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| <b>Course Title</b>                              | <b>Probability and Statistics</b>   |               |            |
| <b>Course Code</b>                               | <b>MS-251N</b>  |               |            |
| <b>Credit Hours</b>                              | 3 (3,0)   |               |            |
| <b>Category</b>                                  | Mathematics & Supporting  |               |            |
| <b>Prerequisite</b>                              | None  |               |            |
| <b>Co-Requisite</b>                              | None  |               |            |
| <b>Follow-up</b>                                 | None  |               |            |
| <b>Course Learning Outcomes (CLOs)</b>           | At the end of the course, the students will be able to:   | <b>BT</b>     | <b>PLO</b> |
|  | CLO1: Know the concept and applications of probability and statistics.  | C1 (Know)     | 1          |
|  | CLO2: Describe expectation and distributions  | C2 (Describe) | 1          |
|  | CLO3: Solve single sample and one- and two- sample estimation.  | C3 (Apply)    | 1,3        |
|  | CLO4: Use regression techniques.  | C3 (Apply)    | 1,3        |
| <b>Syllabus</b>                                  | <p><b>Introduction:</b> 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. <b>Probability:</b> Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Independence, and the Product Rule, Bayes' Rule. Random Variables and Probability Distributions. <b>Mathematical Expectation:</b> Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables, Chebyshev's Theorem. <b>Probability Distributions:</b> Discrete Probability Distributions, Continuous Probability Distributions. <b>Fundamental Sampling Distributions:</b> Sampling Distributions and Data Descriptions, Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem. Sampling Distribution of <math>S^2</math>, t-Distribution, F-Quantile and Probability Plots. <b>Single Sample &amp; One- and Two-Sample Estimation Problems:</b> Single Sample &amp; One- and Two-Sample Tests of Hypotheses. The Use of P-Values for Decision Making in Testing Hypotheses (Single Sample &amp; One- and Two-Sample Tests). <b>Regression:</b> 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.</p> |               |            |
| <b>Suggested Instructional/ Reading Material</b> | <ol style="list-style-type: none"> <li>1. Dimitri P. Bertsekas, John Tsitsiklis, Introduction to probability, Athena Scientific, 2<sup>nd</sup> Edition, 2008, ISBN: 978-1886529236.</li> <li>2. Jay L. Devore, Probability and Statistics for Engineering and the Sciences, Cengage Learning, 9<sup>th</sup> Edition, 2015, ISBN: 978-1305251809.</li> <li>3. R.E. Walpole, R.H. Myers and S.L Myers, "Probability and Statistics for Engineers and Scientists", 9<sup>th</sup> Edition.</li> <li>4. MIT open courseware: <a href="https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/">https://ocw.mit.edu/courses/mathematics/18-05-introduction-to-probability-and-statistics-spring-2014/</a></li> </ol>   |               |            |