



KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್ & ಟಿ) ವಿಭಾಗ



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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/SSL-394A/2022-23/1056

Date: 23 SEP 2022

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2022-23ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳಿಗೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್
NEP-2020 ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ
ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 260 ಯುಎನ್ಇ 2019(ಭಾಗ-1), ದಿ:7.8.2021.
2. ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯ ಸಭೆಯ ಠರಾವುಗಳ ದಿನಾಂಕ: 06.09.2022
3. ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂ. 01, ದಿನಾಂಕ: 17.09.2022
4. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 22-09-2022

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2022-23ನೇ
ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ವಿಜ್ಞಾನ & ತಂತ್ರಜ್ಞಾನ ನಿಖಾಯದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸುಗಳ ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ
(NEP)-2020 ರಂತೆ 3 ಮತ್ತು 4ನೇ ಸೆಮೆಸ್ಟರ್ಗಳಿಗಾಗಿ ವಿಶೇಷ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ
ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಪ್ರಕಟಪಡಿಸಿದ್ದು, ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. www.kud.ac.in ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ
ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತಾ, ವಿದ್ಯಾರ್ಥಿಗಳು ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ
ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ / ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

Kud-2023/1056
ಕುಲಸಚಿವರು.

ಗೆ,

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ
ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:

1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿ.ಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ
ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.



Practical Subject

KARNATAK UNIVERSITY, DHARWAD

04 - Year B.Sc. (Hons.) Program

SYLLABUS

Subject: STATISTICS

[With effect from 2022-23]

DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM III & IV

OPEN ELECTIVE COURSE (OEC) FOR SEM III & IV

AS PER N E P - 2020

Karnatak University, Dharwad
Four Years Under Graduate Program in STATISTICS for B.Sc. (Hons.)
With effect from 2022-23

Sem	Type of Course	Theory/ Practical	Instruction hour per week	Total hours of Syllabus / Sem	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks	Credits
III	DSCC-5 033STA011	Theory	04hrs	56	02 hrs	40	60	100	04
	DSCC-6 033STA012	Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC-3 003STA051	Theory	03 hrs	42	02 hrs	40	60	100	03
IV	DSCC-7 034STA011	Theory	04 hrs	56	02 hrs	40	60	100	04
	DSCC-8 034STA012	Practical	04 hrs	52	03 hrs	25	25	50	02
	OEC- 4 004STA051	Theory	03 hrs	42	02 hrs	40	60	100	03
Details of the other Semesters will be given later									

B.Sc. Semester – III

Subject: STATISTICS
Discipline Specific Course (DSC)

The course STATISTICS in III semester has two papers (Theory Paper –I for 04 credits & Practical Paper -II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-3 (Theory): 033STA011

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-03	DSCC-5	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.3 (Theory): Title of the Course (Theory) : **033STA011: Calculus and Probability Distributions**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1 Judge continuity of a function, find integrations and solve problems of differentiability.
- CO 2 Solve problems of various analytical environments using different distributions and their properties.
- CO 3 Find sampling distributions of functions of random variables and explore their applications.

Syllabus- Course 3 (Theory): 033STA011: Title- Calculus and Probability Distributions	Total Hrs: 56
Unit-I : Calculus of one and more variables	14 hrs
Review of calculus of one variable: continuity, differentiability, mean value theorem and Taylor series expansion. Functions of several variables: Continuity, directional derivatives, differentials of functions of several variables, the gradient vector. The mean value theorem, a sufficient condition for the existence of the differential, partial derivatives of higher order and Taylor's formula. Applications of partial differentiation, Jacobians. Riemann integrals, integration by parts, mean value theorem. Multiple integrals and evaluation of multiple integrals by repeated integration, Mean-value theorem for multiple integrals. Sequences and Series of real numbers. convergence of sequences and series, tests for convergence of series. (Only results and applications)	
Unit-II Distribution of Random Variables (Two-dimensional)	14 hrs
Two dimensional random variables: Joint distribution, Marginal distribution and Conditional distributions of random variables, conditional expectation, covariance, correlation and moments. Distribution of functions of random variables using m.g.f. and distribution function. Transformation of variable technique (one and two variables). Chebyshev's inequality- proof and its use in approximating probabilities; Statements of Weak Law of Large Numbers; Convergence in law and Central Limit theorems – De-Moivre. (Some simple examples)	

