Mathematical Preparation Course For FSRM & MSDS
Fall 2020

Instructor: Hang Deng
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Class: Saturday 9:00am–12:00pm
Office Hours: by appointment

Zoom meeting link: Every Saturday from 09/12 to 11/07
`https://rutgers.zoom.us/j/6458718423?pwd=WkZkNUtXNlYwa21id2h0RHIySngxQT09`

Course Objective: This course is designed to meet the prerequisite for the probability and statistics courses in FSRM program. Students are expected to be familiar with the concepts and techniques in Calculus and Linear Algebra that are essential to Statistics after this course.

Textbook: No textbooks will be used. Some materials will be based on the mathematical lecture notes of Paul Dawkins in Lamar University. The notes are available in http://tutorial.math.lamar.edu/.

Exams (55%): One exam will be held at the end of each section. Both exams are closed book, closed notes.

Homework (30%): Homework will be assigned after each lecture and solutions will be posted after the deadline. Large volume of excercises may be assigned for your practice.

Quiz (15%): There will be a quiz with two questions before each lecture (except the first one).

Topics covered:

Linear Algebra

- Algebra of Matrices: *Matrix Arithmetic and Operations, Inverse of Matrices, Special Matrices, Determinants*
- Vector Spaces: *Concepts, Subspaces, Linear combinations, Linear Independence, Basis, Change of Basis, Row and Column Space, Rank*
- Inner Product Spaces: *Concepts, Norms, Orthogonality, Positive Definite Matrices, Orthonormal Basis, Some Inequalities*
- Eigenvalues and Eigenvectors, Spectral Value Decomposition: *Concepts and Calculation, Diagonalization*

Calculus

- Review of univariate calculus: *Function, Limit, One-Sided Limits, Continuity, Inverse Function, Derivative(Interpretation, Chain Rule), Integration(Interpretation, finite and infinite intervals, Integration by Parts, Transformation of Variables)*
- Partial Derivatives: *Interpretation, Higher Order, Chain Rule, Transformation of Variables*
- Multiple Integrals: *Double Integrals, Double Integrals over General Regions, Triple Integrals , Triple Integrals over General Regions, N-Dimensional Integrals, Transformation of Variables*
- Taylor Exapansion

Tentative Schedule:

Sept. 12th	Algebra of matrices
Sept. 19th	Vector Spaces
Sept. 26th	Inner Product Spaces
Oct. 3rd	Eigenvalues and Eigenvectors
Oct. 17th	Univariate calculus Review
Oct. 24th	Partial derivatives
Oct. 31st	Multiple Integrals
Nov. 7th	Taylor Expansion