



KARNATAK UNIVERSITY, DHARWAD  
ACADEMIC (S&T) SECTION

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ  
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ



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'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/JS/MGJ(Gen)/2023-24/ 59

Date: 04/09/2023

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2023-24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಪದವಿಗಳಿಗೆ 5 ಮತ್ತು 6ನೇ ಸೆಮೆಸ್ಟರ್

NEP-2020 ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

- ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 104 ಯುಎನ್ಇ 2023, ದಿ: 20.07.2023.  
2. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 2 ರಿಂದ 7, ದಿ: 31.08.2023.  
3. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 04/09/2023

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2023-24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music) /BVA / BTM / BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS) / BBA & BA ILRD ಸ್ನಾತಕ ಪದವಿಗಳ 5 ಮತ್ತು 6ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020ರ ಮುಂದುವರಿದ ಭಾಗವಾಗಿ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಕೋರ್ಸಿನ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕೆ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ [www.kud.ac.in](http://www.kud.ac.in) ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕೆ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನ್‌ಲೋಡ್ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕೆ.ವಿ.ವಿ. ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

04/09/23  
ಕುಲಸಚಿವರು.

ಗೆ,

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

ಪ್ರತಿ:

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



**KARNATAK UNIVERSITY, DHARWAD**

# **B.A. in- Applied Statistics**

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## **SYLLABUS**

**With Effect from 2023-24**

**DISCIPLINE SPECIFIC CORE COURSE (DSCC) FOR SEM V & VI,  
SKILL ENHANCEMENT COURSE (SEC) FOR SEM V SEM**

**AS PER N E P - 2020**

# Karnatak University, Dharwad

B.A.in Applied Statistics

Effective from 2023-24

Sem.	Type of Course	Theory/ Practical	Course Code	CourseTitle	Instructi onhour/ week	Total hours / sem	Duration of Exam	Marks			Credits
								Formative	Summa tive	Total	
V	DSCC-9	Theory	015AST011	Distributions and Survival Analysis	04hrs	56	02 hrs	40	60	100	04
	DSCC-10	Theory	015AST012	Industrial Statistics	04hrs	56	02 hrs	40	60	100	04
	DSCC-11	Theory	015AST013	Population Studies	04hrs	56	02 hrs	40	60	100	04
	Other subject										04
	Other subject										04
	Other subject										04
	SEC-3	Theory	015AST061	Basics of Computer Fundamentals	02hrs	28	01 hr	20	30	50	02
	Total										26
VI	DSCC-12	Theory	016AST011	Non-Parametric Inference	04hrs	56	02 hrs	40	60	100	04
	DSCC-13	Theory	016AST012	Operations Research	04hrs	56	02 hrs	40	60	100	04
	DSCC-14	Theory	016AST013	Statistics for National Development	04hrs	56	02 hrs	40	60	100	04
	Other subject										04
	Other subject										04
	Other subject										04
	Internship/ SEC-4	Theory	016AST091/ 016AST061	Data Science Internship /Quantitative Aptitude for Competitive Examinations	02hrs	28	01 hr	20	30	50	02
	Total										26

## B.A. Semester – V

### Discipline Specific Course (DSC)-9

**Course Title: Distributions and Survival Analysis**

**Course Code: 015AST011**

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
DSCC-9	Theory	04	04	56 hrs.	2hrs.	40	60	100

**Course Outcomes (COs): At the end of the course students will be able to:**

CO 1: Solve problems of various analytical environments using different distributions and their properties.

CO 2: Practical knowledge of carrying out numerical analysis

CO 3: Explain Life Tables, types of life tables, its functions, construction.

CO 4: Know survival models, concepts of survival analysis, notion of ageing.

Unit	Title:	56.hrs/ sem
Unit I	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.	14Hrs
Unit II	Continuous distributions: Uniform, Exponential, lognormal, Pareto, Gamma and Weibull– definition through probability density function, mean, variance, moments, m.g.f., other properties and applications.  Bivariate normal distribution- definition through probability density function, marginal and conditional distribution.	14Hrs
Unit III	Survival Concepts: Life distributions, survival functions, failure rate, Integrated hazard function, residual life time, mean residual life time. Notion of aging: IFR, IFRA, DMRL, NBU, NBUE classes of life distributions and their dual classes.  Common Life Distributions: binomial, Poisson, exponential, Weibull, gamma, Pareto and log-normal distributions.	14Hrs
Unit IV	Censoring Schemes: Type I, Type II and progressive or random censoring with biological examples. Estimation of mean survival time and variance of the estimator for Type I and  Type II censored data with numerical examples. Non-parametric methods: Actuarial and Kaplan-Meier methods for estimating survival function and variance of the Estimator.	14Hrs

**References:**

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. Jay Kerns, G. (2010). Introduction to Probability and Statistics using R. 1st Edition, Springer.
5. Ross, S. M. (2014). Introduction to Probability Models. 11th Edition, Elsevier science.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Quiz/ Assignment/ Small Project	10
Seminar	10
<b>Total</b>	<b>40 Marks</b>
<i>Formative Assessment as per guidelines.</i>	