Unit-III Probability Distributions-II	14 hrs
<p>Discrete distributions: Rectangular, Geometric, Negative Binomial, Hypergeometric, Multinomial- definition through probability mass function, mean, variance, moments, p.g.f., m.g.f., other properties and applications.</p> <p>Continuous distributions: Uniform, Gamma, Exponential, Beta (type 1 and type 2), Cauchy, Weibull- definition through probability density function, mean, variance, moments, m.g.f., other properties and applications.</p> <p>Bivariate normal distribution- definition through probability density function, marginal and conditional distribution.</p>	
Unit-IV Sampling Distributions and Simulation	14 hrs
<p>Definitions of random sample, parameter and statistic, sampling distribution of sample mean, standard error of sample mean, sampling distribution of sample variance, standard error of sample variance.</p> <p>Exact sampling distributions: Chi square distribution- mean, variance, moments, mode, additive property. Student's and Fisher's t-distribution- mean, variance, moments and limiting form of t distribution. Snedecor's F-distribution: mean, variance and mode. Distribution of 1/F. Relationship between t, F and χ^2 distributions.</p> <p>Introduction to simulation. Generation of random observations from Uniform, Exponential, Normal, Binomial, Poisson distributions using inverse-method and R-codes.</p>	

Books recommended.

1. Andre I Khuri (2003). Advanced Calculus with Applications in Statistics, Second Edition, John Wiley & Sons.
2. Ghorpade, S. R. and Limaye, B. V. (2006). A Course in Calculus and Real Analysis, Springer
3. Gupta S.C. and V.K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand and Co. 12th Edition.
4. Hogg, R. V. McKean J. W. and Craig, A. T. (2012), Introduction to Mathematical Statistics, Pearson 7th Edition.
5. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009), Probability and Statistical Inference, 10th Edition, Pearson Education, New Delhi.
6. Jay Kerns, G. (2010). Introduction to Probability and Statistics using R. 1st Edition, Springer.
7. Rohatgi, V.K. and A.K. Md. Ehsanes Saleh. (2002). An Introduction to Probability Theory and Mathematical Statistics, New York, John Wiley.
8. Ross, S. M. (2014). Introduction to Probability Models. 11th Edition, Elsevier science.
9. Ross, S. M. (2012). Simulation. Academic Press.
10. Shanthi Narayana (2000), Integral Calculus, S. Chand & Co. Ltd.
11. Shanti Narayana (2000). Differential Calculus, S. Chand & Co. Ltd.
12. Verzani, J. (2002). Simple R - Using R for Introductory Statistics.

B.Sc. Semester – III

Subject: STATISTICS
Discipline Specific Course (DSC)

Course No.-03 (Practical): 033STA012

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-03	DSCC-6	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.03 (Practical): Title of the Course (Practical): **033STA012: Practicals (based on DSCC-5: Calculus and Probability Distributions)**

Course Outcome (CO):

After completion of course (Practical), students will be able to gain:

- CO 1 Practical knowledge of handling various types of R-functions for calculus and probability distributions.
- CO 2 Practical knowledge of carrying out numerical analysis.
- CO 3 The knowledge of simulating random observations from various probability distributions using R.

List of the Experiments for 52 hrs / Semesters

Note: The first practical assignment is on R-programming. Practical assignments 2 to 10 have to be first solved manually (using scientific calculators) and executed using R-programming.

1. Demonstration of R functions for calculus, distribution of random variables, probability distributions, sampling distributions, simulation.
2. Numerical differentiation and integration.
3. Bivariate Probability Distributions - Marginal and Conditional distributions,
4. Bivariate Probability Distributions - Conditional Mean, Conditional Variance, Correlation.
5. Applications of Chebyshev's inequality (For standard distributions such as Normal, Exponential, Gamma).
6. Applications of discrete probability distributions - Negative – Binomial, Geometric, Hyper geometric and discrete uniform, multinomial distributions.
7. Applications of continuous probability distributions - Exponential, Gamma, Cauchy, Weibull distributions.
8. Fitting of discrete and continuous distributions.
9. Generating random sample from discrete distributions.
10. Generating random sample from continuous distributions.

General instructions:

Computation of all the practicals manually and using Excel

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

Students have to attempt 3 practical questions out of four practical questions given, each carrying 7 marks.

