KANNUR UNIVERSITY
(Abstract)

B.Sc. Statistics Programme- Scheme, Syllabus and Pattern of Question Papers of Core, Complementary Elective and Generic Elective Course under Choice Based Credit and Semester System (Outcome Based Education System-OBE) in Affiliated colleges with effect from 2019 Admission-Implemented-Orders issued.

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Academic Branch

No.Acad.C2/12349/2019   Civil Station P.O Dated 20/06/2019
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Read:- 1.   U.O.No.Acad.C2/429/2017 dated10-10-2017
     2.   The Minutes of the Meeting of the Curriculum Restructuring Committee held on 28-12-2018.
     3.   U.O No.Acad.C2/429/2017 Vol.II dated .03-06-2019
     4.   The Minutes of the meeting of the Board of Studies in Statistics(UG) held on 06-06-2019
     5.   Submission of the Syllabus by the Chairperson, Board of Studies in Statistics (UG) dated 13/06/2019

ORDER

1. A Curriculum Restructuring Committee was constituted in the University vide the paper read (1) above to co-ordinate the activities of the Syllabus Revision of UG programmes in Affiliated colleges of the University.

2. The meeting of the Members of the Curriculum Restructuring Committee and the Chairpersons of different Boards of Studies held, vide the paper read (2) above, proposed the different phases of Syllabus Revision processes such as conducting the meetings, of various Boards of Studies, Workshops and discussions.

3. The Revised Regulation for UG programmes in Affiliated colleges under Choice Based Credit and Semester System(in OBE-Outcome Based Education System) was implemented with effect from 2019 Admission as per paper read (3) above.

4. Accordingly, as per paper read (4) above, the Board of Studies in Statistics (UG) finalized the Scheme, Syllabus & Pattern of Question Paper of Core, Complementary Elective & Generic Elective Course of B.Sc.Statistics Programme to be implemented with effect from 2019 Admission.

5. Subsequently, as per paper read (5) above, the Chairperson, Board of Studies in Statistics (UG) submitted the finalized copy of the Scheme, Syllabus & Pattern of Question Papers of B.Sc.Statistics Programme for implementation with effect from 2019 Admission.

6. The Vice Chancellor after considering the matter in detail and in exercise of the powers of the Academic Council conferred under Section 11(1) of Kannur University Act 1996 and all other enabling provisions read together with accorded sanction to implement the Scheme, Syllabus & Pattern of Question Paper(Core/Complementary Elective/Generic Elective Course) of B.Sc. Statistics programme under Choice Based Credit and Semester System(in OBE-Outcome Based Education System) in Affiliated colleges with effect from 2019 Admission, subject to reporting to the Academic Council.

7. The Scheme, Syllabus & Pattern of Question Paper of B.Sc. Statistics Programme are uploaded in the University website (kannuruniversity.ac.in)

Orders are issued accordingly.

Sd/-
DEPUTY REGISTRAR(ACADEMIC)
For REGISTRAR

To
The Principals of Colleges offering B.Sc. Statistics programme

Copy to:-
1. The Examination Branch (through PA to CE)
2. The Chairperson, Board of Studies in Statistics (UG)
3. PS to VC/PA to PVC/PA to Registrar
4. DR/AR-I, Academic
5. The Computer Programmer(for uploading in the website)
6. SF/DF/FC

Forwarded/By Order

SECTION OFFICER

KANNUR UNIVERSITY

BOARD OF STUDIES, STATISTICS (UG)

SYLLABUS FOR
BSc STATISTICS CORE,
COMPLEMENTARY ELECTIVE COURSE
FOR BSc MATHEMATICS / COMPUTER SCIENCE /
GEOGRAPHY / PSYCHOLOGY PROGRAMMES
AND GENERIC ELECTIVE COURSES

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(2019 ADMISSION ONWARDS)

KANNUR UNIVERSITY
VISION AND MISSION STATEMENTS

<u>Vision:</u> To establish a teaching, residential and affiliating University and to provide equitable and just access to quality higher education involving the generation, dissemination and a critical application of knowledge with special focus on the development of higher education in Kasargode and Kannur Revenue Districts and the Manandavady Taluk of Wayanad Revenue District.

<u>Mission:</u>

- ➢ To produce and disseminate new knowledge and to find novel avenues for application of such knowledge.

- ➢ To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.

- ➢ To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher education and to cater to the modern notions of equity, social justice and merit in all educational endeavors.

