Four Year UG Program
Syllabus - Minor

Programme	BSc Statistics				
Course Code	STA1MN101 (P)				
Course Title	Descriptive Statistics for Data Science				
Type of Course	Minor				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic knowledge of data, variables, charts and graphs, Basic computer skills				
Course Summary	This course aims to equip students with a holistic understanding of different data types and probability, enabling them to make informed decisions and draw meaningful conclusions from data.				

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Describe different types of data	U	F	Instructor-created exams / Quiz
CO2	Compare and differentiate various types of data	U	C	Instructor-created exams / Home Assignments
CO3	Visualize different types of data and analyze data to help entrepreneurial decisions using critical thinking skills.	R	P	Seminar Presentation / Group Tutorial Work
CO4	Summarize various descriptive measures of data and critically evaluate ethical implications of statistical methods aligning with human values.	U	C	Instructor-created exams / Home Assignments
CO5	Define basic terms in probability	R	F	One Minute

				Reflection Writing assignments
CO6	Solving uncertainty with sample data with spread sheet	Ap	P	Viva-Voce/Practical Assignment/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	Hours (45 +30)	Marks (70)
I	**Introduction to Statistics**		**8**	**10**
	1	Basic terms and types of Variables	2	
	2	Collection of data- Primary and secondary data,	2	
	3	Methods of collecting primary data	2	
	4	Sources of Secondary data	2	
	Sections from References: Unit 1: 1.2&1.3 [Ref 3] Unit 2: 2.2 [Ref 2] Unit 3: 2.3 [Ref 2] Unit 4: 2.5 [Ref 2]			
II	**ORGANIZING AND GRAPHING DATA**		9	**15**
	5	Frequency Distribution	2	
	6	Cumulative Frequency distribution	2	
	7	Diagrammatic Representations	3	
	8	Graphical Representation of data	2	
	Sections from References: Unit 5: 3.3 [Ref 2] Unit 6: 3.5 [Ref 2] Unit 7: 4.3(4.3.2 to 4.3.7) - [Ref 2] Unit 8: 4.4(4.4.3 to 4.4.5)- [Ref 2]			
III	**NUMERICAL DESCRIPTIVE MEASURES**		**12**	**25**
	9	Measures of central tendency	1	
	10	Arithmetic Mean	2	
	11	Median and Mode	2	
	12	Geometric mean and Harmonic Mean	2	
	13	Partition values	1	

	14	Measures of dispersion	3	
	15	Skewness and Kurtosis (Concept only)	1	
	Sections from References: Unit 9: 2.4 [Ref 1] Unit 10: 2.5 [Ref 1] Unit 11: 2.6, 2.7 [Ref 1] Unit 12: 2.8, 2.9 [Ref 1] Unit 13: 2.11 [Ref 1] Unit 14: 2.13 [Ref 1] Unit 15: 2.16, 2.17 [Ref 1]			
IV	**PROBABILITY**		**16**	**20**
	16	Random Experiment, Sample Space, Events (Basic terminology), Three Conceptual Approaches to Probability	2	
	17	Addition theorem (for two and three events) and simple problems	2	
	18	Conditional probability	3	
	19	Multiplication theorem of probability	2	
	20	Independent events and its Multiplication Theorem	2	
	21	Pairwise and mutual independence (Concept and Problems)	2	
	22	Baye's theorem	3	
	Sections from References: Unit 16: 3.3, 3.4, 3.5, 3.6 & 3.8 [Ref 1] Unit 17: 3.9 [Ref 1] Unit 18: 3.10[Ref 1] Unit 19: 3.11 [Ref 1] Unit 20: 3.12, 3.13& 3.14 [Ref 1] Unit 21: 3.15[Ref 1] Unit 22: 4.2 [Ref 1]			
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	Types of data		
	2	Introduction to spreadsheet		
	3	Frequency distributions for organizing and summarizing data		
	4	Histograms		
	5	Graphs that enlighten and graphs that deceive		

