

Course Title	Statistical inference using R				
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	Students should be comfortable with concepts such as probability distributions, random variables, and conditional probability.				
Course Summary	Upon completion of this course, students will be proficient in understanding and applying the concept of estimation and testing of hypothesis in statistics, allowing them to make informed decisions and draw reliable conclusions from sample data.				

### Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Articulate the purpose of estimation in making inferences about population parameters based on sample data and analyze data to help entrepreneurial decisions using critical thinking skills.	Ap	C	Instructor-created exams / Quiz
CO2	Explain the difference between point estimation and interval estimation	U	C	Practical Assignment / Observation of Practical Skills
CO3	Calculate and interpret confidence intervals for both population mean and proportion and critically evaluate ethical implications of statistical methods aligning with human values	Ap	F	Seminar Presentation / Group Tutorial Work/ Instructor-created exams
CO4	Explain how to formulate null and alternative hypotheses for different types of research questions	U	C	Instructor-created exams / Home Assignments
CO5	Introduce R software and discuss R code for various graphical representations of data.	U	F	One Minute Reflection Writing assignments/ Instructor-created

				ed exams
CO6	Apply estimation and hypothesis testing methods to real-world data sets.	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	Units	Content	Hrs (45 +30)	Marks (70)
<b>I</b>	<b>THEORY OF ESTIMATION</b>		14	25
	<b>1</b>	Point estimation	1	
	<b>2</b>	Unbiasedness	2	
	<b>3</b>	Consistency	2	
	<b>4</b>	Efficiency	2	
	<b>5</b>	Sufficiency	2	
	<b>6</b>	Methods of estimation	2	
	<b>7</b>	Interval estimation	1	
	<b>8</b>	Confidence limits for mean	1	
	<b>9</b>	Confidence limits for proportion	1	
	Sections from References: Unit 1: 16.1, 16.2, 16.2.1 [Ref 1] Unit 2: 16.2.2 [Ref 1] Unit 3: 16.2.3 [Ref 1] Unit 4: 16.2.4 [Ref 1] Unit 5: 16.6.5 [Ref 1] Unit 6: 16.2.6 [Ref 1] Unit 7: 16.4 [Ref 1] Unit 8: 16.4.2 [Ref 1] Unit 9: 16.4.3 [Ref 1]			
<b>II</b>	<b>TESTING OF HYPOTHESIS</b>		10	20
	<b>10</b>	Statistical hypothesis, Simple and composite hypothesis	2	
	<b>11</b>	Null and alternate hypothesis, Two types of errors, Level of significance, Critical region, one tailed and two tailed	2	

		tests		
	<b>12</b>	Large sample tests: Test for single proportion	3	
	<b>13</b>	Test of significance for a single mean	3	
	Sections from References: Unit 10: 16.6.1 [Ref 1] Unit 11: 16.6.3, 16.6.4, 16.6.5, 16.6.6, 16.6.7, 16.6.8 [Ref 1] Unit 12: 17, 17.2.1 [Ref 1] Unit 13: 17.3.2 [Ref 1]			
<b>III</b>	<b>CHI SQUARE TEST</b>		9	15
	<b>14</b>	Applications of Chi square distribution	2	
	<b>15</b>	Chi square test of goodness of fit	3	
	<b>16</b>	Chi square test for independence of attributes	4	
	Sections from References: Unit 14: 18.3 [Ref 1] Unit 15: 18.4 [Ref 1] Unit 16: 18.6 [Ref 1]			
<b>IV</b>	<b>INTRODUCTION TO R</b>		12	10
	<b>17</b>	Installation & Basic Mathematical Operations	2	
	<b>18</b>	R Preliminaries	1	
	<b>19</b>	Methods of Data Input	1	
	<b>20</b>	Graphical Representations (R Code)	2	
	<b>21</b>	Diagrammatic Representations (R Code)	3	
	<b>22</b>	Descriptive Measures (Mean, Median, Mode, Range, Standard deviation, variance)	3	
	Sections from References: Unit 19: 1.2&1.3 [Ref 5] Unit 20: 1.4 [Ref 5] Unit 21: 1.5&1.6 [Ref 5] Unit 22: 1.8,2.3 [Ref 5] Unit 23:2.2 [Ref 5] Unit 24: 2.4,2.5 [Ref 5]			
<b>V</b>	<b>PRACTICUM</b>		30	
	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	Basic mathematical operations and R preliminaries		
	2	Methods of data input		
	3	Data accessing or indexing		
	4	Built in functions in R		
	5	Graphical representations (R Code)		
	6	Diagrammatic representations (R Code)		
	7	Mean, Median, Mode		
	8	Range, Standard deviation, variance		
	Sections from References: Unit 1: 1.3&1.4 [Ref 5] Unit 2: 1.5 [Ref 5] Unit 3: 1.6 [Ref 5] Unit 4: 1.7 [Ref 5] Unit 5: 1.8 [Ref 5] Unit 6: 2.2 [Ref 5] Unit 7: 2.4 [Ref 5] Unit 8: 2.5 [Ref 5]			
<b>Books and References:</b> <b>1.</b> Gupta, S. C.. (2015). Fundamentals of Statistics, Himalaya Publishing House. <b>2.</b> Gupta, S. C. and Kapoor, V. K. (2002). Fundamentals of Mathematical Statistics, 11 <sup>th</sup> edition, Sulthan Chand, New Delhi <b>3.</b> Prem S. Mann (2016), Introductory Statistics 9 th Edition, Wiley <b>4.</b> The R book (2007) , Michael J. Crawley John Wiley Series <b>5.</b> Sudha G Purohith, Sharad D Core, Shailaja R Deshmukh (2015), Statistics Using R				

### 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	1	-	-	2	2	3	-	-	3	-
CO 2	-	2	-	3	2	3	3	3	1	-	-	-
CO 3	2	-	2	-	-	-	2	2	-	3	-	3

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