

Programme	BSc Statistics				
Course Code	STA2MN101 (P)				
Course Title	Probability theory I				
Type of Course	Minor				
Semester	II				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Students should have a strong foundation in algebra and calculus, including functions, differentiation, and integration. Basic knowledge about descriptive Statistics				
Course Summary	Students will acquire a comprehensive understanding of key statistical concepts; random variable, standard theoretical distributions and sampling distributions.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Define random variables and distinguish different types of random variables	R	C	Instructor-created exams / Quiz
CO2	Identify discrete and continuous probability function and analyze data to help entrepreneurial decisions using critical thinking skills.	R	C	Practical Assignment / Instructor-created exams
CO3	Describe standard theoretical distributions	R	F	Seminar Presentation / Group Tutorial Work/Instructor-created exams
CO4	Discuss various tools for association between the bivariate variables.	U	C	Instructor-created exams / Home Assignments
CO5	Distinguish between a population distribution and a sampling distribution and critically evaluate ethical implications of statistical methods aligning with human values.	U	F	One Minute Reflection Writing assignments, Instructor-created exams
CO6	Explain the calculation of correlation	U	P	Viva

	coefficient using spread sheet.			Voce/Instructor -created exams
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Module	Units	Content	Hrs (45 +30)	Marks (70)
I	DISCRETE RANDOM VARIABLES AND THEIR PROBABILITY DISTRIBUTIONS		12	15
	1	Random Variables- Discrete	1	
	2	Probability mass function, properties and problems	1	
	3	Cumulative distribution function and its properties	1	
	4	Mathematical expectation of a random variable, function of a random variable and properties of expectation	1	
	5	Properties of variance	1	
	6	Covariance	2	
	7	Moments (definition only), Moment Generating Function (Definition, Simple problems and Properties (without proof))	1	
	8	Binomial Distribution (Mean, variance, m.g.f., Simple Problems)	2	
	9	Poisson Distribution (Mean, variance, m.g.f., Simple Problems)	2	
	Sections from References: Unit 1: 5.1 & 5.3 [Ref 1] Unit 2: 5.3.1 [Ref 1] Unit 3: 5.2, 5.2.1, 5.3.2 [Ref 1] Unit 4: 6.1, 6.2, 6.3, 6.4 [Ref 1] Unit 5: 6.3 [Ref 1] Unit 6: 6.6 [Ref 1] Unit 7: 7.1, 7.1.2 [Ref 1] Unit 8: 8.4, 8.4.1 [Ref 1] Unit 9: 8.5, 8.5.2 [Ref 1]			
II	CONTINUOUS RANDOM VARIABLES AND THEIR PROBABILITY DISTRIBUTIONS		12	20
	10	Probability density function, properties and problems	2	

	11	Rectangular distribution (Mean and Variance)	2	
	12	Exponential distribution (Mean and Variance)	2	
	13	Normal Distribution (Moments, Moment Generating Function, Additive Property ,Area property and their problems)	6	
	Sections from References: Unit 10: 5.4, 5.4.1, 5.4.2 [Ref 1] Unit 11: 9.3.1 [Ref 1] Unit 12: 9.8, 9.8.1[Ref 1] Unit 13: 9.2, 9.2.5, 9.2.7, 9.2.8, 9.2.11[Ref 1]			
III	DESCRIPTIVE METHODS IN CORRELATION AND REGRESSION		10	20
	14	Simple correlation	3	
	15	Simple regression	3	
	16	Coefficient of determination	2	
	17	Curve linear regression	2	
	Sections from References: Unit 14: 10.1, 10.2, 10.3, 10.4, 10.4.1, 10.4.2 [Ref 1] Unit 15: 11.1, 11.2, 11.2.1, 11.2.2 [Ref 1] Unit 16: 11.2.6 [Ref 1] Unit 17: 11.3 [Ref 1]			
IV	SAMPLING DISTRIBUTIONS		11	15
	18	Parameter and Statistic, sampling distribution, standard error.	2	
	19	Distribution of sample mean	2	
	20	Chi- square distribution (definition, mean, variance, m.g.f, additive property)	4	
	21	F distribution (definition only)	1	
	22	t distribution	2	
	Sections from References: Unit 18: 14.3, 14.3.1, 14.3.2 [Ref 1] Unit 19: 4.2 [Ref 3] Unit 20: 4.3 [Ref 3] Unit 21: 4.4 [Ref 3] Unit 22: 4.5 [Ref 3]			
V	PRACTICUM		30	
	Do practice problems in spreadsheet from any 5 units of the given list and one additional problem decided by the teacher-in-charge, related to the content of the course. Other units listed here may be used as demonstrations of the concepts			

	taught in the course.			
1	Scatterplot and correlation			
2	Linear correlation coefficient r			
3	Regression			
4	Calculate factorials, permutations and combinations			
5	Concept of simulation			
6	Finding mean and variance of a probability distribution			
7	Methods for finding binomial probabilities			
8	Methods for finding Poisson probabilities			
	Sections from References: Unit 1: 2.4 [Ref 5] Unit 2: 2.4 [Ref 5] Unit 3: 2.4 [Ref 5] Unit 4: 4.4 [Ref 5] Unit 5: 4.5 [Ref 5] Unit 6: 5.1 [Ref 5] Unit 7: 5.2 [Ref 5] Unit 8: 5.3 [Ref 5]			

Books and References:

1. Gupta, S. C. and Kapoor, V. K. (2002). Fundamentals of Mathematical Statistics, 11th edition, Sulthan Chand, New Delhi
2. Prem S. Mann (2016), Introductory Statistics 9th Edition, Wiley
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
4. Neil A. Weiss, Introductory Statistics, 9th Edition, Addison Wesley Pearson Learning (2011)
5. Mario F Triola, Elementary Statistics using Excel, (2018), 6th edition.

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	3	-	-	-	2	3	2	-	-	-	-
CO 2	-	-	-	-	-	3	3	2	-	-	-	-
CO 3	-	-	-	-	-	2	2	3	-	-	-	-
CO 4	-	-	-	-	-	-	3	3	-	-	1	1

CO 5	-	2	-	3	2	-	2	-	1	-	2	-
CO 6	2	-	2	-	-	3	2	3	-	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments (20%)
- Final Exam (70%)

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓			✓
CO 4	✓	✓		✓
CO 5	✓	✓		✓
CO 6	✓			✓

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