	6	Measures of central tendency		
	7	Measures of dispersion		
	8	Measures of Relative Standing and Boxplots		
	Sections from References: Unit 1: 1.2 Ref [5] Unit 2: 1.4 Ref [5] Unit 3: 2.1 Ref [5] Unit 4: 2.2 Ref [5] Unit 5: 2.3 Ref [5] Unit 6: 3.1 Ref [5] Unit 7: 3.2 Ref [5] Unit 8: 3.3 Ref [5]			

Books and References:

1. Gupta, S. C. and Kapoor, V. K. (2020). Fundamentals of Mathematical Statistics, 12th edition, Sulthan Chand, New Delhi
2. Gupta, S. C. (2015). Fundamentals of Statistics, Himalaya Publishing House.
3. Prem S. Mann (2016), Introductory Statistics 9 th Edition, Wiley
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	1	2	-	-	2	-	2	-	-	-
CO 2	3	3	-	2	1	-	3	1	2	3	-	-
CO 3	1	2	-	2	-	-	2	-	2	-	-	-
CO 4	3	2	-	1	-	-	3	-	2	2	-	-
CO 5	3	2	-	-	-	-	3	-	2	-	-	-
CO 6	1	1	2	-	3	3	2	2	1	-	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	✓			

Programme	BSc Statistics				
Course Code	STA1MN109 (P)				
Course Title	Elementary statistics				
Type of Course	Minor				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic knowledge of mathematics, including algebra and calculus. Familiarity with geographical concepts and spatial data.				

Course Summary	To equip students with the fundamental principles of statistical analysis and their application in geographical contexts, enabling them to effectively analyze, interpret, and communicate spatial data.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Recognize the importance of statistical methods in geographical research and analysis.	U	C	Instructor-created exams / Quiz
CO2	Evaluate different types of data used in geography, including qualitative and quantitative variables, and analyze data to help entrepreneurial decisions using critical thinking skills.	Ap	F	Practical Assignment / Observation of Practical Skills/ Instructor-created exams
CO3	Calculate and interpret measures of central tendency, such as mean, median, and mode, and measures of dispersion, including range, variance, and standard deviation, in the context of geographical data analysis.	Ap	F	Seminar Presentation / Group Tutorial Work/ Instructor-created exams
CO4	Analyze higher-order moments or other numerical measures of the characteristics of distributions, such as skewness and kurtosis, and interpret their implications for spatial patterns and trends and critically evaluate ethical implications of statistical methods aligning with human values.	U	C	Instructor-created exams / Home Assignments
CO5	Introduce the concepts of correlation and regression analysis and their applications in geography, including assessing the strength and direction of relationships between variables and making predictions based on statistical models.	U	C	One Minute Reflection Writing assignments/ Instructor-created exams
CO6	Demonstrate measures of central	Ap	P	Viva Voce/ Instructor-creat

	tendency using spreadsheet.			ed 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)				

COURSE CONTENT

Module	Unit	Content	Hours (45 +30)	Marks (70)
1		**STATISTICS AND GEOGRAPHY**	**10**	**15**
	1	Statistical Analysis and Geography	1	
	2	Data, sources of data, internal data, external data, primary and secondary data, meta data	2	
	3	Data collection, characteristics of data sets	2	
	4	Quantitative and qualitative data sets	1	
	5	Measurement Evaluation: Validity, accuracy, precision	2	
	6	Data and Information	1	
	Sections from References: Unit 1: 1, 1.1 [Ref 1] Unit 2: 1.2 [Ref 1] Unit 3: 1.2 [Ref 1] Unit 4: 1.2 [Ref 1] Unit 5: 1.3 [Ref 1] Unit 6: 1.4 [Ref 1]			
2		**DISPLAYING AND INTERPRETING DATA**	**12**	**15**
	7	Organization of data	2	
	8	Classification	2	
	9	Frequency distribution	2	

