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| <b>Department</b>                       | Department of Sciences & Humanities                                | <b>Dept. Code</b>  | SH     |
| <b>Course Title</b>                     | Probability & Statistics (CS/DS/SE)                                | <b>Course Code</b> | MT2005 |
| <b>Pre-requisite(s)</b>                 | -  | <b>Credit Hrs.</b> | 3      |
| <b>Moderator</b>                        | Ms Sarah Ahmad   |                    |        |
| <b>Course Instructors (Spring 2025)</b> | Ms Sarah Ahmad, Ms Kanwal Saleem, Dr. Nushat Aftab, Ms. Huma Akbar |                    |        |
| <b>Note:</b>                            | It is a tentative schedule of course. It may vary (if required).   |                    |        |

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|-------------------------|---|
| <b>Course Objective</b> | To understand the basic concepts and tools of statistics & probability and to apply them for the analysis of problems in computer sciences. |
|-------------------------|---|

| No. | Assigned Program Learning Outcome (PLO) | Level | Tool |
|-----|---|-------|------|
| 01  |   |       |      |

I = Introduction, R = Reinforcement, E = Evaluation.

A = Assignment, Q = Quiz, M = Midterm, F=Final,

| No. | Course Learning Outcome (CLO) Statements   | Tools        |
|-----|--|--------------|
| 1   | <ul style="list-style-type: none"> <li><b>Statistical Data Interpretation:</b> Analyze and interpret various data types by computing measures of central tendency and dispersion, constructing frequency distributions, and utilizing graphical techniques for precise data representation.</li> </ul> | A,Q1,M1,F    |
| 2   | <ul style="list-style-type: none"> <li><b>Probability and Distribution Analysis:</b> Apply foundational principles of probability to analyze experiments, including Bayes' theorem, evaluate discrete and continuous distributions, and explore applications in machine learning.</li> </ul>           | A,Q2,M1,M2,F |
| 3   | <ul style="list-style-type: none"> <li><b>Inferential and Predictive Analysis:</b> Estimate parameters, perform hypothesis testing, and employ regression analysis to model relationships between variables, assess coefficient significance, and confidently predict future outcomes.</li> </ul>      | A,Q3, F      |

|                     |                  |   |
|---------------------|------------------|---|
| <b>Text Book(s)</b> | <b>Title</b>     | Probability and Statistics for Engineers and Scientists 9th ed.   |
|                     | <b>Author</b>    | R. E. Walpole, R. H. Myers, S.L. Myers and Keying Ye              |
|                     | <b>Publisher</b> | Prentice Hall, 2011   |
| <b>Ref. Book(s)</b> | <b>Title</b>     | Probability and Statistics for Engineering and the Sciences       |
|                     | <b>Author</b>    | Jay Devore  |
| <b>Ref. Book(s)</b> | <b>Title</b>     | Statistics for Business and Economics. 2003 (11 <sup>th</sup> Ed) |
|                     | <b>Author</b>    | David R. Anderson, Dennis J. Sweeney, Thomas A. Williams.         |



| Week               | Course Contents  | Chapter | CLO |
|--------------------|--|---------|-----|
| 01                 | Basic Introduction, Types of variables, Data types, Group vs Ungroup data, Measurement Scales, sample, population, dataset. Summarization of data into tabular form; Freq dist for qualitative data, quantitative/discrete freq dist, C.F dist, Graphical representation of data: (Bar chart, Pie-chart) | 1       | 1   |
| 02                 | For Ungroup data: Mean, Median, Mode, Trimmed mean, Quartile, Percentile, Variance, Standard Deviation, Coefficient of variation, IQ range, Five point summary, Box-plot   | 1       | 1   |
| 03                 | For Group data: Construction of dist, Freq, P.F, R.F, C.F, Mean, Variance. Graphical representation of data: (Dot Plot, Histogram)   | 1       | 1   |
| 04                 | Introduction to probability, set theory, Tree diagram, Counting techniques (cross tab and joint prob table)  | 2       | 2   |
| 05                 | Probability of an event, addition law, Conditional Probability   | 2       | 2   |
| 06                 | Independence, Multiplicative rules, Bayes rule, Bayesian Spam Filter and Bayes application to Machine Learning   | 2       | 2   |
| <b>MID-TERM-I</b>  |  |         |     |
| 07                 | Concept of random variable, Discrete Probability Distributions and Cumulative Distribution Function (CDF), Mathematical Expectation and Variance   | 3,4     | 2   |
| 08                 | Continuous Probability Distribution and Cumulative Distribution Function (CDF) , Mathematical Expectation and Variance   | 3,4     | 2   |
| 09                 | Joint Probability Distribution for discrete, Marginal distribution of discrete, Statistical Independence.  | 3       | 2   |
| 10                 | Binomial, Hyper geometric and Poisson Distribution   | 5       | 2   |
| 11                 | Normal distribution, Area under the normal curve, Application of Normal distribution and Standard Normal Distribution  | 6       | 2   |
| <b>MID-TERM-II</b> |  |         |     |
| 12                 | Concept of estimation, Point estimation, interval estimation, confidence interval for mean, Introduction to Hypothesis testing: z-test and t test for single mean.   | 9,10    | 3   |
| 13                 | Introduction to Regression, SLR vs MLR concept, SLR application, correlation, Testing of correlation coef. coefficient of determination,   | 11,12   | 3   |
| 14                 | Testing of slope, Testing of overall regression significance using ANOVA   | 11      | 3   |
| 15                 | Revision of concepts and problem discussion  | 9-12    | 3   |
| <b>FINAL EXAM</b>  |  |         |     |



### Evaluation Procedure & Marks Distribution:

| Assessment Tools                                  | Total No.    | Weightage      |
|---|--------------|----------------|
| Q: Quizzes  | 3 (At least) | 10%            |
| A: Assignments/Tests/<br>Class Participation etc. | 3 (At least) | 10%            |
| M: Mid Term Exam                                  | 2 (I+II)     | 30% (15% each) |
| F: Final Exam                                     | 1            | 50%            |

**Grading policy: Relative** (Combined for the same degree program and instructor)

**Instructions:** Please regularly check your Flex portal for updates on marks and attendance. The following guidelines must be adhered to:

- **Marks Concerns:** Any issues regarding marks must be resolved within the same class/session when the evaluation is returned. After this period, no further queries will be entertained. Ensure that your updated marks are checked on Flex within one week. Each CLO has its own weightage in exams, and marks will be entered accordingly for each CLO.
- **Attendance:** Make sure your attendance is accurately recorded and updated within the same week. Afterward, no claims regarding attendance or Flex marks will be accepted.
- **Retake Policy:** There will be no retakes for quizzes, assignments, or tests. Only retakes for midterms and final exams will be considered for cases approved by the Exam Cell.