- ➢ To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative and infrastructural standards in such institutions.

- ➢ To build stronger community networks based on the values and principles of higher education and to ensure the region's intellectual integration with national vision and international standards.

- ➢ To associate with the local self-governing bodies and other statutory as well as non-governmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

PROGRAMME OUTCOMES (PO)

PO 1.Critical Thinking:
1.1. Acquire the ability to apply the basic tenets of logic and science to thoughts, actions and interventions.
1.2. Develop the ability to chart out a progressive direction for actions and interventions by learning to recognize the presence of hegemonic ideology within certain dominant notions.
1.3 Develop self-critical abilities and also the ability to view positions, problems and social issues from plural perspectives.

PO 2.Effective Citizenship:
2.1. Learn to participate in nation building by adhering to the principles of sovereignty of the nation, socialism, secularism, democracy and the values that guide a republic.
2.2. Develop and practice gender sensitive attitudes, environmental awareness, empathetic social awareness about various kinds of marginalization and the ability to understand and resist various kinds of discriminations.
2.3. Internalise certain highlights of the nation's and region's history. Especially of the freedom movement, the renaissance within native societies and the project of modernisation of the post-colonial society.

PO 3.Effective Communication:
3.1. Acquire the ability to speak, write, read and listen clearly in person and through electronic media in both English and in one Modern Indian Language
3.2. Learn to articulate, analyse, synthesise, and evaluate ideas and situations in a well-informed manner.
3.3. Generate hypotheses and articulate assent or dissent by employing both reasons and creative thinking.

PO 4.Interdisciplinarity:
4.1. Perceive knowledge as an organic, comprehensive, interrelated and integrated faculty of the human mind.
4.2. Understand the issues of environmental contexts and sustainable development as a basic interdisciplinary concern of all disciplines.
4.3. Develop aesthetic, social, humanistic and artistic sensibilities for problem solving and evolving a comprehensive perspective.

PREFACE

This syllabus is based on the Outcome Based Education (OBE) Curriculum proposed by the Kerala State Higher Education Council. Kannur University is implementing this revised syllabus from the academic year 2019 -2020.

KSHEC and Kannur University jointly conducted a three-day workshop (29-01-2019, 30-01-2019 & 31-01-2019) on OBE with the intention of setting up a suitable syllabus for this goal. The Board of Studies Statistics (UG) Kannur University further conducted a two-day workshop (9-05-2019 & 10-05-2019) for faculty members from various colleges of Kannur University for the proper restructuring of the curriculum. This proposed syllabus (Choice Based Credit and Semester System in OBE-system) is finalized after consulting with eminent academicians and researchers in the field of statistics. The new syllabus is sure to play a great role in equipping the students to meet the challenges of the present time through the development of their knowledge in statistics.

Sd/-

Anitha B

Chairperson

Board of Studies Statistics (UG)

Kannur University
Programme Specific Outcome of BSc Statistics

PSO 1: To cultivate statistical thinking among students by acquainting them with various statistical methods and its applications.

PSO 2: Be able to construct statistical models of real world problems and obtain their solutions.

PSO 3: To acquire a good knowledge in decision making and inferences.

PSO 4: To familiarize with statistical software packages and can serve as a data analyst in the public or private sector.

PART B:

STATISTICS COMPLEMENTARY ELECTIVE COURSES

[FOR B.Sc. MATHEMATICS / COMPUTER SCIENCE PROGRAMMES]

WORK AND CREDIT DISTRIBUTION

(2019 ADMISSION ONWARDS)

COURSE CODE	COURSE TITLE	SEMESTER	HOURS PER WEEK	CREDIT	EXAM HOURS	MARKS		
						CE	ESE	TOTAL
1C01 STA	BASIC STATISTICS	I	4	3	3	10	40	50
2C02 STA	PROBABILITY THEORY AND RANDOM VARIABLES	II	4	3	3	10	40	50
3C03 STA	PROBABILITY DISTRIBUTIONS	III	5	3	3	10	40	50
4C04 STA	STATISTICAL INFERENCE	IV	5	3	3	10	40	50

EVALUATION

ASSESSMENT	WEIGHTAGE
EXTERNAL	4
INTERNAL	1

INTERNAL ASSESSMENT

COMPONENT	WEIGHTAGE	REMARKS
COMPONENT 1 TEST PAPER	**3**	For each theory course there shall be a minimum of 3 written tests and the average mark of the best two tests is to be considered for internal mark. Each test paper may have duration of minimum one hour.
COMPONENT 2 ASSIGNMENT/ SEMINAR/VIVA	**1**	For each theory course each student is required to submit two assignments or to present a seminar or to attend a viva-voce. Assignments /seminar / viva-voce shall be evaluated on the basis of student performance.

