Programme	BSc Statistics				
Course Code	STA2MN109 (P)				
Course Title	Theory of probability				
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	Knowledge of introductory statistics would be beneficial for students				

	to grasp the content covered in the course effectively.
Course Summary	Provide students with a foundational understanding of probability theory and its applications in statistical experiments, random variables, probability distributions, and sampling techniques.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Define statistical experiments, sample spaces, and events, and recognize their significance in modeling uncertain outcomes.	U	C	Instructor-created exams / Quiz
CO2	Utilize conditional probability and understand the concept of statistical independence to analyze probabilistic relationships between events.	U	F	Practical Assignment / Observation of Practical Skills/ Instructor-created exams
CO3	Define random variables and probability distributions, and analyze the distribution of discrete and continuous random variables, including calculating expectations and variances.	R	C	Seminar Presentation / Group Tutorial Work/ Instructor-created exams
CO4	Identify sampling biases and evaluate different types of non-probability sampling techniques, such as judgmental, convenience, quota, and volunteer sampling and analyze data to help entrepreneurial decisions using critical thinking skills.	U	C	Instructor-created exams / Home Assignments
CO5	Acquire a comprehensive knowledge of probability theory and its diverse applications in statistical experiments, random variables and critically evaluate ethical implications of statistical methods aligning with human values.	U	C	One Minute Reflection Writing assignments/ Instructor-created exams
CO6	Solve practical problems involving probability distributions using	Ap	P	Viva Voce/ Instructor-created exams

	spreadsheet.			

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)
# - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

COURSE CONTENT

Module	Units	Content	Hrs (45 +30)	Marks (70)
1		**PROBABILITY**	**12**	**20**
	1	Mathematical Preliminaries	1	
	2	Set theory	2	
	3	Permutation and combination	1	
	4	Definitions of probability	1	
	5	Addition theorem of probability	2	
	6	Multiplication theorem of probability	2	
	7	Independent events, multiplication theorem for independent events	2	
	8	Pairwise and mutual independence	1	
	Sections from References: Unit 1: 12.4 [Ref 1] Unit 2: 12.4.1 [Ref 1] Unit 3: 12.4.2 [Ref 1] Unit 4: 12.5, 12.6, 12.7 [Ref 1] Unit 5: 12.8 [Ref 1] Unit 6: 12.9 [Ref 1] Unit 7: 12.9.1, 12.9.2 [Ref 1] Unit 8: 12.10 [Ref 1]			
II		**RANDOM VARIABLES**	**10**	**15**
	9	Random variable, probability distribution of discrete and continuous random variable	2	

	10	Distribution function	2	
	11	Moments (definition only)	2	
	12	Mathematical Expectation	2	
	13	Variance and covariance	2	
	Sections from References: Unit 9: 13.1, 13.2, 13.3 [Ref 1] Unit 10: 13.4 [Ref 1] Unit 11: 13.5 [Ref 1] Unit 12: 13.6 [Ref 1] Unit 13: 13.8, 13.9 [Ref 1]			
III	**STANDARD DISTRIBUTIONS**		**12**	**20**
	14	Binomial distribution	2	
	15	Poisson distribution	2	
	16	Normal distribution	4	
	17	Areas under standard normal probability curve, Importance of normal distribution	4	
	Sections from References: Unit 14: 14.2, 14.2.1, 1.2.2, 1.2.3 [Ref 1] Unit 15: 14.3, 14.3.1, 14.3.2, 14.3.3 [Ref 1] Unit 16: 14.4, 14.4.1, 14.4.2 [Ref 1] Unit 17: 14.4.6, 14.4.7 [Ref 1]			
	SAMPLING		**11**	**15**
IV	**18**	Census, sample, principal steps in sample survey	2	
	19	Purposive Sampling	2	
	20	Simple random Sampling	3	
	21	Stratified random sampling	2	
	22	Systematic Sampling	2	
	Sections from References: Unit 18: 15.6, 15.8[Ref 1] Unit 19: 15.10.1 [Ref 1] Unit 20: 15.11 [Ref 1]			

	Unit 21: 15.12 [Ref 1] Unit 22: 15.13 [Ref 1]			
5	**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	Probability distribution		
	2	Probability histogram		
	3	Mean and variance of probability distribution		
	4	Finding binomial probabilities		
	5	Finding Poisson probabilities		
	6	Finding normal probabilities		
	7	Finding z scores from known areas		
	8	Find critical values		
	Sections from References: Unit 1: 5.1 [Ref 4] Unit 2: 5.1 [Ref 4] Unit 3: 5.1 [Ref 4] Unit 4: 5.2 [Ref 4] Unit 5: 5.3 [Ref 4] Unit 6: 6.1 [Ref 4] Unit 7: 6.1 [Ref 4] Unit 8: 6.1 [Ref 4]			
	Books and References: 1. Gupta, S. C.. (2015). Fundamentals of Statistics, Himalaya Publishing House. 2. James E. Burt_ Gerald M. Barber_ David L. Rigby - Elementary Statistics for Geographers-The Guilford Press (2009) 3. J. Chapman McGrew Jr., Arthur J. Lembo Jr., Charles B. Monroe - An Introduction to Statistical Problem Solving in Geography, Third Edition-Waveland Press, Inc. (2014) 4. Mario F Triola, Elementary Statistics using Excel.			

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	2	3	-	-	-	-	2	-	-	-	-	-
CO 2	-	-	-	-	2	-	-	-	3	-	-	-
CO 3	-	3	1	2	-	-	1	-	2	-	-	-
CO 4	-	-	2	-	-	2	-	-	-	-	3	-
CO 5	1	-	-	-	-	3	-	3	-	-	-	3
CO 6	-	-	3	-	-	-	-	-	-	2	-	-

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	✓			

Programme	BSc Statistics				
Course Code	STA3MN209 (P)				
Course Title	Statistical inference				
Type of Course	Minor				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic knowledge of random variable, probability, standard distributions				