Marshall University Syllabus
College of Science
Department of Mathematics & Physics

Course: STA 661 – Advanced Mathematical Statistics

Section: 101

CRN: 3777

Credit Hours: 3 hours - Graduate

Catalog Description: Topics in mathematical statistics including distribution theory for functions of random variables, convergence concepts, sufficient statistics, finding optimal estimates for parameters, and optimal test of hypotheses (PR: STA 546).

Course Description and Objective: This course aims to consolidate the knowledge of probability and statistics acquired at the upper-undergraduate or beginning graduate level in probability and statistics and prepare students for graduate-level topics in probability and statistics. At the end of the course, the student will 1) have a good knowledge of probability and statistical distributions, 2) have a good knowledge of multivariate distributions and some special distribution functions, 3) learn the concepts of statistical inferences, limiting distributions, and theory of estimation, and 4) have a good knowledge of the tests of hypotheses.

Prerequisites: Grade C or higher in STA 546

Term/Year: Fall 2024

Class Meeting Days/Times: TR, 12:30 pm – 1:45 pm

Location: SH 518 (Smith Hall, Huntington)

Academic Calendar: For the beginning, ending, and add/drop dates, see the Marshall University Academic Calendar (URL: https://www.marshall.edu/academic-calendar/fall-2024-semester/).

Instructor: Alfred Akinsete, Ph.D.

Contact Information:

- **Office:** Smith Hall 523/524
- **Office Phone:** 304-696-6010
- **Marshall Email:** akinsete@marshall.edu
- **Office Hours**: TR, 11:00a – 12:30p or by appointment. Mask is not mandated during office hours, but you may choose to wear one.

Health and Safety Information

All members of the Marshall University community are expected to always observe health and safety protocols. This includes general health and safety protocols as well as specific protocols that might emerge in response to community and campus health conditions.

Campus Carry Policy

University Policy, UPGA-12 (Campus Carry Policy) derives its authority from West Virginia State law, including the Campus Self-defense Act (W. Va. Code § 18B-4-5b). It pertains to the exercise of Concealed Carry on Marshall University's campus, except in designated areas, by individuals with a valid permit to Conceal Carry.

Individuals who choose to Conceal Carry are responsible for knowing and understanding all applicable federal, state, and local laws and Marshall University Board of Governors Rules, University Policies, and Administrative Procedures. University Policy, UPGA-12 applies to areas of campus and buildings that are directly under the possession or control of Marshall University.

Concealed Handguns are not observable to others and must be holstered and concealed on the body of the permit holder or in a personal carrier, such as a backpack, purse, or other bag that remains under the exclusive and uninterrupted control of the permit holder. This includes wearing the personal carrier with a strap, carrying or holding the personal carrier, or setting the personal carrier next to or within your immediate reach at all times. If your participation in class activities impedes your ability to maintain constant control of your Handgun, please make alternate arrangements prior to coming to class.

Faculty Office

NOTICE: University Policy, UPGA-12 (Campus Carry Policy) defines Sole Occupancy Offices as areas that may restrict Concealed Carry. Please be aware that my office is a Sole Occupancy Office and this statement serves as notice that concealed weapons or handguns are not permitted in my office. If you plan to attend a meeting in my office or to drop by my office, secure your weapon or handgun appropriately before you arrive.

Required and/or Recommended Texts and Materials:

Required Texts and Materials

No textbook is required for this course. The instructor will provide the required course materials for the course.

Recommended/Optional Texts and Materials

Students may wish to purchase a copy of the recommended textbook:

Hogg, R. V., McKean, J. W., and Craig, A. T. (2019). *Introduction to Mathematical Statistics, 8th Ed.,* Boston, MA: Pearson. ISBN – 10: 0-13-468699-3; ISBN – 13: 978-0-13-468699-8

A one-semester course in mathematical statistics that is based on or taught from the recommended textbook could consist of the coverage of the materials in Chapters 1 – 4 with a section of topics from Chapter 5.

Course Student Learner Outcomes:

The table below shows the following relationships: How each student'slearning outcome will be practiced and assessed in the course.

Course Student Learning Outcomes	**How students will practice each outcome in this Course**	**How student achievement of each outcome will be assessed in this Course**
Students will be able to **define** the concepts of set-theoretic probability and distribution functions and **explain** the discrete and continuous random variables, their transformations, and various expected values.	Homework, Active participation, and contributions to discussions.	Homework assignments and Exams.
Students will be able to **construc**t multivariate distributions and **analyze** their statistical properties.	Homework, Active participation, and contributions to discussions	Homework assignments and Exams.
Students will be able to **identify** some special distributions and **construct**, **compute,** or **generate** their distributions using basic distributions.	Homework, Active participation, and contributions to discussions	Homework assignments and Exams.
Students will be able to **simulate** random variables from the concept of quantiles and be able to **perform** various tests of hypotheses, as well as **deduce** from statistical inference.	Homework, Active participation, and contributions to discussions	Homework assignments and Exams.
Students will be able to **define** the Central Limit Theorem and **categorize** various forms of limiting distributions and convergences.	Homework, Active participation, and contributions to discussions	Homework assignments and Exams.
Students will be able to **formulate** the maximum likelihood estimation **compute** parameter estimates as well as **construct** and **assess** unbiased estimates.	Homework, Active participation, and contributions to discussions	Homework assignments and Exams.