1. 7 Marks
2. 7 Marks
3. 7 Marks
4. Viva 2 Marks
5. Journal 2 Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Andre I Khuri (2003). Advanced Calculus with Applications in Statistics, Second Edition, John Wiley & Sons.
2. Ghorpade, S. R. and Limaye, B. V. (2006). A Course in Calculus and Real Analysis, Springer
3. Gupta S.C. and V.K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand and Co. 12th Edition.
4. Hogg, R. V. McKean J. W. and Craig, A. T. (2012), Introduction to Mathematical Statistics, Pearson 7th Edition.
5. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009), Probability and Statistical Inference, 10th Edition, Pearson Education, New Delhi.
6. Jay Kerns, G. (2010). Introduction to Probability and Statistics using R. 1st Edition, Springer.
7. Rohatgi, V.K. and A.K. Md. Ehsanes Saleh. (2002). An Introduction to Probability Theory and Mathematical Statistics, New York, John Wiley.
8. Ross, S. M. (2012). Simulation. Academic Press.
9. Verzani, J. (2002). Simple R - Using R for Introductory Statistics.

B.Sc. Semester – III

Subject: STATISTICS
Open Elective Course (OEC-3): 003STA051
(OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-3	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-3: **003STA051**: Title of the Course: **POPULATION STUDIES**

After completion of course, students will be able to:

CO 1 : Study the concepts of Vital Statistics, sources of data, different measures of Fertility, Mortality and migration.

CO 2 : Understand the Growth rates- GRR and NRR and their interpretations.

Syllabus- OEC: 003STA051: Title- POPULATION STUDIES	Total Hrs: 42
Unit-I Introduction and Sources of Population Data	14 hrs
History, definition, nature and scope of population Studies. Sources of population data – salient features of Census, Civil Registration System, National Sample Surveys, Demographic Surveys, relative merits and demerits of these sources. Coverage and content errors. Use of balancing equations, Chandrasekar-Deming formula to check completeness of vital registration data, use of Whipple’s, Myer’s and UN indices.	
Unit-II Fertility, Mortality	14 hrs
Basic concepts and terms used in the study of fertility. Measures of fertility- Crude Birth Rate (CBR), General Fertility Rate (GFR), Age Specific Fertility Rate (ASFR), Total Fertility Rate (TFR), Birth order statistics, Child Women ratio. Measures of reproduction- Gross Reproduction Rate (GRR)and Net Reproduction rate(NRR). Measurement of population growth rate- simple growth rate and compound growth. Basic concepts and terms used in the study of mortality. Measures of mortality- Crude Death Rate (CDR), Age Specific Death Rate (ASDR), Direct and Indirect Standardized Death rates, Infant Mortality Rate (IMR), Under-five mortality Rate, Neo-natal mortality rate, Post-natal mortality rate; Maternal Mortality Rate (MMR).	

Unit-III Life tables and Population change	14 hrs
<p>Life tables: Components of a life table, force of mortality and expectation of life table, types of life tables. Construction of life tables using Reed-Merrell's method, Greville's method. Uses of life tables.</p> <p>Basic concepts and definition of population change, migration. Types of migration- internal and international, factors affecting migration. Rates and ratios of Migration-Indirect measures of net-internal migration, national growth rate method, residual method, push-pull factors Population estimates and projections.</p>	

Books recommended.

1. Barclay, G, W(1968). Techniques of Population Analysis, John Wiley and Sons, Inc. New York/London.
2. Keyfitz, H (1968). Introduction to the Mathematics of Population. Addison-Wesley Publishing Co.
3. Pathak, K.B and Ram, F (1991).Techniques of Demographic Analysis, Himalaya Publishing House.
4. Ramakumar. R (1986). Technical Demography, Wiley Eastern Ltd.
5. Srinivasan. K (1998). Basic Demographic Techniques and Applications, Sage Publication, New Delhi.
6. Wunsch G.J. & M.G. Tarmota(1978). Introduction to Demographic Analysis, Plenum Press, N.Y.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

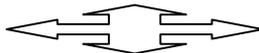
Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.



B.Sc. Semester – IV

Subject: STATISTICS
Discipline Specific Course (DSC)

The course **STATISTICS** in IV semester has two papers (Theory Paper –I for 04 credits & Practical paper-II for 2 credits) for 06 credits: Both the papers are compulsory. Details of the courses are as under.

Course No.-4 (Theory): 034STA011

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-04	DSCC-7	Theory	04	04	56 hrs	2hrs	40	60	100

Course No.4 (Theory): **034STA011**: Title of the Course (Theory) : **STATISTICAL INFERENCE-I**

Course Outcome (CO):

After completion of course (Theory), students will be able to:

- CO 1 Carryout statistical analysis by identifying families of distributions and the use of order statistics.
- CO 2 To find estimators using different methods of estimation and compare estimators.
- CO 3 To carryout statistical inference using different tests of hypotheses under different scenarios.

