Scheme of
B.Sc. Physical Science-(Statistics)
AND
B.A. Multidisciplinary-(Statistics)

(Scheme UG A2: Undergraduate Programs)

Semester 1

Course Code	Course Title	Course ID	L (Hrs)	T (Hrs)	P (Hrs)	L Credits	T Credits	P Credits	Total Credits	MARKS TI	MARKS TE	MARKS PI	MARKS PE	MARKS Total
Core Course(s)														
CC-A1	Descriptive Statistics	240/STAT/CC101	3	--	2	3	-	1	4	25	50	5	20	100

Semester 2

Course Code	Course Title	Course ID	L (Hrs)	T (Hrs)	P (Hrs)	L Credits	T Credits	P Credits	Credits	MARKS TI	MARKS TE	MARKS PI	MARKS PE	MARKS Total
Core Course(s)														
CC-A2	Probability Theory	240/STAT/CC201	3	--	2	3	-	1	4	25	50	5	20	100

Semester 3

Course Code	Course Title	Course ID	L (Hrs)	T (Hrs)	P (Hrs)	L Credits	T Credits	P Credits	Credits	MARKS TI	MARKS TE	MARKS PI	MARKS PE	MARKS Total
Core Course(s)														
CC-A3	Probability Distributions	240/STAT/CC301	3	--	2	3	-	1	4	25	50	5	20	100

Marks

Semester 4

Course Code	Course Title	Course ID	L (Hrs)	T (Hrs)	P (Hrs)	L Credits	T Credits	P Credits	Credits	MARKS TI	MARKS TE	MARKS PI	MARKS PE	MARKS Total
Core Course(s)														
CC-A4	Sampling & Design of Experiments	240/STAT/CC401	3	--	2	3	-	1	4	25	50	5	20	100

Semester 5

Course Code	Course Title	Course ID	L (Hrs)	T (Hrs)	P (Hrs)	L Credits	T Credits	P Credits	Credits	MARKS TI	MARKS TE	MARKS PI	MARKS PE	MARKS Total
Core Course(s)														
CC-A5	Elementary Inference	240/STAT/CC501	3	--	2	3	-	1	4	25	50	5	20	100

Semester 6

Course Code	Course Title	Course ID	L (Hrs)	T (Hrs)	P (Hrs)	L Credits	T Credits	P Credits	Credits	MARKS TI	MARKS TE	MARKS PI	MARKS PE	MARKS Total
Core Course(s)														
CC-A6	Operations Research	240/STAT/CC601	3	--	2	3	-	1	4	25	50	5	20	100

Marks

Semester-III			
Session: 2025-26			
Part A – Introduction			
Subject	Statistics		
Semester	III		
Name of the Course	Probability Distributions		
Course Code	CC-A3		
Course ID	240/STAT/CC301		
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC		
Course Learning Outcomes(CLOs)	After completing this course, the learner will be able to: 1. Explain and illustrate the concept of distribution function. 2. Understand various types of generating function and cumulants. 3. Explain and illustrate the concept of a discrete probability distribution. 4. Explain and illustrate the concept of a continuous probability distribution. 5. Apply various probability distributions to a variety of problems.		
Credits	**Theory**	**Practical**	**Total**
	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	25	5	30
End Term Assessment Marks	50	20	70
Examination Time	3 Hours	3 Hours	100
Part B - Course Content			

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	Bernoulli distribution: Definition and its moments. Binominal distribution: Definition, mean, mode, mean deviation about mean, moments, moment generating function (m.g.f.), characteristic function (c.f.), probability generating function (p.g.f.), additive property, cumulants.	12
II	Poisson Distribution: Definition , median, mode, moments, m.g.f., c.f. ,p.g.f, additive property of independent poisson variate and cumulants. Negative Binominal distribution: Definition, mean,, m.g.f., p.g.f., moments and cumulants.	11
III	Discrete uniform distribution. Geometric distribution: Definition, moments, m.g.f. and Lack of memory. Hypergeometric distribution: Definition, mean and variance . Continuous Uniform distribution: Definition, Moments, mean deviation, m.g.f. and c.f.	11
IV	Normal distribution: mode, median,moments, m.g.f., and c..f. , points of inflexion, mean deviation about mean, area property. Gamma distribution: m.g.f. properties of Gamma distribution, Beta distribution of first and second kind, Exponential Distribution.	11

