

Advanced Theory of Statistics

STAT 8021, Fall Semester 2025

Section 001 - Wed/Fri 11:00 pm-12:20 pm, French W 4211

Instructor: Siva Sivaganesan, Professor
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Office Hours: Wed. 1:00-1:50 PM (in-person), Th. 9-10 am (Virtual), or by appointment (in-person or virtual). Please send an email at least 30 min ahead. If virtual, you will receive a Zoom link.

Course Description: We will cover the the following core topics of statistics theory, not necessarily in the same order:

- Foundation and Approaches to Decision Theory, and various decision principles such as Bayes and Frequentist principles,
- Bayesian and Frequentist Decision Theory, including concepts of admissibility, minimaxity and invariance, Simultaneous Estimation of Norma Means, Stein estimation.
- Hierarchical and Empirical Bayes estimation. Connection to Stein Estimation.
- Bayesian Hypothesis Testing and Model Selection.
- Fallacy of p-values.

These will be followed by selected topics from topics of current interest such as

- Bayesian Nonparametrics using Drichlet Priors (coverag as time permits).
- Sparse Variable Selection.

Prerequisites: Stat Theory STAT 7021

Textbook: Selected sections from **Statistical Decision Theory and Bayesian analysis** by J. O. Beregr, and from **The Bayesian Choice** by Christian Robert, and from selected papers or book chapters for selected special topics.

Class Notes: Class work will involve both slides and writing on the board. **Students are urged to take notes in class.**

Grade Determination: Course grades will be based on homework and quizzes, and class presentation. Class presentation will be assigned based on students' interest and relevance to topics covered in class.

Course grade will be assigned based on the total 100 points that you have accumulated from

Homework/Quiz: 50 pts, Class Participation: 10 points, Midterm/Final Project: 40 pts

Grade will be assigned based on the following cut-offs.

Grade	A	A-	B+	B	B-	C+	C	F
Accumulated Scores	93.0 - 100.0	90.0 - 92.9	86.0 - 89.9	83.0 - 85.9	80.0 - 82.9	76.0 - 79.9	70.0 - 75.9	0.0 - 69.9

CANVAS: Please follow Canvas closely for important announcements, homework assignments and grades.

HOMEWORK AND QUIZZES: Homework can be either regular assignment or reading assignment. Home work will be assigned through Canvas.

For regular assignment, you need to submit a scanned pdf document of your homework solution to Canvas. No late homework will be accepted unless there are extenuating circumstances of extreme nature. Homework needs to be presented using a word processor (e.g., Word) Sloppy or using clean legible hand-writing. Illegible answers will not be graded and will receive zero credit. Proofs must be clear and logical, and must include justification for each step unless trivial. Short qQuizzes may be given with advance notice.

For reading assignment you need to write a report and/or make a presentation.

Attendance:

- For the first unexcused absence, no point is deducted. **Starting the second**, each unexcused absence counts for a one-point deduction up to the maximum of 13 points deduction.
- Academic-/athletic-/medical-related absences may be excused upon prior notice to the instructor and permission.
- Please let the instructor know before/after the absence if you need to miss a class.
- **Grades for Auditing:** To get a "T" for auditing, students must attend classes with at most four unexcused absences. The students who audit the course are not required to turn in HW and take exams (but they will be graded and returned if submitted).

Other Policy Matters

About withdrawal: The last day to withdraw from the course is Wednesday, March 17, 2017.

In case a withdrawal shall occur, the instructor will be required to affirm whether or not you minimally participated in the class. Although the instructors will do the best to answer accurately, in the absence of any evidence to the contrary the instructors will affirm that you did **not** minimally participate. Ways for you to provide clear evidence of your presence in the class include submitting a homework or quiz(if applicable) or taking a test.

Academic Integrity Policy: The University Rules, including the Student Code of Conduct, and other documented policies of the department, college, and university related to academic integrity will be enforced. Any violation of these regulations, including acts of plagiarism or cheating, will be dealt with on an individual basis according to the severity of the misconduct. (http://www.uc.edu/conduct/Academic_Integrity.html)

Regrading Policy: If a student believes that a grading error has occurred, he/she should request for regarding within the next 5 days after the work is returned to the class. This will apply even if the student is absence in the class on the day the work is returned unless prior permission was obtained from the instructor.

Policy about make-up exam: Only students with legitimate excuses will be allowed to make up missed exam. The student must request make-up tests within a reasonable amount of time after one of the following excusable events occurs:

1. **Illness.** Need official certification from your doctor, typed on medical stationary (with their license # to practice medicine on it).
2. **Attending the funeral of an immediate relative.** Need proof of attending the funeral with the date of the ceremony.
3. **Mandatory courtroom appearance.** Need a copy of your official court summons with the date.
4. **Winthrop Athletic event participation.** Need a signed letter from your coach **no later than one week prior** to the day of the exam.

Special Needs Policy: If you have any special needs related to your participation in this course, including identified visual impairment, hearing impairment, physical impairment, communication disorder, and/or specific learning disability that may influence your performance in this course, you should meet with the instructor to arrange for reasonable provisions to ensure an equitable opportunity to meet all the requirements of this course. At the discretion of the instructor, some accommodations may require prior approval by Disability Services. In order to take advantage of those available accommodations, students may contact the Disability Services Office at 210 University Pavilion (513-556-6823). (<http://www.uc.edu/aess/disability.html>)

Personal Communication Devices Policy: Cell phones and PDAs must be either turned off or put on vibrate mode during class. Additionally, please make all efforts not to use cell phones during the class time.

Email Communication Policy: All communications will be done via UEmail.

