PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM – 636011

DEGREE OF MASTER OF PHILOSOPHY

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR

M.PHIL. STATISTICS

(SEMESTER PATTERN)

(For Candidates admitted in the Colleges affiliated to Periyar University from 2017-2018 onwards)

REGULATIONS

OBJECTIVES OF THE COURSE

To provide course study to postgraduates in Statistics with a view to strengthen their foundations for undertaking Ph.D work in theoretical and Applied Statistics.

ELIGIBILITY FOR ADMISSION

Good academic record with first or Second class Master Degree in Statistics of Periyar University or in examinations recognized there equivalent to.

DURATION

The duration of the M.Phil course will be one year for full time and 2 years for part time.

COURSE STRUCTURE

(i) For Full time:

The M.Phil course will consist of two parts.

Part – I will be devoted to teaching of the courses. The written examination will be conducted at the end of first semester.

Part – II will be devoted to the writing of dissertation. Dissertation should be submitted at the end of second semester.

(ii) For Part time:

First year : course work only.

Part I : Theory examination (for all the three papers) will be held at the end of first semester in the second year.

Part II : Project / Dissertation evaluation at the end of II semester in the second year.

COURSE OF STUDY AND SCHEME OF EXAMINATION

S.No.	Paper Code	Subject Title	Exam Hours	Credits	University Examination		
					Internal (25%)	External (75%)	Total
		I SEMESTER					
1.	Paper I	Research Methodology	3	4	25	75	100
2.	Paper II	Advanced Statistical Inference	3	4	25	75	100
3.	Paper III	Guide Paper	3	4	25	75	100
		TOTAL		**12**			**300**
		II SEMESTER					
4.	Paper IV	Dissertation					
		Evaluation		8	By both exami - ners		150
		Viva-voce		4			50
		TOTAL		**12**			**200**
		TOTAL		**24**			**500**

QUESTION PAPER PATTERN

The Question paper is divided into two parts.

PART-A consists of 5 questions, one from each unit with internal choice. Each question carries 5 marks. All questions should be answered. Total marks for PART-A is 25.

PART-B consists of 5 questions, one from each unit with internal choice. Each question carries 10 marks. All questions should be answered. Total marks for PART-B is 50.

Evaluation of Dissertation

Internal Mark	:	50 marks
(For two reviews : 2 * 20 = 40 marks		
For seminar : 10 marks)		
Evaluation of Dissertation by both Examiners (Internal & External)	:	100 marks
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Total	:	150 marks

Viva-Voce

Internal Examiner & External Examiner	:	50 marks

Total	:	200 marks

Dissertation copies to be submitted	(i) to the university	=	2
	(ii) to the department	=	1
	(iii) to the guide	=	1
	(iv) to the student	=	1

	Total	**=**	**5**

Classification of Successful Candidates:

(i) Passing Minimum:

The performance of the students is indicated by letter grades and the corresponding grade point (GP), Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

Passing Minimum is 50% of the ESE and also 50% of the maximum of that paper.

(ii) Minimum Credits to be earned: 24 credits.

(iii) Marks and Grades:

The following table gives the marks, grade points, letter grades and classification to indicate the performance of the candidate.

Conversion of Marks to Grade Points and Letter Grade (Performance in a paper / course)

RANGE OF MARKS	GRADE POINTS	LETTER GRADE	DESCRIPTION
90-100	9.0-10.0	O	Outstanding
80-89	8.0-8.9	D+	Excellent
75-79	7.5-7.9	D	Distinction
70-74	7.0-7.4	A+	Very Good
60-69	6.0-6.9	A	Good
50-59	5.0-5.9	B	Average
00-49	0.0-4.9	U	Re-appear
ABSENT	0.0	AAA	ABSENT

Ci = Credits earned for course i in any semester.

Gi = Grade point obtained for course i in any semester

n = Refers to the semester in which such courses were credited.

a) Semester:

GRADE POINT AVERAGE (GPA) =

$$GPA = \frac{\text{Sum of the multiplication of grade points by the credits of the courses}}{\text{Sum of the credits of the courses in a semester}}$$

b) The Entire Programme:

CUMULATIVE GRADE POINT AVERAGE (CGPA) =

$$CGPA = \frac{\text{Sum of the multiplication of grade points by the credits of the entire programme}}{\text{Sum of the credits of the courses of the entire programme}}$$

CGPA	GRADE	CLASSIFICATION OF FINAL RESULT
9.5 – 10.0	O+	First Class – Exemplary
9.0 and above but below 9.5	O	
8.5 and above but below 9.0	D++	First Class with Distinction
8.0 and above but below 8.5	D+	
7.5 and above but below 8.0	D	
7.0 and above but below 7.5	A++	First Class
6.5 and above but below 7.0	A+	
6.0 and above but below 6.5	A	
5.5 and above but below 6.0	B+	Second Class
5.0 and above but below 5.5	B	
0.0 and above but below 5.0	U	Re-appear

* The candidates who have passed in the first appearance and within the prescribed semester of the M.Phil Programme are eligible.

The maximum duration for completion of the M.Phil Programme shall not exceed three years.

Commencement of this Regulation:

These regulations shall take effect from the academic year 2017-2018, ie., for students who are to be admitted to the first year of the course during the academic year 2017-2018 and thereafter.

Transitory Provision:

Candidates who were admitted to the M.Phil course of study before 2017-2018 shall not be permitted to appear for the examinations under these regulations.

