

<b>Course Code:</b> <b>MAT1011</b>	<b>Course Title:</b> Applied Statistics	<b>TPC</b>	3	2	4
<b>Version No.</b>	3.1				
<b>Course Pre-requisites/ Co-requisites</b>	None				
<b>Anti-requisites (if any).</b>	MAT1014				
<b>Objectives:</b>	<ul style="list-style-type: none"> <li>1. To provide the case based (on company data) knowledge to understand the basics of statistics in in the field of engineering and mathematics.</li> <li>2. To understand the strength of relationship and model a linear relationship between dependent and independent variables of real-life problems.</li> <li>3. To summarize and interpret the decision regarding given data.</li> <li>4. To apply statistics in the real-life based problems.</li> </ul>				
	<b>CO's Mapping with PO's</b>				
	<b>Course Outcomes</b>	<b>Course Outcome Statement</b>	<b>PO's</b>		
	<b>CO1</b>	Understanding of statistical data and characterization of its all parameters	PO1		
	<b>CO2</b>	Presentation and interpretation of chance outcomes in terms of abstract statistical concepts that occur in a planned study or scientific investigation using theory as well as computing technology based tools.	PO1,PO3		
	<b>CO3</b>	Learn the important statistical random distribution functions and try to mimic or model the engineering, science, business and industry etc. related problems in terms of these functional distribution to find the meaningful solution.	PO1,PO2		
	<b>CO4</b>	Learn recent reliable and accurate statistical computational procedures for making inferences of a large variety of population parameters using known tabulated or software tools (R,Matlab etc.) computation.	PO3		
	<b>CO5</b>	Analyze the validity of relationship and model a linear relationship between dependent and independent random variables occur in real life situations.	PO1,PO2		
	<b>CO6</b>	Apply the understanding and the knowledge of statistical tools and properties to solve the real life problems.	PO1,PO6		
			<b>Total Hours of Instruction 45</b>		

<b>Module No. 1</b>	<b>Descriptive Statistics and Probability</b>	<b>9 Hours</b>
Introduction to Statistics- Data, Variable types, <b>Descriptive measures</b> - Measures of central tendency (Mean, Median and Mode), Measures of Dispersion (Standard deviation, Coefficient of Variation). <b>Probability</b> : Basics of Probability, Types of probability, Probability rules (Additional Rule, Multiplication Rule), Conditional probability, Probability Trees, Bayes' Rule.		
<b>Module No. 2</b>	<b>Modelling with Probability distributions</b>	<b>9 Hours</b>
Random Variables – Discrete & Continuous, Probability functions- mass function & density function. Expected value and Variance of Random variable, Properties of Expected values Discrete Probability Models- The Binomial Model, The Poisson Model and Continuous Probability Model-Normal Model.		
<b>Module No. 3</b>	<b>Exploring the Bi-variate Data- Correlation and Regression Analysis</b>	<b>9 Hours</b>
Bi-variate Random variables- Correlation, Types of Correlation, Measures of Correlation- Graphical and mathematical: Scatter diagram and Karl Pearson's correlation, Rank Correlation for non-repeated, repeated ranks. The linear model, Regression lines, Least Squares and Fitted Model.		
<b>Module No. 4</b>	<b>Inference for Decision Making - I</b>	<b>9 Hours</b>
Introduction to Hypothesis, Hypothesis test procedure, p-values and decision. Test of hypothesis for Proportion- single Proportion, Difference of Proportions. Testing hypothesis about Mean- the single sample- Z test and t-test, The two sample tests- comparing two means- Z test and t-test, Test for equality of variance- F-test. ANOVA: One-way analysis of variance (fixed-effect model)		
<b>Module No. 5</b>	<b>Inference for Decision Making -II</b>	<b>9 Hours</b>
Introduction to Non-parametric tests, Chi-Square test for Goodness of fit test, Chi-Square test for Goodness of fit test using Probability distributions, Chi-Square Test of Independence of Attributes. Wilcoxon signed rank test, Wald Wolfowitz Run test, Mann- Whitney U test, test for normality, Kolmogorov- Smirnov test.		
<b>Text Books:</b> 1. Mendenhall, William, Robert J. Beaver, and Barbara M. Beaver. <i>Introduction to probability and statistics</i> . Cengage Learning, 2020.		
<b>References</b> 1. R.E. Walpole, R.H. Mayers, S.L. Mayers and K.Ye, Probability and Statistics for engineers and scientists, 9th Edition, Pearson Education, 2018. 2. Douglas A. Wolfe, Grant Schneider, Intuitive Introductory Statistics, Springer, 2017. 3. Miller & Freund's, Probability and statistics for engineers, 8th edition, Pearson publication, 2018. 4. Richard I. Levin, David S. Rubin, Masood H. Siddiqui, Sanjay Rastogi, Statistics for Management, 8th Edition, Pearson Publications, 2018. 5. S. C. Gupta and V. K. Kapoor, Fundamentals of Applied Statistics, S. Chand, 2006. 6. Mark L. Berenson, David M. Levine, Kathryn A. Szabat, Basic Business Statistics Concept and Application, Thirteenth Edition, Pearson Education Limited, 2015. 7. Bruce L. Bowerman, Richard T. O'Connell, Emily S. Murphree, Business Statistics in Practice, Seventh Edition, McGraw-Hill, 2014. 8. Douglas C. Montgomery, George C. Runger, Applied Statistics and Probability for Engineers, Sixth Edition, John Wiley and Sons, 2014. 9. Norean R. Sharpe, Richard D. De Veaux, Paul F. Velleman, Business Statistics, Fourth Edition, Pearson Education. 2019.		

