You can also schedule by appointment or via online WebEx.
Telephone: (361) 825-2819 (office)
E-mail: celil.ekici@tamucc.edu
Appointments: Please email me, and include information about your availability during the week you
would like to meet with me.

C. COURSE DESCRIPTION

Catalog Course Description
An investigation of the principles and applications of probability and descriptive and inferential
statistics. 3 sem. hrs. (3:0)

D. PREREQUISITES AND COREQUISITES

Prerequisites ONLY Graduate or Graduate Doctoral.
Corequisites: None

E. REQUIRED TEXTBOOK(S), READINGS AND OTHER SUPPLIES

Albert (2010). Data Analysis and Probability for Teachers. Open source textbook available on
http://www-math.bgsu.edu/~albert/dap/
Suggested Resources:

We will incorporate resources from Friday Institute’s On Teaching Statistics Through Inferential Reasoning and Statistic tasks design and analysis. Please visit https://place.fi.ncsu.edu/ for online resources and professional development support.


You will be given handouts and content will be posted in blackboard for you to study ahead of the time.


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

1. Create, use and explain a variety of appropriate data displays (tables, charts, graphs) and basic descriptive statistics that summarize data sets; compare and contrast the various representations.
2. Create, use and evaluate simulations and models that explore simple and compound experimental probability events.
3. Use, justify and explain appropriate counting techniques, including permutations and combinations, to determine theoretical probabilities.
4. Discuss the similarities and differences between experimental and theoretical probabilities.
5. Identify student mathematical reasoning, and analyze their response patterns present in secondary students work on probability and statistics, and learn to model instruction to support students understanding.
6. Write, and solve mathematical problems that involve probabilistic, and statistical reasoning, as well as basic ideas of mathematical modeling, in a variety of mathematical or non-mathematical settings.
7. Communicate mathematical ideas appropriately through multiple representations, including oral and written words, concrete manipulative materials and pictures, graphs, tables, and symbols.
8. Strengthen your understanding of how to engage students in a statistical investigation process for the purpose of making inferences or claims;
9. Explore a framework for guiding your teaching of statistical investigations to promote inferential reasoning for your students; Examine the ways students reason with data to make inferences or claims;
10. Learn to design, adapt, and analyze instructional tasks and explore students' levels of statistical sophistication based on a statistical task framework and support students' statistical sophistication and statistical habits of mind.
11. Use rich data sources and dynamic graphing tools to support data exploration for investigative questions that give students opportunities to make inferences about contexts and issues of interest them;
12. Collaborate with colleagues near and far to gain different perspectives and to build a library of teaching resources.
G. **INSTRUCTIONAL METHODS and ACTIVITIES**
The course will be a combination of lectures, individual, and group work. Students are expected to participate in group and whole class discussions by contributing with knowledge and thoughtful evaluation of the contribution of others. Students are expected to follow the classroom materials posted in the blackboard and shared google drive folder. Since this is a mathematics course for teachers, there is a duality of objectives in each session addressing a school mathematics topic related to probability and statistics. One perspective focuses on the mathematical content preparation of *teacher as a learner*, the other focuses on the teachers’ pedagogical content preparation approaching the teaching and student learning of the content in classroom practice. Throughout this course students (in-service mathematics teachers) will be studying Probability and statistics from an advanced perspective following the curriculum examples and practices. Students will have mini presentations, activities, discussions, and assignments towards understanding and developing practices for teaching/learning probability and statistics.

H. **MAJOR COURSE REQUIREMENTS AND GRADING**

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
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<tbody>
<tr>
<td>In-Class Exams</td>
<td>20%</td>
</tr>
<tr>
<td>Problem Solving Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Assignments and Reflections</td>
<td>15%</td>
</tr>
<tr>
<td>Attendance and Active Participation</td>
<td>10%</td>
</tr>
<tr>
<td>Project: Including Proposal, Sample Group Activity, Reflections as teachers on their work and others.</td>
<td>15%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
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I. **RUBRICS.** Please note that the term project will expect you to develop instructional materials using instructional technologies with online tools or virtual manipulatives to experiment with any one of the probability or statistics topic in high school. The project requires a presentation along with a short model classroom activity that will be graded using the following rubric:

**Presentation Grading Rubric:**

<table>
<thead>
<tr>
<th>Category</th>
<th>4 Exemplary</th>
<th>3 Good</th>
<th>2 Satisfactory</th>
<th>1 Unsatisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject knowledge 50%</td>
<td>Demonstrates subject knowledge throughout the entire assignment. All information is clear, appropriate, and accurate. The solutions to all problems are correct.</td>
<td>Demonstrates subject knowledge most of the time. Most of the information is clear, appropriate, and accurate. Most of the solutions to problems are correct, some solutions have minor errors.</td>
<td>Demonstrates some subject knowledge. Some information is clear, appropriate, and accurate. Some solutions to problems are correct.</td>
<td>Subject knowledge is not demonstrated. Information is confusing, insufficient, inappropriate, and inaccurate. Most of the problems have incorrect solutions.</td>
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J. COURSE CONTENT/SCHEDULE

The course will build on five elements over the semester: Curriculum Content, Technology, Peer Teaching, Problem Solving and Reflections on Reading/Practices.