M.Phil. STATISTICS
PART - I
PAPER I - RESEARCH METHODOLOGY

UNIT I

Definition of research – types of research – criteria for good research – research methods – research process.

Report writing – significance of report writing – steps involved in report writing – Types of report – layout of a report – Precautions for writing research reports.

UNIT II

Vector space over real field – subspaces – Rank of vector space and rank of matrices –Characteristic roots and vectors.

Generalized inverse – Moore & Penrose generalized inverse – existency and uniqueness. Quadratic forms – Real quadratic forms – Properties – Trace concepts & Kronecker product of matrices.

UNIT III

Probability measures –Basic concepts of probability- conditional probability. Random variables. Distribution function and their classifications.

UNIT IV

Convergence of sequence of random variables and their relationships. Radon-Nikodym theorem and its applications.

UNIT V

Characteristic function – properties. Inversion theorem and Continuity theorem. Concept of Law of Large Numbers and central limit theorem – Simple problems.

BOOKS FOR STUDY AND REFERENCE:

1. Kothari. C.R. (2004) — Research Methodology, New Age International (p) Ltd.
2. Rao. A.R. and Bhimasankaran.P. (1992) — Linear Algebra, Tata Mc Graw Hill Publishing company Ltd.
3. Graybill. F.A. (1983) — Matrices with Applications in Statistics, 2nd Edition, Wadsworth.
4. Ash. R.B. (2000) — Probability and Measure theory., 2nd edition, Academic Press.
5. Bhat. B.R. (1980) — Modern Probability Theory, Wiley Eastern Ltd.
6. Billingsley. P. (1966) — Probability and Measure, Wiley Publications.

QP Pattern: Unit wise internal choice with maximum 75 marks

Part A: 5 x 5 = 25 & Part B: 5 x 10 = 50

M.Phil. STATISTICS

PART - I

PAPER II - ADVANCED STATISTICAL INFERENCE

UNIT I

Sufficient statistics – Existence and construction of minimal sufficient statistics. Sufficiency and Completeness – Sufficiency and Invariance.

UNIT II

Minimum variance unbiased estimation. Locally minimum variance unbiased estimators. Unbiased estimation of location and scale parameters.

UNIT III

Strong consistency of Maximum Likelihood Estimators. Asymptotic efficiency of Maximum Likelihood Estimators. Best Asymptotically Normal estimators. BAN estimation for multi parameter exponential family.

UNIT IV

Uniformly Most Powerful Tests. Distributions with Monotone Likelihood Ratio. Generalization of Neymann-Pearson Fundamental lemma - LR test – Properties (asymptotic test only).

UNIT V

Unbiasedness of hypothesis testing- Similarity and completeness – UMP Unbiased tests for multi parameter exponential family.

BOOKS FOR STUDY AND REFERENCE:

1. Kale. B.K. (1999) — A First Course on Parametric Inference, Narosa Publishing Co.
2. Rohatgi. V. (1988) — An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd.
3. Rao. C.R. (1985) — Linear Statistical Inference and its applications, Wiley Eastern Ltd.
4. Lehmann. E.L. (1986) — Testing Statistical Hypothesis, John Wiley and Sons.
5. Lehmann. E.L. (1986) — Theory of Point Estimation, John Wiley and Sons.
6. Dudewicz. E.J. and Mishra. S.N. (1988) — Modern Mathematical Statistics, Wiley Eastern Ltd.

QP Pattern: Unit wise internal choice with maximum 75 marks

Part A: 5 x 5 = 25 & Part B: 5 x 10 = 50

MODEL QUESTION PAPER

(For the candidates admitted from 2017 - 2018 onwards)

M.Phil., DEGREE EXAMINATION

STATISTICS

First Semester

Paper I - RESEARCH METHODOLOGY

Time :Three hours Maximum:75 marks

PART A - (5 x 5 = 25 marks)

Answer ALL questions.

All questions carry equal marks.

1. (a) Define research.List out its types. (Or)
   (b) Explain the significance of report writing.
2. (a) If A and B are two matrices of same order, then show that (A+B) (A) + (B)
   (b) Distinguish between linearly dependent and independent sets of vectors.
3. (a) Define the distribution function of random variable and state its properties. (Or)
   (b) Define general probability space. Mention its properties.
4. (a) show that convergence in rth mean implies convergence in probability. (Or)
   (b) If $\{X_n\}$ converges in probability to X_1 and $\{X_n\}$ converges in probability to X_2 then show that X_1 and X_2 are equivalent.
5. (a) Define characteristic function. Write down its properties. (Or)
   (b) Find the characteristic function of standard Cauchy distribution.

PART B - (5 x 10 = 50 marks)

Answer ALL questions.

All questions carry equal marks.

6. (a) Explain in detail the criteria of a good research. (Or)
   (b) Discuss the layout of a research report.
7. (a) Prove that the number of linear independent solutions of the equation AX = 0 is (n - r), where r is the rank of m x n matrix A. (Or)
   (b) Write a note on definite quadratic form X' AX. If X' AX is positive definite, then prove that
   (i) det A > 0 and
   (ii) every principal minor of A is positive.
8. (a) State and prove Jordan decomposition theorem. (Or)
   (b) Define the empirical distribution function and its jump. Show that the number of Jumps of a distribution function is almost countable.
9. (a) State and prove Monotone convergence theorem. (Or)
   (b) Define convergence in probability and convergence in distribution. Also prove that the convergence in probability implies convergence in distribution.
10. (a) State and prove Inversion theorem. (Or)
    (b) Discuss Kolmogorov strong law of large numbers.