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Hankuk University of Foreign Studies

2025 Summer Session

STAT 346 Intermediate Statistical Theory

Course Outline

Course Code: STAT 346

Instructor: Dr. Michael J. Petersen

Home Institution: North Dakota State University

Office Hours: By appointment

Email: Michael.j.petersen@ndsu.edu

Credit: 4

Class Hours:

This course will have 60 class hours, including 32 lecture hours, professor 8 office hours, 8-hour TA discussion sessions, 4-hour review sessions, 8-hour extra classes.

I. Course Description

This course provides an intermediate level coverage of statistical theory to provide a framework for valid inferences from sample data. The topics covered include sampling distribution, main methods for point estimation and their properties including bias, variance, mean squared error, consistency, efficiency, and MVUE; interval estimation for unknown parameters, including the mean, differences of two means, variances, and proportions; hypothesis test including Neyman-Pearson lemma, significance and power, likelihood ratio test and tests for mean, variance, contingency tables, and goodness-of-fit. Some basic Bayesian inference is also covered in this course.

A. After successfully completing Intermediate Statistical Theory you should be able to:

- Derive the moment estimates and maximum likelihood estimates (MLE) for a probability model with one or two parameters, including for censored data.
- Understand and apply the knowledge of several properties of estimators, including unbiasedness, efficiency and consistency.
- Learn important sampling distributions including chi-square distribution, t distribution and F distribution.

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- Derive the confidence intervals for means, difference between means, proportions, difference between proportions, variances and ratio of two variances based on the corresponding sampling distributions.
- Master the basic concepts in hypothesis testing, including type I error, type II error and power, and calculate the power function for the composite hypotheses.
- Understand the concept of the most powerful test and derive the Neyman-Pearson Lemma.
- Use likelihood ratio test to derive the tests concerning means, variances, proportions, and tests for several binomial probabilities, multinomial probabilities, independence for contingency tables and goodness of fit test.
- Understand and apply the chi-square approximation for likelihood ratio statistics for simple and composite hypotheses.
- Understand the basic Bayesian inference and can calculate the posterior densities and the posterior predictive distributions for Normal, Binomial and Poisson models.

Required Textbooks and Software:

John E. Freund's Mathematical Statistics with Applications (8th Ed), Irwin Miller and Marylees Miller, published by Pearson 978-0-321-82452-3

Grading System (1 ~ 100)

A+ : 96 - 100	A : 91 - 95
B+ : 86 - 90	B : 81 - 85
C+ : 76 - 80	C : 71 - 75
D+ : 66 - 70	D : 60 - 65
F : 0 - 59	
Pa : Pass	Fa : Fail

Course Assignments:

Homework: There will be 8 homework assignments due, covering basic exercises from the material.

Quizzes: There will be 2 quizzes to cover key terms and concepts from the chapters.

Exams: There will be 2 exams for the course.

Course Grades:

Homework (8 @ 20 pts each)	160 pts
Quizzes (2 @ 50 pts each)	100 pts
Exams (2 @ 100 pts each)	200 pts
Total	460 pts

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Course Schedule:

Day	Chapter and Topic	Assignment
Week 1 Day 1	6.1, 6.2, 6.3, 6.4	
Week 1 Day 2	6.5, 6.6, 6.7, 6.8	
Week 1 Day 3	8.1, 8.2, 8.3	HW #1
Week 1 Day 4	8.4, 8.5, 8.6	
Week 1 Day 5	Quiz #1 8.7, 8.8	HW #2
Week 2 Day 1	10.1, 10.2, 10.3	
Week 2 Day 2	10.4, 10.5, 10.6	HW #3 Due
Week 2 Day 3	10.7, 10.8, 10.9, 10.10	
Week 2 Day 4	Review	HW #4 Due
Week 2 Day 5	Midterm Exam	
Week 3 Day 1	11.1, 11.2, 11.3	
Week 3 Day 2	11.4, 11.5, 11.6	
Week 3 Day 3	11.7, 11.8, 12.1	HW #5 Due
Week 3 Day 4	12.2, 12.3, 12.4	
Week 3 Day 5	Quiz #2 12.5, 12.6, 12.7	HW #6 Due
Week 4 Day 1	13.1, 13.2, 13.3	
Week 4 Day 2	13.4, 13.5, 13.6	HW #7 Due
Week 4 Day 3	13.7, 13.8, 13.9	
Week 4 Day 4	Review	HW #8 Due
Week 4 Day 5	Final Exam	

All assignments are due by the beginning of class on the day assigned.