## B.A. Semester – V

### Discipline Specific Course (DSC)-10

**Course Title: Industrial Statistics**

**Course Code: 015AST012**

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
<b>DSCC-10</b>	<b>Theory</b>	<b>04</b>	<b>04</b>	<b>56 hrs.</b>	<b>2hrs.</b>	<b>40</b>	<b>60</b>	<b>100</b>

**Course Outcomes (COs): At the end of the course students will be able to:**

- CO1 : Learn about process control and product control, different limits and causes of variation.
- CO2 : Understand control chart for variables and process capability.
- CO3 : Understand lot acceptance sampling and sampling plans.
- CO4 : Construct control charts
- CO5 : Know acceptance sampling plans

Unit	Title:	56.hrs/sem
Unit I	<b>Statistical Quality Control:</b> Concept of quality and its management - quality planning, quality control and quality improvement, quality pioneers, quality costs. Meaning, aims and objectives of statistical quality control. Concept of variations and its impact, chance & assignable causes of variation. Relevance of exploratory data analysis, run plot, lag plot, frequency distribution and other QC tools. Statistical quality control, Process control, Product control, Importance & uses of statistical quality control in industry. Introduction to control charts.	14 Hrs
Unit II	<b>Control charts for variables:</b> Theoretical basis and practical background of control charts for variables. $3\sigma$ - Limits, Warning limits and Probability limits. Derivation of control limits and construction of $\bar{X}$ & R charts and $\bar{X}$ & S charts. Interpretation Criteria for detecting lack of control. Rational subgroups, Natural tolerance limits and specification limits, Process capability studies.	14 Hrs
Unit III	<b>Control charts for attributes:</b> Theoretical basis and practical background of control charts for attributes. Fraction defective p-chart, number of defectives np-chart, number of defects per unit C – chart, and U – chart, derivation of control limits and interpretations.	14 Hrs
Unit IV	<b>Acceptance Sampling (Product Control) :</b> Lot Acceptance Sampling – Sampling Inspection, 100 % inspection and rectifying	14 Hrs

	inspection AQL, LTPD, Producer's Risk and Consumer's Risk. Acceptance sampling plans – single and double sampling plans by attributes.	
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**References:**

1. Montgomery D.C. (1996) Introduction to Statistical Quality Control, Wiley, New York.
2. Grant E.L. (1980) Statistical Quality Control McGraw Hill, New York.
3. Weetherhill G.B. and Brow D.W. (1991) Statistical Process Control. Chapman and Hall, London.
4. Gupta S C and Kapoor V K. Fundamentals of Applied Statistics. S Chand & Sons.

<b>Formative Assessment for Theory</b>	
<b>Assessment Occasion/ type</b>	<b>Marks</b>
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Quiz/ Assignment/ Small Project	10
Seminar	10
<b>Total</b>	<b>40 Marks</b>
<i>Formative Assessment as per guidelines.</i>	

**B.A. Semester – V**  
**Discipline Specific Course (DSC)-11**

**Course Title: Population Studies**

**Course Code: 015AST013**

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
<b>DSCC-11</b>	<b>Theory</b>	<b>04</b>	<b>04</b>	<b>56 hrs.</b>	<b>2hrs.</b>	<b>40</b>	<b>60</b>	<b>100</b>

**Course Outcomes (COs): At the end of the course, students will be able to:**

- CO1 : Acquire knowledge about the size, composition, organization and distribution of the population.
- CO2 : Perform basic demographic analysis using various techniques.
- CO3 : Study the trend of population growth which describes the past evolution, present distribution and future changes in the population of an area.
- CO4 : Acquire knowledge about the construction of life table and its applications in demographic analysis.

<b>Unit</b>	<b>Title:</b>	<b>42.hrs/sem</b>
<b>Unit I</b>	<b>Introduction and Sources of Demographic Data :</b> Demography: Its definition, nature, and scope. Sources of demographic data – salient features of Census, Civil Registration System, Demographic Surveys, their limitations and uses. Coverage and content errors. Vital Statistics: Introduction, definition, and uses of Vital statistics. Sources of data on Vital statistics. Measurement of population, rates, and ratios of vital events.	14 hrs
<b>Unit II</b>	<b>Measures of Fertility :</b> 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), use of Birth order statistics, Child Women ratio.	14 hrs
<b>Unit III</b>	<b>Measures of Mortality</b> Basic concepts and definitions of mortality. Measures of mortality- Crude Death Rate (CDR), Age Specific Death Rate(ASDR), Standardized death rates, Neonatal, Perinatal and Postnatal mortality rates, Maternal and Infant mortality rates. Cause Specific Death Rate.	14 hrs



