Course outline
Probability and Statistics

Course	
Lectures Days, Time & class room location	Monday *11:00 – 01:00* Tuesday, Wednesday *03:30 – 05:30* Friday *08:00 – 10:00*
Semester	Fall 2019

Course Instructor — *Dr. Mubashir Qayyum*

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Consulting hours

Tuesday	*09:00 AM -12:00 Noon*
Any other days	By appointments

Required Text & Recommended Additional Readings, Books and Other Material

Probability and Random Processes by Garcia
Probability and Stochastic Processes by Roy D. Yates, David J. Goodman
Introduction to Statistics by Walpole, 1982.
Introduction to Statistical Theory Part – I by Prof. Sher Muhammad Chaudhry

Course Credit hours 4+0

Other Course Pack Material Shall be made available through photocopier

Pre requisites of the Course Nil

Methodology Primarily Lecture method based on Lectures including the explanations of different topics and solutions of numerical problems related to topics.

Course Objectives, Expected outcome & Policy

Probability and Statistics is one of the very important courses for the students of Computer Science/ Engineering to help them in understanding the real world problems. This course has three portions. First portion includes, Introduction to Statistics, Measure of central tendency, Measure of dispersion, Method of least square and testing of hypothesis through different test etc.

In second portion theory of probability will be discussed which is a powerful tool that helps Computer scientists and Telecommunication engineers to explain model, analyze and design the technology they develop. Moreover probability theory is used to give a mathematical description of the behavior of real world systems that involve randomness such a system might be as simple as a coin flipping experiment, in which we are interested in whether 'head' or 'tail' is the outcome, or it might be more complex, as in the study of random error in a coded digital system e.g CD recording or digital mobile phone.

Third portion includes random variable and different types of random variables their Averages, Variance, Correlation and Covariance of random variables etc.

This course is design to equip students with the knowledge of statistical techniques and skills needed in their future work.

Course Evaluation and Rewards

Quizzes   **10 %**

There shall be at least 5 quizzes from the assigned and lecture topics, No Makeup quizzes shall be allowed whatsoever.

Assignments   **10 %**

Assignments will be individual and includes theoretical as well as numerical problems. Also evaluation of the assignment will be through assignment quiz.

Mid Term   **(15% + 15%) = 30 %**

First Mid Term will be conducted in 6th Week and second Mid Term will be in 12th Week of the semester.

Final Comprehensive Examination   **50 %**

The final examination could be mixture of short questions and long questions. Students should also expect questions from the assignments & quizzes.

Week	Contents	Assigns/Quiz
1,2	**Introduction to Statistics** Basic Statistical Concepts (definition of Statistics, types, Characteristics, Applications, Importance) (sample and Population Data, Observation and Variable, Discrete and Continuous Variables, Grouped and Ungrouped Data, Class type Data etc) **Presentation of Data** Classification of Data Tabulation Frequency Distribution Graphical Representation of Data Diagrams, Graphs	
3,4	**Measure of Central Tendency** Arithmetic Mean for Ungroup Data, Grouped Data and Specifically Class type Data Properties of A.M Geometric Mean for Ungroup Data, Grouped Data and Specifically Class type Data Harmonic Mean for Ungroup Data, Grouped Data and Specifically Class type Data Median, Quartiles, Deciles and Percentiles for Ungroup Data, Grouped Data and Specifically Class type Data Mode for Ungroup Data, Grouped Data and Specifically Class type Data Advantages and Disadvantages of these averages	Quiz No. 1 Assignment No. 1
5,6 & 7	**Measure of Dispersion** General Introduction containing meaning and need of measure of dispersion or scatter Coefficient of Variation, Dispersion Range, Inter quartile range, Semi inter quartile range, Mean Deviation, Standard Deviation and Variance for Ungroup Data, Grouped Data and Specifically Class type Data Properties of Variance Moments about origin and Moments about mean etc Moment generating function technique b) Characteristic function technique **Curve Fitting by Least Squares** Introduction, Fitting a straight line, second degree parabola and higher degrees curves, Fitting exponential curves, other type of curves by least square method.	
8,9 & 10	**Probability** **Introduction**: Sets, Subsets, Set operations, Vann Diagram, Cartesian Product of sets, Random Experiment, Sample space and their types, Events and their types. **Definitions of Probability** Classical Definition, Relative Frequency Definition **Laws of Probability** Addition Law of Probability, Conditional Law of Probability, Multiplication Law of Probability, Dependent	Quiz No. 2 Assignment No. 2 Quiz No. 3

	and Independent Events, Total Probability Law and Baye's Law of Probability with its application in Computer Science and Engineering.	
11,12 & 13	**The concept of random variable** Types of random variables a) Discrete random variable b) Continuous random variable The probability function The probability density function The probability distribution Conditional *pdf* and conditional *cdf* **Important Discrete random variables** a) Binomial random variable b) Poisson random variable c) Geometric random variable d) multinomial random variable e) Discrete uniform random variable etc	Assignment No. 3 Quiz No. 4
14	**Important Continuous random variables** a) Exponential random variable b) Uniform random variable c) Normal random variable d) Laplacian random variable e) Cauchy random variable etc	Assignment No. 4 Quiz No. 5
15	The Expected value of a random variable The Expected value of a function of a random variable Mean and Variance of a) Binomial random variable b) Poisson random variable c) Geometric random variable d) Exponential random variable e) Uniform random variable f) Normal random variable etc Application of the expected value of a random variable	Assignment No. 5
16	The concept of multiple random variable The joint probability function The joint probability density function The joint cumulative probability distribution The joint probability distribution Marginal probability density function of X and Y Expected value of a function of two random variables The Covariance of two random variables The Correlation of two random variables Application of correlation and covariance of random variables Moment generating function and its application in random variables, Characteristic function and its use in random variable.	
	Final Term Examination	