Syllabus- Course 4 (Theory): 034STA011: Title- STATISTICAL INFERENCE-I	Total Hrs: 56
Unit-I Point Estimation-I	14 hrs
Families of distributions- location and scale families. Single parameter exponential family. Concept of order statistics, Distribution of maximum and minimum order statistics (with proof) and rth order statistic (without proof). Concepts of estimator and estimate. Criteria for estimators: Unbiasedness, Consistency. Invariance property of consistent estimators. Efficiency and relative efficiency. Mean squared error as a criterion for comparing estimators. Sufficient statistics. Statement of Neyman-Factorization theorem.	
Unit-II : Point Estimation-II	14 hrs
Fisher information function. Statement of Cramer–Rao inequality and its applications. Minimum Variance Unbiased Estimator and Minimum Variance Bound Estimator. Maximum likelihood and method of moment estimation; Properties of MLE and moment estimators and examples. Method of Scoring, Rao-Blackwell theorem and examples.	

Unit-III Testing of Hypotheses	14 hrs
Statistical hypotheses - null and alternative, Simple and composite hypotheses. Type-I and Type-II errors, test functions. Randomized and non-randomized tests. Size, level of significance, Power function, power of tests. Critical region, p- value and its interpretation. Most Powerful (MP) and UMP test. Statement of Neyman-Pearson Lemma and its applications. Likelihood ratio tests. Large and small samples tests of significance. Tests for single mean, equality of two means, single variance and equality of two variances for normal populations. Tests for proportions.	
Unit-IV Interval Estimation	14 hrs
Confidence interval, confidence coefficient, shortest confidence interval. Methods of constructing confidence intervals using pivotal quantities. Construction of confidence intervals for mean, difference of two means, variance and ratio of variances, proportions, difference of two proportions and correlation coefficient.	

Books recommended.

1. Gupta S.C. and V.K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand and Co. 12th Edition.
2. Hogg, R. V. McKean J. W. and Craig, A. T. (2012), Introduction to Mathematical Statistics, Pearson 7th Edition.
3. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009), Probability and Statistical Inference, 10th Edition, Pearson Education, New Delhi.
4. Kale, B.K. (1999). A First Course on Parametric Inference, New Delhi, Narosa Publishing House.
5. Kendall, M.G., et. al., (1996).An Introduction to the Theory of Statistics, Universal Book Stall.
6. Rohatgi, V.K. and A.K. Md. Ehsanes Saleh. (2002). An Introduction to Probability Theory and Mathematical Statistics, New York, John Wiley.
7. Ross, S.M. (2014), Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, Academic Press.

B.Sc. Semester – IV

Subject: STATISTICS
Discipline Specific Course (DSC)
Course No.-4 (Practical) : 034STA012

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
Course-04	DSCC-8	Practical	02	04	52 hrs	3hrs	25	25	50

Course No.4 (Practical): **034STA012**: Title of the Course (Practical): **Practicals (Based On DSCC-7: Statistical Inference-I)**

Course Outcome (CO):

After completion of course (Practical), students will be able to gain :

- CO 1 Practical knowledge of computing the estimates and test statistics using R.
- CO 2 Practical knowledge of carrying out statistical inference with different tests of hypotheses.
- CO 3 Practical knowledge on carrying out MP and UMP tests using R.

List of the Experiments for 52 hrs / Semesters

Note: The first practical assignment is on R-programming and R packages. Practical assignments 2 to 10 have to be first solved manually (using scientific calculators) and executed using R-programming.

1. Demonstration of R-functions for estimation and testing of hypotheses.
2. Point estimation of parameters and obtaining estimate of standard errors and mean square error.
3. Computing maximum likelihood estimates.
4. Computing moment estimates.
5. Interval estimation: Construction of confidence interval (large and small samples)
6. Evaluation of Probabilities of Type – I and Type – II errors and power of tests.
7. Small sample tests: Tests for mean, equality of means under normality when variance is (i) known (ii) unknown, P-values.
8. Small sample tests: single proportion and equality of two proportions, variance and equality of two variances under normality.P-values for the above tests.
9. Large sample tests: Tests for mean, equality of means when variance is (i) known (ii) unknown, under normality, variance and equality of two variances under normality. P-values for the above tests.
10. MP and UMP tests for parameters of binomial, Poisson distributions, normal and Exponential(scale parameter only) distributions and power curve.