COMPLEMENTARY ELECTIVE COURSE I: BASIC STATISTICS

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
I	1C01 STA	4	3	3

COURSE OUTCOME
Student should be able to
CO1: understand the different types of data.
CO2: compute various measures of central tendency, measures of variation.
CO3: analyse the relationship between two variables.
CO4: acquire knowledge in time series data and compute various index numbers.

Unit I : Statistical Methods - Scales of measurement - Nominal, Ordinal, Ratio and Interval, Collection of data, Primary and Secondary data, Census method, Sample survey method, Comparison of census method and sample survey method, Principal steps in a sample survey, Types of sampling - probability, restricted and non-restricted sampling, judgement and mixed sampling, SRSWOR, SRSWR, stratified and systematic random sampling(concepts only).

(12 Hrs.)

Unit II : Measures of Central Tendency Definition and properties of various measures of central tendency - A.M,weighted A.M, Median, Mode, G.M., H.M. and weighted averages, Partition values - Quartiles, Deciles, Percentiles, Dispersion - Definition and properties of various measures of dispersion - Range, Q.D, M.D, S.D, and relative measures of dispersion, Moments - raw moments, central moments and relation between them, Skewness and Kurtosis - Definition and various measures of skewness and kurtosis.

(30 Hrs)

Unit III: Correlation and Regression Analysis - Method of least squares - Fitting of linear, quadratic and exponential curves, Regression analysis - linear regression, fitting of regression lines, regression coefficients and their properties, Correlation analysis - Definition and properties of correlation coefficient, Rank correlation coefficient-formula and problems only, Definitions of partial and multiple correlation coefficients(trivariate case only).

(18 Hrs)

Unit IV: Time Series and Index Numbers- Time series - Meaning, need, components and models of time series, estimation of linear trend by moving average

method and least square method, Index numbers - Meaning and uses of index numbers, weighted index numbers - Laspeyer's, Paasche's and Fisher's index numbers, time reversal and factor reversal tests.

(12 Hrs)

Books for Study:

1. Gupta, S. C. & Kapoor, V. K. (1980). *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi.
2. Gupta, S. C. & Kapoor, V. K. (1994). *Fundamentals of Applied Statistics*, Sultan Chand & Sons, New Delhi.
3. Gupta, S. P. (2004). *Statistical Methods*, Sultan Chand & Sons, New-Delhi.

Books for Reference:

1. Mukhopadhyay, P. (1996). *Mathematical Statistics*, New Central Book Agency (P) Ltd., Kolkata.
2. Agarwal, B. L. (2006). *Basic Statistics*, 4th Edition, New Age International (P) Ltd., New Delhi.

Marks including choice:

Unit	Unit I	Unit II	Unit III	Unit IV	Total
Marks	10	20	15	15	60

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)
- **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)
- *Answer any 6questions* (*6questions x Marks 2 each=12*)

Part C - Essay (6 questions x Marks 3 each =18)
- *Answer any 4 questions* (*4 questions x Marks 3 each=12*)

Part D - **Long Essay** (4 questions x Marks 5 each =20)
- *Answer any 2 questions* (*2 questions x Marks 5 each=10*)

- **Total marks including choice -60**
- *Maximum marks of the course- 40*

COMPLEMENTARY ELECTIVE COURSE II: PROBABILITY THEORY AND RANDOM VARIABLES

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
II	2C02STA	4	3	3

COURSE OUTCOME
Student should be able to
CO 1: evaluate the probability of events.
CO 2: understand the concept of random variables with examples in real life
CO3: calculate the probability distribution of discrete and continuous random variables.
CO 4: understand the change of variable technique.

Unit I: Probability Theory-I
Random experiments, sample space, events, classical definition and frequency approach to probability, laws of events, sigma field, axiomatic definition of probability, probability space, addition theorem (2 and 3 events), Boole's inequalities.
(25 Hrs)

Unit II: Probability Theory-II
Conditional probability, multiplication theorem, independence of events, pair wise and mutual independence, Baye's theorem and its applications.

