**TEACHING PLAN**

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| **Course Title:** | **Probability & Statistics** |
| **Course Code:** | GSC - 122 |
| **Credit Hours:** | 3 |
| **Contact Hours:** | 3 hours lecture per week |
| **Prerequisite(s):** | None |
| **Semester:** | 3 of BS(CS) |
| **Instructor(s):** | Dr Talat Rehmani |
| **Course material available** | University LMS |
| **Objectives:** | 1. To familiarize students with various statistical concepts and methods and enable them to develop statistical reasoning.  2. To understand and apply the concepts of Probability theory.  3. To provide students, the knowledge of different Probability distributions and their applications in Computer Science.  4. To enable the students to learn and apply the tools for curve fitting via Linear Regression and Correlation |
| **Course Learning Outcomes** | |  |  |  | | --- | --- | --- | | After successful completion of this course, the students should be able to: PLO BT Level | | | | 1. Explain and express the basic understanding of probability and statistics. | 1 | C2 | | 1. Demonstrate an ability to use descriptive techniques to describe the statistical data. | 2 | C2 | | 1. Apply inferential statistical methods to solve problems. | 3 | C3 | | 1. Analyse and investigate any given data distribution. | 3 | C4 | |  |  |  | |
| **Synopsis:** | Introduction to Statistics and Data Analysis, Statistical Inference, Samples, Populations, and the Role of Probability. Sampling Procedures. Discrete and Continuous Data. Statistical Modeling. Types of Statistical Studies. Probability: Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule. Random Variables and Probability Distributions. Mathematical Expectation: Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Discrete Probability Distributions. Continuous Probability Distributions. Fundamental Sampling Distributions and Data Descriptions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem. Sampling Distribution of S2, t-Distribution, F-Quantile and Probability Plots. Single Sample & One- and TwoSample Estimation Problems. Single Sample & One- and Two-Sample Tests of Hypotheses. The Use of P-Values for Decision Making in Testing Hypotheses (Single Sample & One- and Two-Sample Tests), Linear Regression and Correlation. Least Squares and the Fitted Model, Multiple Linear Regression and Certain, Nonlinear Regression Models, Linear Regression Model Using Matrices, Properties of the Least Squares Estimators |

**Lecture Plan**

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| WEEK | TOPICS/SUBTOPICS | Lab | QUIZZES/ASSIGNMENTS | REMARKS |
| **01** | **Introduction to Course**  Basic definitions of descriptive and inferential statistics, Qualitative & Quantitative data. Graphical representation, Stem & leaf plot, Box Whisker plots |  |  |  |
| **02** | Measures of central tendency. Mean, Median & Mode, Quartile (ungroup data). Mean, Median & Mode, Quartile (Group data) |  |  |  |
| **03** | Measure of Dispersion: Variance, Standard Deviation, Coefficient of variation, Quartile Deviation, Coefficient of Q.D (ungroup data). Variance , Standard Deviation, Coefficient of variation , Quartile Deviation, Coefficient of Q.D(Group data) |  | Quiz 1 |  |
| **04** | Counting techniques, Permutation & Combination.  Probability Concepts: Sample Space, Events, & Null Space. Operations with Events: Intersection, Mutually Exclusive event Union, & Complement of an Event, Venn Diagrams, Problem Solving, Counting Sample points: Multiplication Rule. Definition & Basic properties of probability. |  | Assignment01 |  |
| **05** | Probability of Mutually Exclusive Events, Probability of Not Mutually Exclusive Events. Probability of Independent & Dependent Events. Application of random variable, Special Probability Distributions: Binomial Probability Distributions |  |  |  |
| **06** | Poisson Probability Distribution. Negative Binomial, Exponential & Gamma distribution. |  | Quiz 2 |  |
| **07** | Concept and application of Normal Probability Distribution. Area under the Normal curve. Linear Regression: Scatter Diagram & Regression Equation. Linear Correlation: Coefficient of Correlation |  | Assignment 2 |  |
| **08** | Strength of Coefficient of Correlation. Problem Solving, Strength of Coefficient of Correlation. Coefficient of Determination: Probable Error |  |  |  |
|  | **Mid Term** | | |  |
| **09** | Sampling with & without replacement. Sampling mean and variance, standard error. Central limit theorem |  |  |  |
| **10** | Estimation. Hypothesis: Introduction. Null & Alternative Hypothesis |  | Assignment 3 |  |
| **11** | Establishing Hypothesis,Type-1 & Type-2 Error. Level of Significance, Test Statistic, & Critical Region Level of Significance, Test. One tailed & Two tailed tests |  |  |  |
| **12** | Use of Rejection Rule & Conclusion. Examples. Testing the Population Mean by *Z-test & t-test* |  | Quiz 3 |  |
| **13** | Applications and problem Solving |  | Assignment 4 |  |
| **14** | To learn and apply hypothesis testing the difference between Two Population Means by *Z-test.* Problem Solving |  |  |  |
| **15** | To learn to solve hypothesis testing the difference between Two Population Means by *t-test.* Problem Solving |  | Quiz 4 |  |
| **16** | More examples and applications problem on the issue. |  |  |  |
|  | **Final** | | |  |

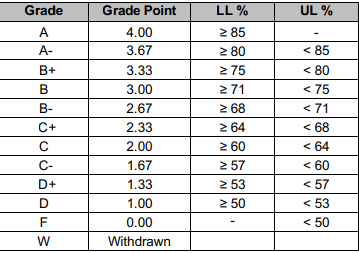
**COURSE EVALUATION:**

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| --- | --- | --- |
| **Type of Assessment** | **Percentage (%)** | **Remarks** |
| Course Work | 30 | 4 Quizzes (10 Marks)  4 Assignments (20 Marks) |
| Mid-Term Exam | 20 |  |
| Final Exam | 50 |  |

**TEXT BOOKS:**

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| **Main** | Introduction to Statistics by Ronald Walpole |
| **Reference** | 1. Statistics by Donald H.Sanders. 2. General Statistics by Warren Chase/Fred Bown Business Statistics by Ken Black   c) Elementary statistics by Allen G. Bluman. ( 8th Edition) |

**GRADING SCHEME:**



**COURSE POLICY:**

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| Homework (Assignments) | * Late homework will not be accepted, * All works have to be done independently, * Students handing in similar homework will receive a grade of 0 (ZERO) and face possible disciplinary actions. |
| Makeup Exams | In accordance with university regulations, i.e. students should bring a valid excuse authenticated through valid channels immediately within first week after the exam. Otherwise they will be considered absent and no makeup exam for them. |
| Lab/Tutorials | All works done in Lab/Tutorials must be individuals. |
| Attendance | * Students are expected to attend all classes * Attendance is compulsory and will be taken regularly. * Attendance for less than 80% of the lectures will result in students being barred from taking the Final Exam. |
| Code of Conduct | The assignments, quizzes and exams need to be done individually. Copying of another student's work or code, even if changes are subsequently made, is inappropriate, and such work or code **will not be accepted**. The University has very clear guidelines for academic misconduct, and they will be enforced in this class. |
| Cell Phone | Cell phones are restricted during class. Cell phones must be turned off during the lecture. If your cell phone rings during class, you may be asked to leave. |

*\*It is acknowledged that the objectives, synopsis of the course and distributions of examination marks will not be changed in the framework of the course as certified.*

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Signature of Course instructor Validated by Head of Department

Date: 18/09/2023 Date: