MA 588-P0 ADVANCED STATISTICS
SYLLABUS

Course Instructor: Keren Li, PhD
Contact Information: kli@uab.edu
Office: University Hall 4041
Office Hours: Wed 1:00 pm - 2:00 pm

Course Info

Meeting times: Lectures: Mon/Wed/Fri 2:20 pm - 4:00 pm
Meeting location: University Hall 4002
Prerequisite: Undergraduate level MA 485 Minimum Grade of B or Graduate level MA 585 Minimum Grade of B or Graduate level MA 587 Minimum Grade of B or Graduate level MA 687 Minimum Grade of B
Credits: 3 semester hours
Recommended Textbooks:

Lecture Notes on Advanced Statistical Theory, by Ryan Martin.
https://www4.stat.ncsu.edu/∼rmartin/Notes/511notes.pdf
Theoretical Statistics, R. Keener, Springer, 2010

Course Description

This course is designed for graduate students who have a foundational understanding of statistics and are looking to deepen their knowledge. The course will cover advanced topics in statistics, including exponential families, sufficiency, information, likelihood-based methods, Bayesian inference, and statistical decision theory. Students will learn to apply these concepts to real-world problems, enhancing their ability to interpret complex data and make informed decisions.

We may occasionally make use of R, which can be downloaded for free at http://cran.r-project.org.

Learning Outcomes

Upon successful completion of the course, a student can

(1) Understand and apply concepts from exponential families, sufficiency, and information.
(2) Utilize likelihood and likelihood-based methods in statistical analysis.
(3) Apply principles of Bayesian inference in data interpretation.

Course Content

Introduction and Preparations: Review of basic mathematical preliminaries and probability,conceptual preliminaries, and preparation for subsequent topics.

Exponential Families, Sufficiency, and Information: In-depth exploration of exponential families, sufficiency, and information in statistics. Practical applications and problem-solving exercises.

Likelihood and Likelihood-based Methods: Detailed study of likelihood functions and methods based on them. Real-world examples and applications.

Bayesian Inference: Comprehensive coverage of Bayesian inference, including principles, applications, and computational methods.

Statistical Decision Theory: Examination of decision theory in statistics, with emphasis on risk, loss functions, and decision rules. Practical examples and case studies.

Course Grade

Your grade in the course is determined by the points earned throughout the semester.

Homework Assignments: (40% total)
Midyrtm Exam: July 8th (15%)
Final Exam: August 9th (35%)
Attendance and Participation: (10%)
Bonus Reflection Assignment: (5%)

Points earned	Grade
85-100+	A
75-84	B
65-74	C
50-64	D
0-49	F

Course Policies

Make-up: No late homework will be accepted, and no make-up exams will be given without a valid excuse.

Group: Homework is to be completed in (fixed) groups of 2–3 students each. Everyone in the group will get the same score.

Email: Information about the course (changes to assignments, reminders, schedules, etc.) will be distributed to students using their BlazerID email address or Canvas. Each student is required to access their UAB email account daily, as these communications represent official university business. This is a requirement for all UAB students. For UAB email account assistance, send an email to userservices@uab.edu, or call 934-3540.

Extended Absences: Attendance is fundamental to course objectives and to the integrity of this course. Courses in the Mathematics Department require a variety of activities that involve interaction with the instructor and/or interaction with other students. Excessive absences and missed assignments (more than 2 weeks) seriously jeopardize a student's ability to successfully complete the course. In the event of excessive absences, students should be prepared to officially withdraw from the course through the Registrar's Office. In cases involving medical hardships, military duty, or other serious personal situations after the withdrawal date for a course, the student may participate in the Academic Policy Appeal (accessed and submitted through Blazernet Links/Forms).

Disability support Services (DSS): UAB is committed to providing an accessible learning experience for all students. If you are a student with a disability that qualifies under Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act, and you require accommodations, please contact Disability Support Services for information on accommodations, registration and procedures. If you are registered with Disability Support Services, please contact DSS to discuss accommodations that may be necessary in this

course. Disability Support Services can be reached at 934-4205 or www.uab.edu/dss or in the Hill Center Suite 409.

Title IX Statement: UAB is committed to providing an environment that is free from sexual misconduct, which includes gender-based assault, harassment, exploitation, dating and domestic violence, stalking, as well as discrimination based on sex, sexual orientation, gender identity, and gender expression. If you have experienced any of the aforementioned conduct we encourage you to report the incident. For more information about Title IX, policy, reporting, protections, resources and supports, please visit http://www.uab.edu/titleix for UAB's Title IX Policy, UAB's Equal Opportunity, Anti Harassment Policy and Duty to Report and Non-Retaliation Policy.

Academic Misconduct: UAB Faculty expects all members of its academic community to function according to the highest ethical and professional standards. You are expected to be aware of, and rigorously adhere to, the UAB code of conduct with regard to academic honesty and inter-personal relations.

Academic dishonesty and misconduct includes, but is not limited to, acts of abetting, cheating, plagiarism, copying homework, fabrication, and misrepresentation. Candidates are expected to honor the UAB Academic Code of Conduct as detailed in the most current UAB Student Catalog.

Add/Drop and Course Withdrawal: Drop/Add: Deadlines for adding, dropping, or withdrawing from a course and for paying tuition are published in the Academic Calendar available online. Review the Institutional Refund Policy for information on refunds for dropped courses. Withdrawal: To avoid academic penalty, a student must withdraw from a course by the withdrawal deadline shown in the academic calendar and receive a grade of W (withdrawn). Failure to attend class does not constitute a formal drop or withdrawal. Syllabus: This syllabus is subject to changes announced in class.