(18 Hrs)

Unit III: Random Variables - Discrete and continuous random variables, probability mass function and probability density function, distribution function - definition and properties, transformation of random variables-discrete and continuous.
(17 Hrs)

Unit IV: Bivariate Random Variables - Definitions, joint probability distributions, marginal and conditional distributions, independence of random variables, transformations of bivariate random variables.
(12 Hrs)

Books for Study:
1. Gupta, S. C. &Kapoor, V. K. (1980). *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi.

Books for Reference:
1. Rao, C. R. (1973). Linear Statistical Inference and its Applications, 2/e, Wiley, New York.

2. Dudewicz, E. J. & Mishra S. N. (1988). Modern Mathematical Statistics, John Wiley & Sons, New York.

3. Pitman, J. (1993). Probability, Narosa Publishing House, New Delhi.

4. Rohatgi, V. K. (1993). An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern, New Delhi. Hsu, H. P. (1997).

5. Hsu,H.P.(1997) Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes, The McGraw-Hill Companies, Inc., New York.

6. Lipschutz, S.& Schiller, J. J. (1998). Schaum's Outline of Theory and Problems of Introduction to Probability and Statistics, The McGraw-Hill Companies, Inc., New York.

Marks including choice:

Unit	Unit I	Unit II	Unit III	Unit IV	Total
Marks	20	15	15	10	60

About the Pattern of Questions:

Part A -   **Short answer**   (6 questions x Mark 1 = 6)

    • **Answer all questions**   (*6 questions x Mark 1 = 6*)

Part B -   **Short Essay**   (8 questions x Marks 2 each =16)

    • *Answer any 6questions*   (*6questions x Marks 2 each=12*)

Part C -   Essay   (6 questions x Marks 3 each =18)

    • *Answer any 4 questions*   (*4 questions x Marks 3 each=12*)

Part D -   **Long Essay**   (4 questions x Marks 5 each =20)

    • *Answer any 2 questions*   (*2 questions x Marks 5 each=10*)

    • **Total marks including choice -60**

    • *Maximum marks of the course- 40*

COMPLEMENTARY ELECTIVE COURSE III: PROBABILITY DISTRIBUTIONS

SEMESTER	COURSE CODE	HOURS PER WEEK	SEMESTER	COURSE CODE
III	3C03 STA	5	3	3

COURSE OUTCOME

Student should be able to
CO1: compute mathematical expectation of a random variable.
CO2: familiarize with different discrete probability distribution associated with real life situations.
CO3: understand the characteristics of different continuous distributions.
CO4: identify the appropriate probability model that can be used.

Unit I: Mathematical Expectation: Definition and properties of mathematical expectation, Addition and multiplication theorem on expectation, Expectation of functions of random variables, Moments - Definition of raw and central moments, relation between raw and central moments, Expectation of bivariate random variables, conditional mean and variance, Coefficient of correlation between random variables. Moment generating function - Definition and properties, Characteristic function - Definition and properties.

(22 Hrs)

Unit II: Discrete Distributions - Definition, moments, m.g.f., characteristic function, properties and different characteristics of discrete uniform distribution, Bernoulli distribution, Binomial distribution, Poisson distribution and Geometric distribution.

(25 Hrs)

Unit III: Continuous Distributions Definition, moments, m.g.f., characteristic function, properties and different characteristics of Uniform distribution, Normal distribution, Standard normal distribution, Exponential distribution, Gamma distribution with one and two parameters, Beta distributions of I and II kind.

(25 Hrs)

Unit IV: Sampling distributions - Definition, standard error, sampling distribution of sample mean and sample variance, Chi-square, Student's t and F distributions, Interrelations between chi-square, t and F distributions.

(18Hrs)

Books for Study:

1. Gupta, S. C. &Kapoor, V. K. (1980). *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi.
2. Goon, A. M., Gupta, M. K. & Dasgupta, B. (2003). *An Outline of Statistical Theory,* Volume I, 4[th]Edn, The World Press Pvt. Ltd., Kolkata.