10. Richard D. De Veaux, Paul F. Velleman, David E. Bock, Intro Stats, Fifth Edition, Pearson, 2018.
11. Michael Barrow, Statistics for Economics, Accounting and Business Studies, Seventh Edition, Pearson, 2017.
12. Gibbons JD. 1985. Non-Parametric Statistical Inference. 2nd Ed. Marcel Dekker.
13. David J. Sheskin , Handbook of Parametric and Nonparametric Statistical Procedures, Fifth Edition, CRC press, 2020.

#### **List of Applications & Laboratory exercises**

Understanding of the concepts through LAB

1. Understanding and exploring the data: Amazon.com. (Module1)
2. Expected value of Random variables: Computer Inventory. (Module2)
3. Binomial model: Blood donor from the American Red Cross. (Module2)
4. Poisson model: Manufacturing quality. (Module2)
5. Normal model: The New York Stock Exchange, Cereal Manufacturer. Packaging Stereos. (Module2)
6. Correlation: Creating a scatterplot, Customer spending from a credit card company. (Module3)
7. Regression: Home size and Price in the real estate company. (Module3)
8. Regression: GDP growth. (Module3)
9. z-Test: Major League Baseball (MLB) season. (Module4)
10. z-Test: iPod reliability. (Module4)
11. t-Test: Insurance profits. (Module4)
12. t-Test: credit card promotions and spending. (Module4)
13. Chi-Square Test: Stock market patterns. (Module5)
14. F-Test: Consistency of blood glucose meter strips. (Module4)
15. F-Test: Listeners in the classical music radio stations. (Module5)
16. ANOVA: Effect of medicines. (Module4)
17. Applications of Non-parametric tests on real data sets. (Module5)
18. Application of K-S test in ball bearing fault diagnosis (Module5)
19. Application of K-S test to CMB data(Module5)
20. Application of Wilcoxon Signed test to Cholesterol levels data (Module5)
21. Application of Mann-Whitney U test to analysing the traffic flows (Module5)

<b>Mode of Evaluation</b>	Continuous Assessment (Quizzes, CATs, Assignments etc.).		
CAT-1	Weightage (in %)	20	
CAT-2	Weightage (in %)	20	
FAT	Weightage (in %)	20	
LAB Continuous Evaluation and LAB Report	Weightage (in %)	25	
Assignment /Project	Weightage (in %)	15	
	<b>Total</b>	<b>100</b>	
<b>Prepared By:</b>	<b>Department of Mathematics</b>		
<b>Recommended by the Board of Studies on</b>	15-11-2023		
<b>Date of Approval by the Academic Council</b>	11 <sup>th</sup> AC 22.11.23		