	10	Basic principles for forming a groupes frequency distribution	2	
	11	Cumulative and bivariate frequency distribution	2	
	12	Tabulation, requisites of a good table	2	
	Sections from References: Unit 7: 3.1 [Ref 2] Unit 8: 3.2 [Ref 2] Unit 9: 3.3, 3.3.1, 3.3.2, 3.3.3, 3.3.4 [Ref 2] Unit 10: 3.4, 3.4.1, 3.4.2, 3.4.3, 3.4.4 [Ref 2] Unit 11: 3.5, 3.5.1, 3.5.2, 3.6 [Ref 2] Unit 12: 3.7, 3.7.2 [Ref 2]			
3	**REPRESENTATIONS OF DATA**		**14**	**25**
	13	Types of diagrams	1	
	14	Graphical representation of data	3	
	15	Limitations of diagrams and graphs	1	
	16	Measures of Central Tendency:	4	
	17	Selection and limitations of an average	2	
	18	Measures of Dispersion	3	
	Sections from References: Unit 13: 4.3.2, 4.3.3, 4.3.44.3.6, 4.3.7 [Ref 2] Unit 14: 4.4.2, 4.4.3, 4.4.4 [Ref 2] Unit 15: 4.5 [Ref 2] Unit 16: 5.4,5.6, 5.7, 5.8, 5.9, 5.10 [Ref 2] Unit 17: 5.12, 5.13 [Ref 2] Unit 18: 6.5, 6.6, 6.9 [Ref 2]			
4	**CORRELATION AND REGRESSION**		**10**	**15**
	19	Correlation	2	
	20	Correlation coefficient	2	

	21	Regression	3	
	22	Lines of regression	3	
	Sections from References: Unit 19: 8.1, 8.1.1, 8.1.2, 8.3 [Ref 2] Unit 20: 8.4 [Ref 2] Unit 21: 9.2 [Ref 2] Unit 22: 9.3, 9.3.1, 9.3.2, 9.3.4 [Ref 2]			
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	Types of data		
	2	Introduction to spreadsheet		
	3	Frequency distributions for organizing and summarizing data		
	4	Histograms		
	5	Graphs that enlighten and graphs that deceive		
	6	Measures of central tendency		
	7	Measures of dispersion		
	8	Measures of Relative Standing and Boxplots		
	Sections from References: Unit 1: 1.2 Ref [5] Unit 2: 1.4 Ref [5] Unit 3: 2.1 Ref [5] Unit 4: 2.2 Ref [5] Unit 5: 2.3 Ref [5] Unit 6: 3.1 Ref [5] Unit 7: 3.2 Ref [5] Unit 8: 3.3 Ref [5]			
	Books and References: 1. James E. Burt_ Gerald M. Barber_ David L. Rigby - Elementary Statistics for Geographers-The Guilford Press (2009) 2. Gupta, S. C.. (2015). Fundamentals of Statistics,			

	Himalaya Publishing House. 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	-	-	-	-	3	-	-	-	-	-
CO 2	-	2	-	-	-	-	-	-	-	-	2	-
CO 3	-	-	-	-	-	3	-	3	-	-	-	-
CO 4	1	-	-	-	2	-	-	-	-	-	-	3
CO 5	-	2	3	1	-	-	-	-	2	1	-	-
CO 6	-	-	3	-	-	2	-	-	-	2	3	-

Correlation Levels:

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

Programme	BSc Statistics				
Course Code	STA1MN110 (P)				
Course Title	Basic statistics and data visualization				
Type of Course	Minor				
Semester	I				
Academic Level	100 - 199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours
	4	3	-	2	75
Pre-requisites	Basic mathematical knowledge, skills in logical thinking and problem solving				

Course Summary	Through theoretical concepts and practical applications, students will develop the skills necessary to classify data, organize frequency distributions, and calculate and interpret measures of central tendency and dispersion.