Preferred Communication Method and Expected Response Time

I prefer communicating by e-mail (akinsete@marshall.edu). My response time to emails is quicker than what my administrative duties demand! Unless I have a series of meetings or urgent schedules that would not allow me to check my emails, you should expect a response to your email within one **business** day. Otherwise, please resend your email or reach out to me in any way.

Course Requirements:

Homework requirement: Homework exercises, when assigned, will be collected and graded. Make it a habit to do homework when they are assigned and turn them in by the deadline. Late assignments will only be accepted with a university excused absence. Please read the university policy on how to secure a university excused absence.

Grading Policy and Exam Dates: The final grade will be based on the following components:

Exam I	150 points (Tentative date: Thursday, October 3, 2024)
Homework	100 points
Final Examination	150 points (12:45 pm – 2:45 pm on Tuesday, December 10, 2024)
Total	**400 points**

The semester grade will be based on the following scale:

A = 90 - ≤ 100% B = 80 - < 90% C = 70 - < 80% D = 60 - < 70% F = 0 - < 60%

Attendance/Participation Policy:

Students are expected to attend all scheduled classes. It is the student's responsibility to find out what was discussed in a missed class. Note also that it is the student's responsibility to present approved notice of any absence that would be excused under the terms and regulations stipulated by the university.

FINAL EXAM: Tuesday, December 10, 2024 [12:45 PM – 2:45 PM]. A copy of the Fall 2024 exam schedule is here https://www.marshall.edu/registrar/exam-schedules/

Generative Artificial Intelligence (AI) Policy for Use in this Course

We shall adopt Option 3 of the use of Generative AI Policy for this course. This policy is available here https://www.marshall.edu/academic-affairs/ai/. In general, Generative AI is fully prohibited in the course.

Technology Assistance

All course materials and discussions will be cataloged in the Microsoft Teams channel that is created for this course. To avoid missing any information, the teaching platform will be kept within the Teams channel for the course. If you have technical problems, please contact one or more of the following:

- Marshall Information Technology (IT) Service Desk (Help Desk) (URL: http://www.marshall.edu/it/departments/it-service-desk/)
    - Huntington: (304) 696-3200
    - Email the IT Service Desk (itservicedesk@marshall.edu)

University Policies: By enrolling in this course, you agree to the University Policies. Please read the full text of each policy (listed below) by going to MU Academic Affairs: University Policies. (URL: http://www.marshall.edu/academic-affairs/policies/)

- Academic Dishonesty Policy
- Academic Dismissal Policy
- Academic Forgiveness Policy
- Academic Probation and Suspension Policy
- Affirmative Action Policy
- Pre-Finals Week Policy
- D/F Repeat Rule
- Excused Absence Policy for Undergraduates
- Inclement Weather Policy
- Sexual Harassment Policy – Title IX prohibits the harassment of students based on sex, which includes pregnancy, childbirth, and related conditions. This includes that students will not be penalized for taking medically necessary leave related to pregnancy, childbirth, or related conditions. Marshall's Title IX Office may be contacted at TitleIX@marshall.edu
- Students with Disabilities (Policies and Procedures)
- University Computing Services Acceptable Use Policy

Students with Disabilities: For University policies and the procedures for obtaining services, please goto MU Academic Affairs: University Policies and read the section, Students with Disabilities. (URL: http://www.marshall.edu/academic-affairs/policies/ or https://www.marshall.edu/academic-affairs/policies/#Disability or https://www.marshall.edu/accessibility/).

Marshall University E-Mail Accounts

You must have and use your MU email account. Your personal email accounts will not be used for official communication with Marshall University programs and personnel. You may redirect your MUemail to your own personal email account, but you must sign into your MU account to do that**.**

Marshall University uses Office 365 email. For more information, visit Marshall IT: Office 365 (URL https://www.marshall.edu/it/microsoft365/).

Tentative Course Schedule and Coverage:

1. 8/19/24 – 8/30/24: [2 weeks] Probability and Distribution Functions
2. 9/2/24 – 9/13/24: [2 weeks] Multivariate Distributions
3. 9/16/24 – 9/27/24: [2 weeks] Some Special Distributions
4. 9/30/24 – 10/4/24: [1 week] Some Elementary Statistical Inferences
   [Exam I: Thursday, 10/3/24]
5. 10/7/24 – 10/18/24: [2 weeks] Consistency and Limiting Distributions
6. 10/21/24 – 10/25/24: [1 week] Maximum Likelihood Methods
7. 10/28/24 – 11/8/24: [2 weeks] Sufficiency and other Parameter Assessment
8. 11/11/24 – 11/22/24: [2 weeks] Tests of Hypotheses
9. 11/25/24 – 11/29/24: [1 week] Thanksgiving Break
10. 12/2/24 – 12/6/24: [1 week] Tests of Hypotheses (Last Week of Classes)
11. Tuesday, 12/10/24, 12:45p – 2:45p: Final Examination