Statistical Analysis & Applications
Course Specifications

Course Specifications

Program(s) on which the course is given : Bachelor in Computer and Information Sciences

Major or Minor element of programs : all majors

Department offering the program : **Scientific Computing**

Department offering the course : Basic Sciences

Academic year / Level : second Year./B.Sc.

Date of specification approval :

Basic Information

Title: Statistical analysis & applications   **Code:** BSC 224

Lecture: 3 hrs/week   **Tutorial:** 2 hrs/week   **Practical: ---**

Credit Hours: ---   **Total:** 5 hrs/week

A. Professional Information

1.   Overall Aims of Course:

The aim of this course is to introduce the mathematical theory governing statistical

modeling methods and to give students a good grasp of how to apply this theory to

simple problems in statistical modeling and data analysis. The course also will introduce the main ideas of linear and generalized linear statistical modeling, methods of estimation and hypothesis testing,and provide practical training in applied statistical modeling.

2. Intended Learning Outcomes of Course (ILOs):

a. Knowledge and Understanding:

a1- Understand the idea of random variables and the basic theoretical methods associated with them

a2- State / know how to use random variables as statistical models of data

a3- Understand the general notion of a confidence interval for a model parameter and be able to calculate confidence intervals in particular cases

a4- Understand the general concept of hypothesis testing and be able to perform hypothesis tests in simple situations

b. Intellectual Skills:

b1- Use linear regression.

b2- Use data to estimate unknown parameters of statistical models in simple situations

b3- Perform one-way Analysis of Variance;

b4- Analyze count data using binomial distributions;

b5- Criticize the usefulness of two estimators.

b6- Derive maximum likelihood estimators of one and two dimensional parameters and establish their major properties.

b7- Propose and use the generalized likelihood ratio statistic when testing composite hypotheses.

c. Professional and Practical Skills:

c1- Identify with statistical modeling and analysis

c2- Identify sufficient statistics and appreciate why they are importance.

d. General and Transferable Skills:

d1- Apply statistical modeling and analysis for practical problems in different settings.

3. Contents

Topic	No. of hours	Lecture	Tutorial/ Practical
Review of sampling theory and distributions(Part I).	5	3	2
Review of sampling theory and distributions(Part II).	5	3	2
Estimation theory: Unbiasedness, efficiency, points estimates, confidence interval estimates (for means, proportions, differences, sums, variances, and variance ratios), maximum likelihood estimates. (Part I)	5	3	2
Estimation theory: Unbiasedness, efficiency, points estimates, confidence interval estimates (for means, proportions, differences, sums, variances, and variance ratios), maximum likelihood estimates. (Part II)	5	3	2
Tests of hypotheses and significance: Null hypothesis, type I and type II errors, level of significance, special tests of significance for large or for small samples, operating characteristic curves, quality control chart,	5	3	2

fitting theoretical distributions to sample frequency distributions, goodness of fit. (Part I)			
Tests of hypotheses and significance: Null hypothesis, type I and type II errors, level of significance, special tests of significance for large or for small samples, operating characteristic curves, quality control chart, fitting theoretical distributions to sample frequency distributions, goodness of fit. (Part II)	5	3	2
Tests of hypotheses and significance: Null hypothesis, type I and type II errors, level of significance, special tests of significance for large or for small samples, operating characteristic curves, quality control chart, fitting theoretical distributions to sample frequency distributions, goodness of fit. (Part III)	5	3	2
Tests of hypotheses and significance: Null hypothesis, type I and type II errors, level of significance, special tests of significance for large or for small samples, operating characteristic curves, quality control chart, fitting theoretical distributions to sample frequency distributions, goodness of fit. (Part IV)	5	3	2
Curve fitting, regression and correlation: Method of least squares, multiple regression, (linear generalized and rank) correlation, correlation and dependence. (Part I)	5	3	2
Curve fitting, regression and correlation: Method of least squares, multiple regression, (linear generalized and	5	3	2

rank) correlation, correlation and dependence. (Part II)			
Curve fitting, regression and correlation: Method of least squares, multiple regression, (linear generalized and rank) correlation, correlation and dependence. (Part III)	5	3	2
Analysis of variance: Purpose, one-factor experiments, variation, linear mathematical models, F-test for the null hypothesis of equal means, modifications for unequal numbers of observations, two-factor experiments, experimental design.(Part I)	5	3	2
Analysis of variance: Purpose, one-factor experiments, variation, linear mathematical models, F-test for the null hypothesis of equal means, modifications for unequal numbers of observations, two-factor experiments, experimental design.(Part II)	5	3	2
Analysis of variance: Purpose, one-factor experiments, variation, linear mathematical models, F-test for the null hypothesis of equal means, modifications for unequal numbers of observations, two-factor experiments, experimental design.(Part III)	5	3	2