MATH 411B MATHEMATICAL STATISTICS I
WINTER 2023 (Jan 4 – Mar 10)

Instructor: Sahadeb Upretee, PhD
E-mail: upretees@cwu.edu
Class Time: MWF 11:00 - 11:50 AM
Office Hours: MTWT 12:00 --1:00 PM or appointment
Office: Samuelson 218J
Classroom: Samuelson 117

TEXTBOOK: Hogg R.V, Tanis E. A., and Zimmerman D. L. (2019): *Probability and Statistical Inference*, 10th Ed. Pearson.

PRE-REQUISITES: MATH 411 A

COURSE CONTENT: This course provides basic knowledge of the fundamental probability tools for quantitatively assessing risk. By applying these tools students can find mean, variance, distribution, and other properties order statistics as well as the properties of point estimation.

Chapter 1: Distributions of functions of random variables
Functions of one random variable, transformations of two random variables, several random variables, the moment-generating function technique, random functions associated with normal distributions.

Learning Outcomes
The students will be able to:

- Define probability generating functions and moment generating functions and use them to calculate probabilities and moments.
- Apply transformations
- Explain and apply joint moment generating functions
- Calculate joint moments, such as the covariance and the correlation coefficient
- Determine the distribution of a transformation of jointly distributed random variables
- Calculate probabilities and moments for linear combinations of independent random Variables
- State and apply the Central Limit Theorem

Chapter 2: Point Estimation
Descriptive statistics, exploratory data analysis, order statistics, maximum likelihood estimation, a simple regression problem, asymptotic distributions of maximum likelihood estimators, sufficient statistics, Bayesian estimation, more Bayesian concepts.

Learning Outcomes
The students will be able to:

- Display the five-point summary in a box and whisker diagram.
- Determine the distribution of order statistics from a set of independent random variables
- Create the quantile-quantile (q-q) plot.
- Apply the maximum likelihood estimation method to estimate parameters.
- Apply the method of moments to estimate parameters
- Apply asymptotic distribution of maximum likelihood estimators.
- Use factorization theorem.

REQUIRED CALCULATOR: A scientific calculator is required. If you are planning to take Exam P, some recommended calculators are TI-30XS MultiView, TI-30Xa, TI-30X II (IIS solar or IIB battery).

IMPORTANT DATES:
First Class: Jan 4
Class End: Mar 10
Martin Luther King Jr. holiday: Jan 16 - No Class
Presidents Day: Feb 20 – No Class
Study Day: Mar 13
Midterm Exam One: Feb - 10
Midterm Exam Two: Mar- 06
Comprehensive Final Exam: Update later

EVALUATIONS:

Class Participation:	5%
Weekly Assignments:	30%
Midterm Exam One:	20%
Midterm Exam Two:	20%
Comprehensive Final Exam:	25%

Note: In the Class Participation, I expect your active involvement while discussion in the classroom.

GRADING SCALE (MINIMUM CUTOFFS):

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
93	90	87	83	80	77	73	70	67	63	60	below 60

EMAIL CORRESPONDENCE: I will respond to student communications during business hours (M-F, 8am-5pm). You can typically expect a reply within approximately 24 hours, not including weekends. If you email me with questions about specific problems, it could be nice if you send pictures of what you've tried so far.

HOMEWORK: Each week homework will be assigned, and due dates will be announced in the Canvas. I will select homework problems from both the textbook and relevant SOA sample questions. Students are encouraged to discuss among the friends but do not copy other's work directly. If I find identical solutions, then both parties will get zero points. Your work should be clear, in a logical order, and provide sufficient explanation. You must upload a single pdf file of the homework into Canvas.

EXAM POLICY: There will be two midterm exams and one comprehensive final exam. All exams are cumulative. They will be taken in classroom and closed book.

TIME INVESTMENT REQUIREMENT**:**
The information listed below illustrates the total investment of time by an average student to achieve the learning goals of the course. (30 hours/credit x 3 = 90 hours)
The amount of time that an average student should expect to spend on this class is as follows:

- 30 hours - Time spent in the classroom, online instruction, taking exams and doing worksheets, etc.
- 60 hours - Time for preparation and study for in-class worksheets, homework, monthly and final exams, discussion during office hours.

COURSE POLICIES

MENTAL HEALTH STATEMENT:

"*Stress and other life circumstances that may be out of your control can make learning and focusing difficult. If you find stress or other mental health concerns make academics difficult, Central has resources to support you. I encourage you to reach out as soon as you notice you're struggling.*"
RESOURCES FOR STUDENTS:

CWU Counseling Center: https://www.cwu.edu/medical-counseling/counseling-clinic

Mental Health Crisis Support outside normal business hours: 1-800 – 273 - 8255, Text HOME to 741741 or call 911.

Wellness Center: https://www.cwu.edu/wellness/ 509-963 -3213

Student Rights and Responsibilities: https://www.cwu.edu/student-rights/office-student-rights-responsibilities

CENTRAL WASHINGTON UNIVERSITY COVID-19 REPORTING FORM: available on http://cwu.edu/student-success/covid-form

POLICY ON ACADEMIC DISHONESTY:
Students are on their honor to follow the student conduct code as outlined in the Washington Administrative Code. Violations of this section will result in a failing grade in the course in addition to further possible university sanctions. (See http://apps.leg.wa.gov/WAC/default.aspx?cite=106-125)

POLICY ON DIVERSITY:
University-level education is about broadening horizons and looking at academic issues from a variety of perspectives. With this in mind, the participants in this class are encouraged to bring their own life experiences and viewpoints to bear on classroom discussions and assignments. Along with the freedom to express one's own views comes the responsibility to respect the views of others. No student will be discriminated against on the basis of race, ethnicity, age, creed, religion, gender, sexual orientation, marital status, or political ideology.

DISABILITY SERVICES:
Central Washington University is committed to creating a learning environment that meets the needs of its diverse student body. If you anticipate or experience any obstacles to learning, contact Disability Services to discuss a range of available options. Student Disability Services is located in Hogue 126. Call (509) 963-2214 or email ds@cwu.edu for more information. (see https://www.cwu.edu/disability-services/)

SUBMITTING ELECTRONIC FILES:
All electronic files must be submitted in .doc, .docx or .pdf format. If you don't have Microsoft Office, you can download it for free, using your CWU email and password from the MS Office website. Here is the guide on (https://cwu.teamdynamix.com/TDClient/2015/Portal/KB/ArticleDet?ID=9080), how to download MS Office. Mac users make sure to save documents with visible extension (.docx or .rtf).

RELIGIOUS HOLIDAY ABSENCES: In compliance with RCW 28B.137.010, CWU makes every effort to deal reasonably and fairly with students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. Students must present written notice to their instructor within the first two weeks of class listing the specific dates on which accommodations are required. Contact the Dean of Student Success at (509) 963-1515 for further information or questions