General instructions:

Computation of all the practicals manually and using R

Scheme of Practical Examination (distribution of marks): 25 marks for Semester end examination

Students have to attempt 3 practical questions out of four practical questions given, each carrying 7 marks.

1. 7 Marks
2. 7 Marks
3. 7 Marks
4. Viva 2 Marks
5. Journal 2 Marks

Total 25 marks

Note: Same Scheme may be used for IA(Formative Assessment) examination

Books recommended.

1. Gupta S.C. and V.K. Kapoor (2020), Fundamental of Mathematical Statistics, Sultan Chand and Co. 12th Edition.
2. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009), Probability and Statistical Inference, 10th Edition, Pearson Education, New Delhi.
3. Ross, S.M. (2014), Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, Academic Press.
4. R for beginners by Emmanuel Paradis (freely available at https://cran.r-project.org/doc/contrib/Paradisrdebuts_en.pdf)

B.Sc. Semester – IV

Subject: STATISTICS
Open Elective Course (OEC-4): 004STA051
(OEC for other students)

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-4	OEC	Theory	03	03	42 hrs	2hrs	40	60	100

OEC-4: **004STA051**: Title of the Course: **Basics of Operations Research**

Course Outcomes (CO):

Students will be able to

CO1- Generate mathematical models of business environment.

CO2-Analyze the business situations.

CO3-Use different solution procedures through OR models.

Syllabus- OEC: 004STA051: Title- Basics of Operations Research	Total Hrs: 42
Unit-I Introduction to Operations Research(OR) and LPP	14 hrs
Origin and growth of OR, importance of OR in managerial decision making, scope and applications of OR, models and modelling in OR. Linear programming problems(LPP): Formulation of the problem, feasible & infeasible, basic feasible solution, optimal, unbounded and multiple optimal solutions of LPP, solution by graphical method. Slack, Surplus and Artificial variables. Duality in LPP, Importance of Duality Concepts, Formulation of Dual Problem, Economic Interpretation of Duality.	
Unit-II Allocation Problems	14 hrs
Transportation problems: Formulation, methods of finding initial solution (North West Corner Rule, Least Cost Method and Vogel's Approximation Method), unbalanced transportation problems, maximization transportation problem. Assignment problems: Formulation, methods of solution, Hungarian method, multiple optimal solutions, unbalanced problems, maximization problems.	
Unit-III Decision theory	14 hrs
Game theory: Basic concepts. Two – Person Zero Sum Game. Pure and Mixed Strategies. Maximin– Minimax principle, Games with and without saddle points. Principle of dominance. Concepts of decision making, decision making environments, Decision making under uncertainty - Decision making under risk, decision tree analysis. Case discussion. Concepts of network analysis, project network models, Critical Path Method, PERT.	

Books recommended.

1. Hillier, F S, et al. Introduction to Operations Research (9/e). Tata McGraw Hill, 2011.
2. Ravindran, A and Don T Phillips. Operations Research: Principles and Practice. John Wiley & Sons, 1987.
3. Sharma, J K. Operations Research: Theory and Applications (5/e). New Delhi: Laxmi Publications, 2013.
4. Taha, Hamdy A. Operations Research: An Introduction (9/e). Prentice Hall, 2010.
5. Vohra, N D. Quantitative Techniques for Management. Tata McGraw Hill Education, 2015.
6. KantiSwarup, Gupta, P.K. and Man Mohan: Operations Research, Sultan Chand & Sons, New Delhi.
7. Kapoor, V.K: Operations Research, Sultan Chand & Sons, New Delhi.
8. Kapoor, V.K.: Operations Research Problems & Solutions, Sultan Chand & Sons, New Delhi.

Details of Formative assessment (IA) for DSCC theory/OEC: 40% weight age for total marks

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8 th Week
Written test-2	10%	1 hr	12 th Week
Seminar	10%	10 minutes	--
Case study / Assignment / Field work / Project work/ Activity	10%	-----	--
Total	40% of the maximum marks allotted for the paper		

Faculty of Science
04 - Year UG Honors programme:2021-22

GENERAL PATTERN OF THEORY QUESTION PAPER FOR DSCC/ OEC
(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks

(Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weight age shall be given to each unit based on number of hours prescribed.

