

## STAT 503 Probability and Mathematical Statistics

<b>Credit and Contact hours</b>	3 / 3 (Lectures), 0 (Tutorials), 0 (Laboratory)	
<b>Required, or Elective</b>	Required	
<b>Course Description</b>	The course covers the main concepts of probabilities with some applications. Then it covers the statistical distributions for both types (discrete and continuous). Next, sampling distribution is applied for mean and proportion. Finally, parameters estimate, and some testing of hypothesis methods are used.	
<b>Prerequisites or Co-requisites</b>	None	
<b>Course Learning Outcomes</b>	Students completing this course successfully will be able to:	
	<b>Course Learning Outcomes (CLOs)</b>	<b>Related Student Outcomes (SO)</b>
	<b>CLO1.</b> Recognize the main assumptions of probability. K1	<b>SO1</b>
	<b>CLO2.</b> Use the rules of probability. K1	<b>SO1</b>
	<b>CLO3.</b> Use the appropriate distribution with its applications. K1	<b>SO1</b>
	<b>CLO4.</b> Demonstrate parameters estimates with their confidence intervals and test hypothesis about them. K1	<b>SO1</b>
	<b>CLO5.</b> Conduct and interpret results based on statistical concepts. S1	<b>SO2</b>
<b>CLO6.</b> Use statistical tables to find probabilities. S1	<b>SO2</b>	
<b>Student Outcomes related to this Course</b>	SO 1 Recognize advanced engineering knowledge, concepts, and techniques to identify, interpret, and analyze complex and real-life engineering problems. SO 2 Provide solutions for complex and real-life engineering problems through critical thinking and the use of modern engineering tools, and identify their impact on social, global, cultural, environmental, safety, and economic factors.	
<b>Topics Covered</b>	<b>List of Topics</b>	<b>Related CLOs</b>
	1. Introduction and some simple concepts of statistics. Sample space, events, and counting sample points (combinations only)	<b>CLO 1</b>
	2. Probability of an event, additive rules. Conditional Probability, Multiplication Rule	<b>CLO 2</b>
	3. Independent random events. Random Variables (R.V.), Discrete Probability distributions	<b>CLO 3</b>
	4. Continuous Probability distributions. Mean of a Random Variable, Variance of a Random Variable.	<b>CLO 3</b>

	5. Moments of a Random Variable, Mean of a linear combinations of Random Variables. Chebychev's Inequality. <b>CLO 3</b>						
	6. Discrete Uniform distribution. Binomial distribution. Hypergeometric distribution. Poisson distribution. <b>CLO 3</b>						
	7. Normal distribution. Areas under the standard normal curve. Applications of the normal distribution <b>CLO 3</b>						
	8. Random Sampling, Some important statistics, Sampling distributions. Sampling distribution of the mean from normal populations, t-distribution <b>CLO 3</b>						
	9. Statistical Inference, Classical estimation methods, Estimation of the mean <b>CLO 4</b>						
	10. Estimating the difference between two means. Estimating of a proportion. Estimating of the difference between two proportions <b>CLO 4</b>						
	11. Testing statistical hypothesis, One- and Two-tail tests, Types of errors. Testing of means with known population variance, Relation to confidence intervals. <b>CLO 4</b>						
	12. Testing of means with unknown population variance, two sample testing, paired comparison. Testing of a single proportion and two proportions. <b>CLO 4</b>						
	13. Simple linear regression and Multiple regression, correlation and its applications <b>CLO 5</b>						
	14. ANOVA one and two ways and its applications <b>CLO 6</b>						
	15. Principal component analysis, clustering technique <b>CLO 6</b>						
<b>Textbook(s) and Other Required Material</b>	<ul style="list-style-type: none"> <li>Probability and Statistics for Engineers and Scientists. By: R.E.Walpole and R.H.MyersStudents</li> </ul>						
<b>Grading System</b>	<table> <tbody> <tr> <td>First Midterm Exam 30%</td> <td>30%</td> </tr> <tr> <td>Second Midterm Exam 30%</td> <td>30%</td> </tr> <tr> <td>Final Exam 40%</td> <td>40%</td> </tr> </tbody> </table>	First Midterm Exam 30%	30%	Second Midterm Exam 30%	30%	Final Exam 40%	40%
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<b>Instructors</b>	To be set by College of Science						
<b>Date of Review</b>	November, 2024						