Programme	BS Computational Statistics and Data Analytics	Course Code	CSTAT-202	Credit Hours	3
Course Title	Inferential Statistics				

Course Introduction

Inferential Statistics: Building upon foundational statistics, inferential statistics focuses on making predictions and inferences about populations based on sample data. Students learn hypothesis testing, confidence intervals, and data analysis techniques to draw meaningful conclusions from data.

Learning Outcomes

By the end of this course, students will get to:

1. Learn the several types of sampling designs and their applications.

2. Know that how to construct the sampling distributions of various statistics.

3. Understand the concepts and applications of statistical methods employed to draw inferences about the population.

4. Have the basic ideas about rates and ratios.

Course Content		Assignments/Readings
Week 1	**Unit – I** Sampling designs of Simple random	
	Unit – II Systematic and Cluster Sampling	
Week 2	**Unit – III** Stratified	
	Unit – IV Judgment Sampling	
Week 3	**Unit – V** Quota Sampling	
	Unit – VI Random Numbers and their uses in sampling	
Week 4	**Unit – VII** Advantages of sampling	
	Unit – VIII Probability and non-probability sampling	
Week 5	**Unit – IX** Sampling Error	
	Unit – X Non-Sampling Error	
Week 6	**Unit – XI** Calculation of sample mean, proportion and variance of simple random samples	
	Unit – XII Calculation of stratified random samples	
Week 7	**Unit – XIII** Sampling distribution of a statistic and its standard error	

	Unit – XIV Distribution of sample mean	
Week 8	**Unit – XV** Distribution of sample proportion	
	Unit – XVI Difference between sample mean, sample proportion	
Week 9	**Unit – XVII** Central limit theorem with illustration (Proof not required).	
	Unit – XVIII Nature of statistical inference	
Week 10	**Unit – XIX** Point estimation of parameter	
	Unit – XX Properties of point estimator and its interpretation	
Week 11	**Unit – XXI** Null and alternative hypothesis	
	Unit – XXII Simple and composite hypothesis	
Week 12	**Unit – XXIII** Type I and Type II errors	
	Unit – XXIV Level of significance. P-value and power of test (only concept and definition)	
Week 13	**Unit – XXV** Acceptance and rejection regions	
	Unit – XXVI One sided and two sided tests, test procedure	
Week 14	**Unit – XXVII** Inference about single mean	
	Unit – XXVIII Difference Between Means For Paired And Un-Paired Observations For Small And Large Sample Sizes	
Week 15	**Unit – XXIX** Inference about proportion and difference between two proportions	
	Unit – XXX Determination of sample size	
Week 16	**Unit – XXXI** Application of Normal distribution and t-distribution	
	Unit –XXXII ANOVA	
Textbooks and Reading Material		

Text Books
1.	Beg, M.A., & Mirza, M.D. (2006). *Statistics, Theory and Methods*, Volume II, Carven Book House, Kutechery Road, Lahore.
2.	Casella, G., & Berger, R. L. (2021). *Statistical inference*. Cengage Learning.
3.	Chaudhry, S.M., & Kamal, S. (2010). *Introduction to Statistical Theory Part II*, Ilmi Kitab Khana, Urdu Bazar, Lahore.
4.	Hogg, R. V., McKean, J. W., & Craig, A. T. (2013). *Introduction to mathematical statistics*. Pearson Education India.

Suggested Readings
1.	Blumen. (2011). *Elementary Statistics* (8th ed.). McGraw Hill, New York.
2.	Crawshaw, J., & Chambers, J. (2014). *A concise course in advanced level Statistics with worked examples*. Nelson Thornes, Revised Edition.
3.	Johnson, R.A., & Wichern, D.W. (2003). *Business Statistics: Decision making with data*. John Wiley & Sons Inc.
4.	Levin, J., & Fox, J.A. (2013). *Elementary Statistics in Social Research* (12th ed.). Pearson Education.
5.	Levine, D.M., Kschbiel, T.C., & Berenson, M.L. (2009). *Business Statistics: A first course* (5th ed.). Pearson Education.
6.	Macfie, B.P., & Nufrio, P.M. (2006). *Applied Statistics for public policy*. Prentice Hall of India.

Teaching Learning Strategies
Class Lecture method, which includes seminars, discussions, assignments and projects. (Audio-visual tools are used where necessary)

Assignments: Types and Number with Calendar
According to the choice of respective teacher.

Assessment			
Sr. No.	**Elements**	**Weightage**	**Details**
1.	Midterm Assessment	35%	It takes place at the mid-point of the semester.
2.	Formative Assessment	25%	It is continuous assessment. It includes: Classroom participation, attendance, assignments, and presentations, homework, attitude and behavior, hands-on-activities, short tests, quizzes etc.
3.	Final Assessment	40%	It takes place at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.