TKU212111

Statistics

Statistika

BASIC INFORMATION

Course Credit	2 / 100 minutes per Week
Course Type	Required
Course Classification	Basic Science
Prerequisites	Probability and Random Variables; Discrete Mathematics

STUDENT AND LEARNING OUTCOMES

Covered Student Outcomes

Fundamental and Engineering Knowledge (KP.1) Development of Engineering Solution (KP.2)

Data and Experiments (KP.4)

Learning Outcomes

LO1 Students are able to understand apply the concept of estimation theory based on samples to characterize the population.

LO2 Students are able to perform hypothesis testing of a sample and provide a conclusion of the hypothesis test that has been conducted.

LO3 Students are able to understand and apply the concept of regression and interpolation.

LO4 Students are able to implement the analysis of variance technique to compare samples of different population.

COURSE DESCRIPTION

In this course, the students study about the concept of inferential statistics to perform estimation on statistical parameters, perform hypotheses testing, and conduct analysis of variance. In addition, the students also learn about how to formulate simple linear and multiple linear regression model based on samples.

TOPICS

1. Sampling Distribution

1.1 Random Sampling (Review on the concept of Population and Samples)

1.2 The Concept of Statistics as Function of Random Variables

1.3 Introduction of Sample Mean and Sample Variance as an Example of Statistics

1.4 The Concept of Sampling Distribution

1.5 Probability Distribution Model of Sample Mean and its relationship to Central Limit Theorem

1.6 Relationship between Theoretical Mean, Population Mean, and Sample Mean

1.7 Probability Distribution Model of Difference of Two Sample Means

1.8 Probability Distribution Model of Sample Variance and Discussion on Chi-Square Distribution

1.9 t-Distribution

1.10 F-Distribution

2. Estimation Theory

2.1 Introduction to Concept of Inferensial Statistics

2.2 Point Estimate and Unbiased Estimator

2.3 Variance of Point Estimator

2.4 Introduction to the Concept of Interval Estimate

2.5 The Estimation of Mean of the Population based on Sample (Single Sample)

2.6 Error on Point Estimate

2.7 Prediction Intervals

2.8 Estimation of the Difference between mean of two Population based on sample (Two Samples)

2.9 Estimation of Proportion based on Single Sample

2.10 Estimation of the Difference between Two Proportions based on Two Samples.

2.11 Estimation of the Variance of Population based on Sample (Single Sample)

2.12 Estimation of the ratio of two Variance of two population based on Samples (Two Samples)

3. Hypotheses Testing

3.1 Introduction to the concept of Hypotheses

3.2 Testing a Statistical Hypotheses: Null Hypothesis and Alternative Hypothesis

3.3 Error in Hypotheses Testing

3.4 One Tailed Test and Two Tailed Test

3.5 The use of P-Values for Decision Making in Testing Hypotheses

3.6 Hypotheses Testing Concerning Mean of One Population

3.7 Hypotheses Testing Concering Mean of Two Population

3.8 Size of samples in Hypotheses Testing on Mean

3.9 Hypotheses Testing concerning Single Proportion

3.10 Hypotheses Testing concerning Two Proportion

3.11 Hypotheses Testing concerning Variance

4. Simple Linear Regression and Correlation

4.1 Introduction to Linear Regression Model

4.2 Line Fitting Model

4.3 Least Square Method

4.4 Properties of Least Squares Estimation Method

4.5 Inference Concerning the Regression Coefficients

4.6 Prediction

4.7 Analysis of Variance Approach to evaluate quality of linear regression estimate

4.8 Correlation

5. Multiple Linear Regression Model and Non Linear Regression Model

5.1 Introduction

5.2 Estimation of Regression Coefficients

5.3 Linear Regression Model in Matrix Notation (Related to Least Square Approach in Linear Algebra)

5.4 Properties of Least Squares Estimation Method (represented in matrix notation).

5.5 Inferences in Multiple Linear Regression

5.6 Choice of a Fitted Model through Hypotheses Testing

5.7 Categorical or Indicator Variables

5.8 Model Selection and Model Checking

5.9 Cross Validation

6. Analysis of Variance (ANOVA) Technique

REFERENCES

[1] Probability and Statistics for Engineers and Scientits, Walpole & Myers, 2012, Ninth Edition, Prentice Hall