**National University** 



**Of Computer & Emerging Sciences**

**Karachi Campus**

**Course Outlines of BS (CS) Degree Program**

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| **Course Instructor** | Mr. Muhammad Amjad / Mr. Osama / Ms. Asma | **Semester** | Spring 2018 |
| **Batch/Section(s)** | Batch 2015 / Section A, B, C, D, E, F and G | **Year** | 2018 |
| **Course Title** | MT206-Probability and Statistics | **Credit Hours** | 4 |
| **Prerequisite(s)** | Calculus 1 & 2 | **Course TA** | 1AZZZ |

**Text Book(s)**

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| Title of book | Probability & Statistics for Engineers & Scientists, 8th Edition | |
| Author(s) | Walpole, Myers, Myers YE |

**Reference Book(s)**

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| **1-Probability And Statistics For Engineering And The Sciences**, Jay L Devore 8th Edition |
| 2-Introductory statistics , Neil A.Weiss , 9rd Edition |

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| **Course Objective:** |
| The course is designed to:   * Develop the understanding of probability, random variables and random processes * To be proficient at manipulating data to draw insights and probe research questions. * Enhance the capabilities of data interpretation. * Develop the necessary software skills like EXCELL,MINITAB, SPSS |

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| **Course Description:** |
| Ideas and tools based on probability, statistics and data analysis are becoming increasingly important in computer science research. In areas such as artificial intelligence and theory, probabilistic methods and ideas based on randomization are central, and in other areas such as networks and systems they are becoming increasingly useful. Research that involves manipulating large data sets is also becoming common, and in all areas of computer science statistical techniques are important in the design and analysis of experimental work.  This course gives an introduction to probability and data analysis from a computer science perspective, including many of the fundamental concepts and techniques that are most relevant to current research areas. The course will put an emphasis on computing. Research in CS is fast-paced, and researchers often need to be proficient at manipulating data to draw insights and probe research questions. The course will make use of three general scientific computing environments to help and develop the necessary skills: Matlab, R, and SPSS. It will include the rudiments of probability and random variables, estimation, special distributions and sampling, hypothesis testing and regression analysis. |

**Tentative Weekly Lectures Schedule:**

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| **Week** | **Theory Contents/Topics** | **Sections** |
| 1 | **Descriptive statistics :**  Basic definition , Types of variables ,Mean, Median, Mode, Variance,Standard Deviation, Quartiles, Deciles, Percentiles, IQRange | 2.1-2.5 (NW) |
| 2 | **Graphical representation of data** :  Construction of bar chart , histograms, Stem-leaf plots,box plot,ogive,frequency curve, Skewnwss and Kurtosis. | 3.1-3.5 (NW) |
| 3 | **Sample Space and Event:**  Sample point,tree diagram,set theory ,venn diagram | 2.1-2.2 (WP) |
| 4 | Counting techniques, Probability of an event, Additive rules | 2.3-2.5 (WP) |
| 5 | **Axioms of Probability:**  Conditional Probability, Independence and Multiplicative rules.Bayes’ Rules | 2.6-2.8 (WP) |
| 6 | **1st Mid Term Exam** |  |
| 7 | **Random Variables & Probability Distributions:**  Concept of random variable, Discrete Probability Distributions and cdf. Continuous Probability Distributions and cdf  Joint Probability Distributions. | 3.1-3.4(WP) |
| 8 | **Mathematical Expectations:**  Mean & Variance of a Random Variable, Properties of Mean & Variance | 4.1-4.2(WP) |
| 9 | **Some Discrete Probability Distributions:**  Discrete unfiform distribution , Binomial & Multinomial distribution  Hyper geometricdistribution, Poisson Distribution and poission process. | 5.1-5.6(WP) |
| 10 | **Some countinuous Probability Distributions:**  Normal distribution, Area under the normal curve , Application of Normal distribution , Normal approximation to the binomial. | 6.2,6.4,6.5  (WP) |
| 11 | Chi-Squared distribution,Mean and variance of distribution. | 6.7(WP) |
| 12 | **2nd Mid Term Exam** |  |
| 13 | **Regression & Correlation:**  Scattered diagram .Introduction to linear regression.  The simple linear regression model and multiple regression  Simple and multiple Correlation | 11.1,11.3  (WP) |
| 14 | **Multiple linear and non linear Regression :**  Estimating the coefficient , polynomial regression | 12.1,12.2 (WP) |
| 15 | **Analysis of variance:**  F-didtribution , Hypothesis Testing,One way ANOVA | 16.3 (NW) |
| 16 | **Final Exam** |  |