Practical

The practical component of the course has two parts **(A) Problem Solving- Questions related to the following problems will be solved and their record will be maintained in the Practical Notebook:** 1. Problems related to Bernoulli distribution. 2. Problems related to Binomial distribution. 3. Problem related to Poisson distribution. 4. Problems related to Geometric distribution. 5. Problems related to Normal distribution. 6. Problems related to Gamma distribution.	30

(B) The following practicals will be done using mathematical software (such as Python with libraries like NumPy, SciPy and Matplotib or R) and their record will be maintained in the practical note book:

1. To fit Bernoulli distribution to the given data.
2. To fit Binomial distribution to the given data.
3. To fit Binomial distribution to the given frequency distribution.
4. To fit Poisson distribution to the given data.
5. To fit Poisson distribution to the frequency distribution using method of ordinates.
6. To fit Geometric distribution to the given data.
7. To fit Binomial distribution to the given data.
8. Problem based on area property of Normal distribution.
9. To fit Normal distribution to the given data.

Suggested Evaluation Methods

Internal Assessment:

➢ **Theory 25**

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 10
- Mid-Term Exam: 10

➢ **Practicum 5**

- Seminar/Demonstration/Viva-voce/Lab records etc.: 5

End Term Examination:

➢ **Theory 50**

- Written Examination

➢ **Practicum 20**

- Lab record, viva-voce, write up and execution of the program

Part C-Learning Resources

Recommended Books:

1. S. C. Gupta & V. K. Kapoor (2020). *Fundamental of Mathematical Statistics.* Sultan Chand & Sons.
2. J. E. Freund (1962) , *Mathematical Statistics (Prentice Hall).* Inc. Engle wood Cliffs, NJ.
3. R.V. Hogg, J. W. Mckean & A. T. Craig (2013). *Introduction to Mathematical Statistics.* Pearson Eduction India.
4. A. M. Goon, M. K. Gupta & B. Dasgupta (1975), *Fundamentals Of Statistics, Vol -I.* World Press Private Limited.

Semester-IV			
Session: 2025-26			
Part A – Introduction			
Subject	Statistics		
Semester	IV		
Name of the Course	Sampling & Design of Experiments		
Course Code	CC-A4		
Course ID	240/STAT/CC401		
Course Type: (CC/MIC/ MDC/ /VOC/AEC/VA C/SEC)	CC		
Course Learning Outcomes (CLOs)	After completing this course, the learner will be able to: 1. Concepts of census, sampling and sample surveys. Simple random sampling techniques, population parameter estimations, and use of random number tables. 2. Stratified random sampling methodologies, comparing and contrasting various allocation strategies. 3. Systematic random sampling, assessing its strengths, weaknesses, and distinguishing it from simple random sampling. 4. Fixed, random, and mixed effect models, perform ANOVA on one-way and two-way data, and test main effects and find expectations of sum of squares. 5. Experiment terminologies, concepts like blocks and replication, and design efficiency. They will grasp the need for experimental design and principles.		
	Theory	**Practical**	**Total**
Credits	3	1	4
Contact Hours	3	2	5
Internal Assessment Marks	25	5	30
End Term Assessment Marks	50	20	70

Examination Time	3 Hours	3 Hours	100

Part B - Course Content

Instructions for Paper- Setter Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking Course Learning Outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will contain 5 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question.