**Curriculum Content Knowledge:** Objective: Develop teachers’ understanding of curriculum for the Probability and Statistics in Secondary mathematics curricula. The purpose here is to develop a deep understanding of the concepts of probability and statistics looking at the organization of learning expectations and their connectedness in curriculum using Concept Mapping as a tool. Each week a group of 2-3 will focus on grade Level Expectations Probability in school mathematics curriculum. Over six weeks we will focus on all grades from 4-12 placing more emphasis on high school level.

**Curriculum Content Study by Identifying and Supporting Learning Trajectories in Probability and Statistics in 4-12**

**Concept Mapping:** List the terms and concepts you think of when you think about probability and statistics in school mathematics. You make a node for each, think of how each concept is connected to another and draw of a map displaying their connectedness. You can use a free program to develop concept maps (such as “IHMC Cmap Tools” for teachers/researchers available at [http://cmap.ihmc.us/download/](http://cmap.ihmc.us/download/)). This introductory activity should be finished during the first week. You should upload your concept map in GoogleDrive and share it with me.

*Week 1:* Grades 4&7, Grades 5&8, Grades 6&9. This is a collaborative activity as a group of 2-3 on curriculum content. Sign-up for one of the three options above. Select and reflect on curriculum material samples used in these grades. You are encouraged to use some local curriculum materials and Standards-based curriculum material samples for comparison.

*Week 2:* Grade 8, Grade 9, Grade 10. You are signing-up for a grade level. Select and reflect on curriculum material samples used in these grades.

*Week 3:* Grade 10, Grade 11, Grade 12. You are signing-up for a grade level. Select and reflect on curriculum material samples used in these grades.

**Concept Mapping Update:** By the end of the third week, you are expected to update your concept map.

Starting the week four, you are focusing the connectedness and learning transitions of topics within and across Grades.

*Week 4:* Grades 8-9; Grades 9-10. Sing-up for a grade level and select and reflect on curriculum material samples used during those grades.

*Week 5:* Grades 10-11; Grades 11-12. In a parallel manner, you will be shifting your grade band focus. Sing-up for a grade level and select and reflect on curriculum material samples used during those grades.

*Week 6:* Grades 7-12. You will be providing a synthesis by giving an overview of probability and statistics in school curriculum.

Update due: By the end of sixth week, you are expected to update and submit your concept map.

**Peer Learning and Teaching:** The goal of this element is to help teachers learning to teach Probability by taking more active role, ownership and leadership of their learning as teachers. The textbook I recommend to be used for this section is by Albert’s *Data Analysis and Probability for Teachers* (2010). It is available in GoogleDrive. From this book, we will be focusing on probability part starting from the page 308. The probability part of the textbook is organized around 7 topics,
which will be covered along the course of 7 weeks. As a part of this element, you are expected to meet once a week for at least 60 minutes. Each week there will be two peer leaders leading half of the session for the weekly topics. Each peer leader should lead an activity and discuss at least two questions on the probability topics of the week. You are expected to make a 30-min presentation discussing the topic including the activity, the assigned problems and discussion. You can use the textbook(s) I recommended or bring other materials as you see fit as a peer instructor. You can also bring excerpts and artifacts such as videos and course material samples for exemplary practices to discuss your topic. At the end of your session, you are expected to assign 2 homework questions, one from textbook and the other problem should be posed and personalized by you applying the mathematical ideas into the South Texas context. You are expected to post them along with your presentation.

Technology Integration- Technological Pedagogical Competence: The goal of this element is to help teachers build technological pedagogical competence in teaching/learning Probability and Statistics with Technologies. You will use an open source textbooks and resources for Probability and Statistics for Teachers integrating technology and data provided. Please check the Google Drive and Blackboard for updates.. Common Online Data Analysis Platform(CODAP) is the main tool instructional technology we will use along with spreadsheets such as MS EXCEL. CODAP builds on best practices from TinkerPlots, and Fathom as leading platforms for teaching probability and statistics in school. Bring the technological tools that you feel most comfortable using including Graphing calculators TI83+.

Problem Solving Element: This element is more traditional addressing the content learning with problem solving approach. We will cover probability topics following the textbook by Grinstead and Snell’s Introduction to Probability uploaded in Google Drive. You are expected to read and study the sections for each week during this course. Sequences of topics includes permutation, combination, probability of events on discrete and continuous sample spaces; random variables and probability distribution starting with binomial distributions, expected values, Theoretical Probability; transformations; Simulations, Experiments; the Central Limit Theorem and the Law of Large Numbers; Comparing Distributions.

Readings and Reflections on Student Understanding and Teaching Practice: Between the weeks 1 and 4, you should prepare a reflection paper every week up to 4 pages containing both readings (Section A below) and observed (real or simulated classroom) practices (Section B below).