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Define and differentiate between primary data and secondary data, and understand the advantages and disadvantages of each type in research and analysis.	U	C	Instructor-created exams / Quiz
CO2	Classify data into quantitative and qualitative categories and recognize their characteristics and appropriate analysis techniques and analyze data to help entrepreneurial decisions using critical thinking skills.	U	F	Practical Assignment / Observation of Practical Skills/ Instructor-created exams
CO3	Construct frequency distributions for discrete and continuous variables, including cumulative frequency distributions, to summarize and organize data effectively and critically evaluate ethical implications of statistical methods aligning with human values.	U	F	Seminar Presentation / Group Tutorial Work/ Instructor-created exams
CO4	Calculate positional values such as quartiles, deciles, and percentiles, and interpret their significance in understanding the distribution of data.	Ap	C	Instructor-created exams / Home Assignments
CO5	Apply measures of dispersion to assess the consistency or variability of data points within a data set and make comparisons between different data sets.	Ap	C	One Minute Reflection Writing assignments/ Instructor-created exams
CO6	Apply spreadsheet functions to calculate measures of central tendency and dispersion.	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 (70)
I	**Introduction of data**		**9**	**15**
	1	Types of data- Primary data, Secondary data, Quantitative data, Qualitative data, Discrete data, Continuous data	2	
	2	Frequency distributions for discrete and continuous variables- Cumulative frequency distribution	2	
	3	Histogram, Frequency Polygon	3	
	4	Frequency Curve, Ogives	2	
	Sections from References: Unit 1: 2.2-2.5 [Ref 3] Unit 2: 3.3 [Ref 3] Unit 3&4: 4.3-4.4 [Ref 3]			
II	**Measures of central tendency**		**9**	**15**
	5	Mean	2	
	6	Median, Mode	3	
	7	GM	2	
	8	HM	2	
	Sections from References: Unit 5: 2.5 [Ref 1] Unit 6: 2.6&2.7 [Ref 1] Unit 7: 2.8[Ref 1] Unit 8: 2.9[Ref 1]			
III	**Measures of dispersion**		**19**	**25**
	9	Positional values – Quartiles	2	
	10	Deciles	2	
	11	Percentiles	1	
	12	Range	1	
	13	Quartile deviation	3	
	14	Mean deviation	3	
	15	Standard deviation	3	
	16	Coefficient of variation	1	
	17	Coefficient of dispersion	3	
	Sections from References: Unit 9,10&11: 2.10,2.11[Ref 1] Unit 12,13,14&15: 2.12,2.13[Ref 1] Unit 16&17: 2.14[Ref 1]			
IV	**Statistical Quality Control**		**8**	**15**

	18	Concept of statistical quality control, assignable causes and chance causes, process control.	2	
	19	Construction of control charts, 3sigma limits	2	
	20	Control chart for variables: Mean chart and Range chart	2	
	21	Control chart for attributes: c chart	1	
	22	np chart	1	
	Sections from References: Unit 18: 25-1.1,1.2,2 [Ref 2] Unit 19: 25-3.1,3.2,3.3[Ref 2] Unit 20: 25:4.1,4.3[Ref 2] Unit 21: 25:5.4[Ref 2] Unit 22: 25:5.1[Ref 2]			
V	**PRACTICUM**		**30**	
	1	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. Types of data 2. Frequency distributions for organizing and summarizing data 3. Graphs of frequency distribution 4. Arithmetic mean 5. Median and Mode 6. Partition of values 7. Measure of dispersion 8. Different charts in quality control		
	Sections from References Unit 1: 1.2 Ref [4] Unit 2: 2.1 Ref [4] Unit 3: 2.2 Ref [4] Unit 4: 3.1 Ref [4] Unit 5: 3.2 Ref [4] Unit 6: 3.3 Ref [4] Unit 7: 3.4 Ref [4] Unit 8:2.2 Ref[4]			
Books and References:				

1. Gupta,S.C. and Kapoor,V.K.(2002).Fundamentals of Mathematical Statistics. , 11th edition, Sulthan Chand, New Delhi.
2. Gupta, P.K. and Man Mohan. (1987). Operations Research and Statistical Analysis, Third edition, Sultan Chand, New Delhi.
3. Gupta, S. C.(2015). Fundamentals of Statistics, Himalaya Publishing House.
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Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	2	-	-	-	-	1	-	-	-	-	-
CO 2	-	-	3	-	2	2	-	-	-	2	3	-
CO 3	-	-	-	-	-	-	2	-	-	-	-	3
CO 4	1	-	-	-	-	3	-	3	-	-	-	-
CO 5	-	3	2	2	-	-	-	-	3	-	-	-
CO 6							-	-	-	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	✓			