Nanchang University
MATH33: Probability Theory
(Last Updated in Jan. 2024)

Credit: 6

Contact Hours

This course is composed of 24 lecture sessions, 3 tutorial sessions and 9 office contact hours. Each lecture session takes 2 contact hours in length; each tutorial session takes 3 contact hours in length; There will be a Q-A review session (3 contact hours) and Final Exam (3 contact hours) at the end of this term. This course has 72 contact hours in total.

Course Description

This course introduces students to a course in probability. The main topics include events, Set Theory, Sample Spaces, Conditional Probability, Functions of Random Variables and distributions and special distributions, Markov Chains, Expectation, Covariance and Correlation, Variance, Moments, the Law of Large Numbers, the Central Limit Theorem, tests and simulation.

Note: This Syllabus is subject to change based on the needs of the class.

Required Material

Textbook: *Probability and Statistics (Fourth Edition),* DeGroot Morris H, Schervish Mark J, publisher: Pearson Education.

Reference book

A Course in Probability Theory 2005 edition. by Neil A. Weiss

Grading

- Participation   10%
- Homework   10%
- Quizzes   20%
- Exercises   15%
- Midterm   20%
- Final Exam   25%

Letter Grade	Grade Points
High Distinction	85-100
Distinction	75-84
Credit	65-74
Pass	50-64
Fail	0-49

Course Schedule

The course has 24 class sessions in total. All sessions are 2 contact hours in length. At the end of this term, there will be a Q-A review session(3 contact hours) and Final Exam (3 contact hours).
Note: the course outline and required readings are subject to change.

Class 1:
Introduction to probability
Experiments and Events

Class 2:
Set Theory; Sample Spaces
Combinatorial Methods
Conditional Probability

Class 3:
Multinomial Coefficients
Independent Events; Bayes' Theorem; Exercise 1
Random Variables.

Class 4:
Distributions.
Continuous Distributions

Class 5:
Conditional Distributions
Multivariate Distributions

Class 6:
Functions of a Random Variable &Two or More Random Variables
Markov Chains; Exercise 2

Class 7:
Expectation

The Expectation of a Random Variable
Properties of Expectations

Class 8:
Variance; Moments
The Mean and the Median; Quiz 1

Class 9:
Covariance and Correlation
Conditional Expectation

Class 10:
The Bernoulli and Binomial Distributions
The Hypergeometric Distributions

Class 11:
Midterm

Class 12:
The Poisson Distributions
The Negative Binomial Distributions

Class 13:
The Normal Distributions
The Gamma Distributions; Exercise 3

Class 14:
TheBetaDistributions
The Multinomial Distributions

Class 15:
The Bivariate Normal Distributions
Large random samples

Class 16:
The Law of Large Numbers
The Central Limit Theorem

Class 17:
The Correction for Continuity
Statistical inference; Exercise 4

Class 18:
Distributions ; Estimators

Sampling distributions of estimators

Class 19:
Joint Distribution of the Sample Mean and Sample Variance
Bayesian Analysis of Samples from a Normal Distribution

Class 20:
Testing hypothesis; The t & F Test
Comparing the Means of Two Normal Distributions; Quiz 2

Class 21:
Bayes Test Procedures
Linear statistical models; Exercise 5

Class 22:
Statistical & Bayesian Inference in Simple Linear Regression
The General Linear Model and Multiple Regression; Analysis of Variance

Class 23:
Simulating Specific Distributions; Importance Sampling

Class 24:
Markov Chain Monte Carlo; The Bootstrap; Discussion

Attending Policy

Regular and prompt attendance is required. Under ordinary circumstances, you may miss two times without penalty. Each absence over this number will lower your course grade by a third of a letter and missing more than five classes may lead to a failing grade in the course. Arriving late and/or leaving before the end of the class period are equivalent to absences.

Policy on "Late Withdrawals"

In accordance with university policy, appeals for late withdrawal will be approved ONLY in case of medical emergency and similar crises.

Academic Honesty

Nanchang University expects all students to do their own work. Instructors will fail assignments that show evidence of plagiarism or other forms of cheating, and will also report the student's name to the University administration. A student reported to the University for cheating is placed on disciplinary probation; a student reported twice is suspended or expelled.

General Expectations:

Students are expected to:
— Attend all classes and be responsible for all materials covered in class and otherwise assigned;
— Complete the day's required reading and assignments before class;
— Review the previous day's notes before class and make notes about questions you have about the previous class or the day's reading;
— Participate in class discussions and complete required written work on time;
— Refrain from texting, phoning or engaging in computer activities unrelated to class during the class period;
— While class participation is welcome, even required, you are expected to refrain from private conversations during the class period.

Special Needs or Assistance

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.