Section A. Building research-based practices on Teaching and Learning Probability: The purpose of this element is to help you develop awareness and integrate into your practice
- the research students’ understanding and conceptions of probability and statistics in secondary schools;
- research based practices to overcome students’ difficulties in learning probability concepts.

You will be assigned to read and reflect on one paper each week between weeks one to four. You will find your weekly readings under Google Drive. Besides the weekly articles, you are welcome to bring an article or a discussion paper of your choice on student’s understanding and learning of probability in schools. In weeks 9-10, you are working more on synthesis, you will develop a presentation on the secondary school students’ conceptions of probability and statistics. You can build from my presentation template first by studying and reflecting on its sections after week six. By the end of week 8, you are expected to personalize and develop your power-point presentation by writing your reflections and
updates. Bring this presentation in such a form that it should carry your signature as a mathematics teacher/learner/educator. You can work collaboratively on this assignment. Section B. For practice related reflections you will visit GoogleDrive folder TAMUCCMATH5328_StructureofProbabilityStatistics. If you find a pertinent classroom practice, please upload it in this folder to share with your peers.

K. Important Dates:
August 26 Classes begin Regular Fall & 1st 7-Week Session
September 2 Labor day Holiday
September 3 Last day to late register or add a class
October 16-30 Mid-Term Grading
November 8 Last day to drop a class
November 27 Reading Day-No Class
November 28-29 Thanksgiving Holidays
December 3 Last day to withdraw from the University
December 4 Last day of classes Regular Fall & 2nd 7-week Session
December 5 Reading Day
December 6-7 and December 9-Final Exams
You can check your final exam schedule from
http://registrar.tamucc.edu/Register%20for%20Classes/Final_Exams.html
December 13-16 Grading days
December 17 Fall grades due at noon

L. COURSE POLICIES

\times Attendance/Tardiness
You are expected to be regular and punctual in your class attendance. You are responsible for all notes, assignments and announcements made in class. Please regularly check BlackBoard for updates.

\times Late Work and Make-up Exams
Late work and Make-up Exams are allowed with proper documentation submitted to Student Services.

\times Extra Credit: None

\times Cell Phone Use
There is a zero tolerance policy for texting or any other cell phone use in class. Cell phones may be left on vibrate for emergency notification purposes. If you expect an important phone call, please inform me before class and quietly excuse yourself when you receive it.

\times Participation
An important aspect of learning to teach is, in part, a function of being a member of a community of learners that interacts to build knowledge about teaching and children’s learning. Another important
aspect of learning to teach is engagement and collaborative work. Effective teachers are committed to professional growth through participation and collaboration to improve their practice. You are expected to actively participate in class, as this course is designed to draw upon the experiences and insights of your peers and your participation makes for a richer experience for all. Simply attending class does not constitute participation.

M. 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 your 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.

× Given the Family Educational Rights and Privacy Act (FERPA), a student has the right to:
  o Inspect and review their education records
    Students can inspect and review their education records within 45 days of the day the University receives a request for access. A student should submit to the registrar, dean, head of the academic department, or other appropriate official, a written request that identifies the record(s) they wish to inspect. The University official will make arrangements for access and notify the student of the time and place where the records may be inspected. If the records are not maintained by the University official to whom the request was submitted, that official shall advise the student of the correct official to whom the request should be addressed.
  o Request to amend their education records
    Students can request to amend any of their education records that they believe are inaccurate, misleading, or otherwise in violation of the student’s privacy rights under FERPA. A student who wishes to ask the University to amend a record should write the University official responsible for the record, clearly identify the part of the record the student wants changed, and specify why it should be changed. If the University decides not to amend the record as requested,
the University will notify the student in writing of the decision and the student’s right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

- **Some control over the disclosure of their education records**
  Students have the right to provide written consent before the University discloses personally identifiable information from their education records, except to the extent that FERPA authorizes disclosure without consent. The University discloses education records without a student’s prior written consent under the FERPA exception for disclosure to school officials with legitimate educational interests. A school official is
  - A person employed by the University in an administrative, supervisory, academic or research, or support staff position (including law enforcement unit personnel and health staff)
  - A person or company with whom the University has contracted as its agent to provide a service instead of using University employees or officials (attorney, auditor, or collection agent)
  - A person serving on the Board of Trustees; or a student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing his or her tasks.
  - A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibilities for the University. Upon request, the University also discloses education records without consent to officials of another school in which a student seeks or intends to enroll.

- **File a complaint if they feel any of these rights have been violated**
  Students can file a complaint with the U.S. Department of Education concerning alleged failures by the University to comply with the requirements of FERPA. The name and address of the Office that administers FERPA is: Family Policy Compliance Office U.S. Department of Education 400 Maryland Avenue, SW Washington, DC 20202-5901.

### N. 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.

### O. GENERAL DISCLAIMER

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F. I will announce such changes in a timely manner during regularly scheduled lecture periods.