Unit	Topic	Contact Hours
I	**Sample Survey:** Concepts of census and sample survey, basic concepts in sampling. Sampling and Non sampling errors. Principal steps involved in a sample survey; limitation of sampling. **Some basic Sampling methods:** Simple Random Sampling (SRS) with and without replacement. Use of random number tables, determination of sample size, estimation of mean and its variance in case of simple random sampling. Estimators of proportions and ratios.	12
II	**Stratified random sampling:** Concept and importance of Stratified random sampling, estimation of population mean and its variance in the stratified random sampling. allocation of sample size, proportional allocation, optimum allocation. **systematic random sampling:** Principle of systematic random sampling, estimation of mean and its variance, comparison of Systematic random sampling with Simple random sampling,	11
III	**Analysis of variance (ANOVA):** Definition, assumptions of ANOVA test, one-way and two-way classifications for fixed effect model with one observation per cell. **Introduction to Design of Experiments:** Definitions of experiment, treatment, experimental unit and experimental error; need for design of experiments; concepts of blocks, replication, efficiency of a design and precision; significance of factors like size and shape of plots and blocks;	12
IV	**Completely Randomized Design (CRD) and Randomized Block Design (RBD):** Layout, applications and statistical analysis of CRD and RBD for one observation per cell, least square estimates of	10

	effects, expectation of sum of squares, critical differences, advantages and disadvantages of CRD and RBD, efficiency of RBD relative to CRD.	
	Practical	
	The practical component of the course has two parts **(A) Problem Solving- Questions related to the following problems will be solved and their record will be maintained in the Practical Notebook.** 1. Draw a random sample of size 5 from Normal Population with given mean and variance. 2. Determine which sampling method (with or without replacement) would result in a more efficient estimate of the population mean, given a fixed sample size and variability. 3. Estimates population mean and its variance using data obtained through stratified random sampling, employing proportional and Neyman allocation methods. 4. Estimates population mean and its variance using systematic random sampling and compare them with results from simple random sampling. 5. Draw a random sample from Chi square distribution with given degree of freedom. 6. Analyze the data using completely randomized design. 7. Analyze the data using randomized block design. 8. Determine the critical difference between means of any 30 two treatments/blocks in randomized block design. 9. Obtain the efficiency of RBD relative to CRD. **(B) The following practical will be done using mathematical software (such as Python with libraries like NumPy, SciPy, and Matplotlib or R) and their record will be maintained in the practical note book:** 1. Write a Python program to draw a random sample of size 5 from a normal distribution with a given mean and variance. 2. To write a Python function to compare sampling with and without replacement in terms of the efficiency of estimating the population mean for a fixed sample size and variability. 3. To write a Python program to estimate the population mean and its variance using stratified random sampling with proportional and Neyman allocation methods. 4. To write a Python program to estimate the population mean and its variance using systematic random sampling and compare the results with simple random sampling. 5. To write a Python program to draw a random sample from a Chi-square distribution with a given degree of freedom. 6. To write a Python program to analyse experimental data using a Completely Randomized Design (CRD).	**30**

7. To write a Python program to analyse experimental data using a Randomized Block Design (RBD).
8. To write a Python program to determine the critical difference between means of any two treatments or blocks in a Randomized Block Design and to compute the efficiency of RBD relative to CRD.

Suggested Evaluation Methods

Internal Assessment:

➢ **Theory 25**

- Class Participation: 5
- Seminar/presentation/assignment/quiz/class test etc.: 10
- Mid-Term Exam: 10

➢ **Practicum 5**

- Seminar/Demonstration/Viva-voce/Lab records etc.: 5

End Term Examination:

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Recommended Books:

1. S.C. Gupta & V.K. Kapoor (2014), *Fundamentals of Applied Statistics*. Sultan Chand & Sons.
2. D. Singh & F.S. Chaudhry (2020), *Sampling Techniques*. New age International.
3. W.G. Cochran (2007), *Sampling Techniques*. Wiley Publishers.
4. D. Raj & P. Chandhok (1998), *Sampling Theory*. Narosa Publishing House
5. D.C. Montgomery (2004), *Design and Analysis of Experiment*. Wiley Publishers.