Books for Reference:

1. John E. Freund (1980). *Mathematical Statistics*, Prentice Hall of India, New Delhi.

2. Rohatgi, V. K. (1993). *An Introduction to Probability Theory and Mathematical Statistics*, Wiley Eastern, New Delhi.

3. Mood, A. M., Graybill, F. A. &Boes, D. C. (2007). *Introduction to the Theory of Statistics*, 3[rd]Edn (Reprint). Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Marks including choice:

Unit	Unit I	Unit II	Unit III	Unit IV	Total
Marks	14	17	17	12	60

About the Pattern of Questions:

Part A - **Short answer** (6 questions x Mark 1 = 6)

• **Answer all questions** (*6 questions x Mark 1 = 6*)

Part B - **Short Essay** (8 questions x Marks 2 each =16)

• *Answer any 6questions* (*6questions x Marks 2 each=12*)

Part C - **Essay** (6 questions x Marks 3 each =18)

• *Answer any 4 questions* (*4 questions x Marks 3 each=12*)

Part D - **Long Essay** (4 questions x Marks 5 each =20)

• *Answer any 2 questions* (*2 questions x Marks 5 each=10*)

• **Total marks including choice -60**

• *Maximum marks of the course- 40*

COMPLEMENTARY ELECTIVE COURSE IV: STATISTICAL INFERENCE

SEMESTER	COURSE CODE	HOURS PER WEEK	CREDIT	EXAM HRS
IV	4C04 STA	5	3	3

COURSE OUTCOME
Student should be able to
CO 1: understand the uses of Chebychev's Inequality and Central Limit Theorem.
CO 2: apply various method of estimation
CO 3: understand the concept of testing statistical hypotheses and its importance in real life situation
CO 4: apply ANOVA

Unit I: Chebychev's Inequality and Law of Large Numbers Chebychev's Inequality and its applications, convergence in probability, Weak law of large numbers, Bernoulli's law of large numbers, Convergence in distribution and central limit theorem for IID random variables (Statement only).

(15 Hrs)

Unit II: Theory of Estimation Point estimation, Desirable properties of a good estimator, Cramer-Rao inequality (statement only), Methods of estimation - method of MLE and method of moments. Interval estimation - Confidence interval for mean, proportion, variance, difference of means, difference of proportions.

(25 Hrs)

Unit III : Testing of Hypotheses - Statistical hypotheses, Simple and composite hypotheses, Null and alternative hypotheses, Types of errors, Critical region, Size and power of test – Definition and problems, most powerful test, Neyman - Pearson lemma (without proof).

(20 Hrs)

Unit IV: Large and small sample tests - Test for mean, proportion, equality of means, equality of proportions, paired t-test, test for variance and equality of variance, Chi-square test for goodness of fit, test for independence of attributes, One-way ANOVA (assumptions and problem only).

(30 Hrs)

<u>**NOTE:**</u> **Numerical computations involved in Assignments submitted may preferably be done using any computer packages.**

Books for Study:

1. Gupta, S. C. & Kapoor, V. K. (1980). *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons, New Delhi.
2. Gupta, S. C. &Kapoor, V. K. (1994). *Fundamentals of Applied Statistics*, Sultan Chand & Sons, New Delhi.

Books for Reference:

1. John E. Freund (1980). *Mathematical Statistics*, Prentice Hall of India, New Delhi.
2. Rohatgi, V. K. (1993). *An Introduction to Probability Theory and Mathematical Statistics*, Wiley Eastern, New Delhi.
3. Medhi, J. (2005). *Statistical Methods-An Introductory Text*, New Age International (P) Ltd., New Delhi.
4. Spiegel, M. R., Schiller, J. J. &Srinivasan, R. A. (2013). *Schaum's Outline of Probability and Statistics*, 4thEdn. The McGraw-Hill Companies, Inc., New York.

Marks including choice:

Unit	Unit I	Unit II	Unit III	Unit IV	Total
Marks	10	17	13	20	60

About the Pattern of Questions:

Part A -   **Short answer**   (6 questions x Mark 1 = 6)

-   **Answer all questions**   (*6 questions x Mark 1 = 6*)

Part B -   **Short Essay**   (8 questions x Marks 2 each =16)

-   *Answer any 6questions*   (*6questions x Marks 2 each=12*)

Part C -   **Essay**   (6 questions x Marks 3 each =18)

-   *Answer any 4 questions*   (*4 questions x Marks 3 each=12*)

Part D -   **Long Essay**   (4 questions x Marks 5 each =20)

-   *Answer any 2 questions*   (*2 questions x Marks 5 each=10*)

-   **Total marks including choice -60**
-   *Maximum marks of the course- 40*