

<b>Programme</b>	<b>B.Sc. Statistics</b>				
<b>Course Code</b>	<b>STA3MN210 (P)</b>				
<b>Course Title</b>	<b>Probability theory and sampling techniques</b>				
<b>Type of Course</b>	<b>Minor</b>				
<b>Semester</b>	<b>III</b>				
<b>Academic</b>	<b>200-299</b>				
<b>Level</b>					
<b>Course Details</b>	<b>Credit</b>	<b>Lecture per week</b>	<b>Tutorial per week</b>	<b>Practical per week</b>	<b>Total Hours</b>
	<b>4</b>	<b>3</b>	<b>-</b>	<b>2</b>	<b>75</b>
<b>Pre-requisites</b>	Understanding of basic algebraic operations and set theory. Familiarity with functions, graphs and their properties				
<b>Course Summary</b>	Through theoretical concepts and practical applications, students will develop the skills necessary to analyze uncertainty, conduct sample surveys, and implement statistical quality control methods				

#### Course Outcomes (CO):

<b>CO</b>	<b>CO Statement</b>	<b>Cognitive Level*</b>	<b>Knowledge Category#</b>	<b>Evaluation Tools used</b>
CO1	Familiarize fundamental terms to introduce probability, discuss different approaches to probability, concepts of independence and conditional probability	Ap	C	Instructor-created exams / Quiz
CO2	Understand definition and types of random variables, probability distribution, mathematical expectation with applications of discrete case	Ap	F	Practical Assignment / Observation of Practical Skills/ Instructor-created exams
CO3	Differentiate population and sample, discuss advantages and disadvantages of census and sampling methods and different types of important sampling methods	Ap	C	Seminar Presentation / Group Tutorial Work/ Instructor-created exams

CO4	Discuss measures of dispersion and correlation coefficient using R software and interpret their strength and direction.	Ap	F	Instructor-created exams / Home Assignments
CO5	Familiarize R code of computing measures of dispersion and correlation analysis with practices using datasets	Ap	P	Viva 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	Unit	Content	Hrs (45+30)	Marks
<b>I</b>	<b>Probability</b>		<b>10</b>	<b>15</b>
	1	Basic concepts of Probability, Classical definition of Probability, Axiomatic approach to Probability	2	
	2	Addition Theorem, Multiplication Theorem	3	
	3	Conditional Probability	3	
	4	Independence of events	2	
	<b>Sections from References:</b> Unit 1: 3.3-3.8 [Ref 1] Unit 2: 3.9,3.11 [Ref 1] Unit 3: 3.10[Ref 1] Unit 4: 3.11-3.15 [Ref 1]			
<b>II</b>	<b>Random Variables</b>		<b>8</b>	<b>15</b>
	5	Random Variables, Discrete and continuous random variables	2	
	6	Probability distribution, Distribution function (Applications in discrete case)	2	
	7	Mathematical expectation (Applications in discrete case)	2	
	8	Variance (Applications in discrete case)	2	
	<b>Sections from References:</b> Unit 5&6: 5.1-5.4.2 [Ref 1] Unit 7: 6.1-6.4 [Ref 1] Unit 8: 6.6 [Ref 1]			
<b>III</b>	<b>Sampling theory</b>		<b>19</b>	<b>25</b>
	9	Population and Sample	2	
	10	Census and Sampling Method	3	
	11	Advantages and Limitations of Sampling	1	
	12	Principal steps in sample survey	3	
	13	Sampling Errors	3	
	14	Non-Sampling Errors	3	

	15	Simple random sampling (Concept and Methods of selection)	1	
	16	Stratified random sampling	1	
	17	Systematic Sampling	2	
	<b>Sections from References:</b> Unit 9: 15.2,15.3,15.6 [Ref 1] Unit 10: 15.6,15.7[Ref 1] Unit 11: 15.8 [Ref 1] Unit 12: 15.9.1[Ref 1] Unit 13&14:15.10[Ref 1] Unit 15:15.11,15.11.1 [Ref 1] Unit 17: 15.12,15.12.1 [Ref 1] Unit 17: 15.13 [Ref 1]			
<b>IV</b>	<b>R programming</b>		<b>8</b>	<b>15</b>
	18	Range	2	
	19	Variance	2	
	20	Loops-Brief explanation	2	
	21	Pearson's correlation	1	
	22	Conditional Statements (Brief)	1	
	<b>Sections from References:</b> Unit 18&19: 2.1-2.3[Ref 3] Unit 20: 7.5 [Ref 2] Unit 21: 6.2 [Ref 2] Unit 22: 7.3 [Ref 2]			
<b>V</b>	<b>PRACTICUM</b>		<b>30</b>	
	Do practice problems in R software 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	Range		
	2	Mean Deviation		
	3	Quartile Deviation		
	4	Standard Deviation		
	5	Variance		
	6	Covariance		
	7	Correlation		
	8	Rank correlation		
	<b>Sections from References:</b> Unit 1,2: 2.1 [Ref 3] Unit 3: 2.2 [Ref 3] Unit 4,5: 2.3 [Ref 3] Unit 6,7,8: 6.2-7.5 [Ref 2]			
	<b>Books and References:</b> 1. Gupta, S. C. and Kapoor, V. K. (2020). Fundamentals of Mathematical Statistics, 12th edition, Sulthan Chand, New Delhi			

2. Douglas, Alex, Deon Roos, Francesca Mancini, Ana Couto, and David Lusseau. (2020), *An Introduction to R*. <https://intro2r.com/index.html>.

3. Sudha G Purohith, Sharad D Core, Shailaja R Deshmukh (2015), *Statistics Using R*.

### Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	2	0	2	0	2
CO2	3	1	2	0	3	0	2
CO3	3	1	2	1	3	0	3
CO4	3	1	3	3	2	0	3
CO5	3	1	3	3	3	0	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
CO1	✓	✓		✓
CO2	✓	✓		✓
CO3	✓	✓		✓
CO4	✓	✓		✓
CO5	✓			