

Hokkaido University Syllabus					
Course Title Advanced Mathematical Methods for Planning					
Subtitle					
Instructor (Institution) Toru HAGIWARA(Graduate School of Engineering)					
Other Instructors (Institution) Toru HAGIWARA(Graduate School of Engineering)					
Course Type				Open To Other Faculties / Schools OK	
Year 2018		Semester 2nd Semester (Winter Term)		Course Number 092532	
Type of Class Lecture		Number of Credits 2		Year of Eligible Students ~	
Eligible Department / Class				Other Information	
Numbering Code		ENG_EPSE 6201			
Major Category Code		Major Category Title			
ENG_EPSE		Engineering_Engineering and Policy for Sustainable Environment			
Level Code		Level			
6		Specialized Subjects (advanced) in graduate level (Master's Course and Professional Course)			
Middle Category Code		Middle Category Title			
2					
Small Category Code		Small Category Title			
0					
Language Type Classes are in English.					

Key Words

Probability and Statistics for Engineering, Categorical Data Analysis, Generalized Linear Model

Course Objectives

The main objective of this class is to develop your skills as a future engineer by providing the practical use of statistical procedures, and the practical modeling procedure to evaluate the significance of uncertainty on system performance.

Course Goals

At the end of this class, students should be able to:

- 1) Understand the fundamentals of statistical and probability models.
- 2) Identify the appropriate model for the observed data.
- 3) Estimate model parameters using R.

Course Schedule

(1) Rules for Research(1 time)

Study five rules that are generally followed to minimize incorrect conclusions from observations.

(2) Standard Experimental Designs (1 time)

Study components of experimentation, principles of experimental design and control in experimentation.

(3) Analytical models of random phenomena (2 times)

Study definition of a random variable and many kinds of useful probability distributions, for example, the normal distribution, the binomial distribution, the poisson distribution, the exponential distribution and so on.

(4) Estimating parameters from observational data (1 time)

Study the role of statistical inference in engineering and the classical approach to estimate parameters.

(5) Random sampling, data description, and some fundamental sampling distributions (1 time)

Study the notions of population and samples, how to show properties of a set of data and some fundamental sampling distributions, for example, t-distribution and F-distribution, and tests of hypotheses

(6) Multiple regression analysis and analysis of variance (2 times)

Study concepts of the single and multiple regression models and the correlation analysis, and analysis of variance.

(7) Introduction of glm and glmm (7 times)

Study the maximum likelihood method and study generalized linear models for categorical and other discrete response data.

(8) Special topic (1 times)

Study R statistical software.

Homework

Students should review immediately after the lecture, and should finish reports. It will take one or two hours per lecture.

Grading System

Grading is given based on results of 3 or 4 reports (40%) and final examination (60%).

■ ■ Textbooks

■ ■ Reading List

Design and Analysis, A researcher's handbook / Geoffrey Keppel, 1991
Probability Concepts in Engineering / Alfredo H-S. Ang and Wilson H. Tang, 2007
Introduction to Linear Regression Analysis / Douglas C. Montgomery, 1992
An Introduction to Categorical Data Analysis / Alan Agresti, 1996
Extending the Linear Model with R / Julian J. Faraway, 2006

■ ■ Websites

■ ■ Website of Laboratory

■ ■ Additional Information

■ ■ Update

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