<b>Unit IV</b>	<b>Measures of reproduction and Life Tables :</b> Measures of reproduction- Gross Reproduction rate and Net Reproduction rate. Measurement of population growth rate- simple growth rate and compound growth rate. Pearl's Vital Index. Population Estimation, 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.	14 hrs
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References	
1	Bhende, Asha and Tara Kanitkar, (2004): Principles of Population Studies, 5th Ed. Himalaya Publishers, New Delhi.
2	Biswas, S. (1988): Stochastic Processes in Demography & Application, Wiley Eastern Ltd.
3	Keyfitz, N and Caswell. H (2005): Applied Mathematical Demography, Springer.
4	Mishra, B. D, (1981): An Introduction to the Study of Population, South Asian Publishers, Pvt. Ltd.
5	Ramakumar, R, (1986): Technical Demography, Wiley Eastern Ltd, New Delhi.
6	Pathak, K. B and F. Ram, (1998): Techniques of Demographic Analysis, Himalaya Publishing House, Mumbai.
7	Pressat, R, (1972): Demographic Analysis, Edward Arnold, London.
8	Shryock, H. S. et al (1979): The Methods & Materials of Demography, Condensed Edition by Stockwell, E. G, Academic Press, New York.
9	Srinivasan K. (1998): Basic Demographic Techniques & Applications, Sage Publications, New Delhi

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Quiz/ Assignment/ Small Project	10
Seminar	10
<b>Total</b>	<b>40 Marks</b>
<i>Formative Assessment as per guidelines.</i>	

## B.A. Semester – V

### Skill Enhancement Course: SEC-3

**Course Title: BASICS OF COMPUTER FUNDAMENTALS**

**Course Code: 015AST061**

Type of Course	Theory / Practical	Credits	Instruction hour /week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
SEC-3	Theory	02	02	30 hrs.	1hr.	20	30	50

**Course Outcomes (COs): At the end of the course students will be able to:**

CO 1: Acquire confidence in using computer techniques available to users;

CO 2: Understand data, information and file management;

CO 3: Create documents using Word processor, Spreadsheet & Presentation Software;

CO 4: Understand computer networks, Internet;

CO 5: Use e-Governance applications;

Unit	Title:	30 Hrs/sem
Unit I	<p><b>Introduction:</b></p> <p><b>Word Processing:</b> Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document.</p> <p><b>Spread Sheet:</b> Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.</p> <p><b>Introduction to Data Analysis Using Excel, Descriptive Statistics using Excel, Graphical presentation using Excel, Construction of Frequency Tables and Cross Tables.</b></p>	15 Hrs
Unit II	<p>Use of <b>Analysis ToolPak for performing:</b> Anova, Correlation, Covariance, F-Test Two-Sample for Variances, Random Number Generation Rank and Percentile Regression Sampling, t-Test, z-Test.</p>	15 Hrs

**References:**

1. V.K.Kapoor (2004), Information Technology and computer applications, Sultan Chand and sons, New Delhi.
2. Joseph Schmuller (2016), Statistical Analysis with Excel For Dummies.
3. Vikash Gupta (2001), Condex Computer course kit, Dreamtech, Publications, New Delhi.
4. Rajaaraman and Niharika (2014), Fundamentals of Computers, PHI, New Delhi.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	5
Internal Assessment Test 2	5
Quiz/ Assignment/ Small Project	5
Seminar	5
<b>Total</b>	<b>20 Marks</b>
<i>Formative Assessment as per guidelines.</i>	

**B.A. in Applied Statistics**

**VI Semester**

**W. e. f.: 2023-24**

## B.A. Semester – VI

### Discipline Specific Course (DSC)-12

**Course Title: Non-parametric Inference**

**Course Code: 016AST011**

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
DSCC-12	Theory	04	04	56 hrs.	2hrs.	40	60	100

**Course Outcomes (COs): At the end of the course students will be able to:**

CO 1: Understand general concepts of non-parametric statistics

CO 2: Know the importance of non-parametric tests

CO 3: Perform various non-parametric tests

CO 4: Know various applications of these tests

Unit	Title:	56.hrs/sem
<b>Unit I</b>	Introduction to nonparametric and distribution-free tests, advantages and limitations. One sample tests: Kolmogorov-Smirnov test, sign test, Wilcoxon signed rank test. Applications of these tests.	14 Hrs
<b>Unit II</b>	Two sample tests: Mann-Whitney test (Wilcoxon rank sum test), Wald-Wolfowitz Run test, signed rank and Wilcoxon signed rank test. Applications of these tests.	14 Hrs
<b>Unit III</b>	Two sample and other nonparametric tests : Kolmogorov-Smirnov test, Spearman's rank, linear rank statistics, Chi-square goodness of fit and independence of attributes. Applications of these tests.	14 Hrs
<b>Unit IV</b>	Several samples: median test, Kruskal -Wallis test, Friedman's test. Applications of these tests.	14 Hrs

#### References:

1. Rohatgi V.K. (1984). An Introduction to Probability Theory and Mathematical Statistics. Wiley Eastern, New Delhi.
2. Jayant V. Deshpande, Isha Dewan: Non-parametric Statistics, Theory and Methods,;
3. Jean Gibbons and Subhabrata Chakraborti: Non-Parametric Statistical Inference.CRC Press
4. V.K. Rohatgi, Statistical Inference, WILEY Series

<b>Formative Assessment for Theory</b>	
<b>Assessment Occasion/ type</b>	<b>Marks</b>
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Quiz/ Assignment/ Small Project	10
Seminar	10
<b>Total</b>	<b>40 Marks</b>
<i>Formative Assessment as per guidelines.</i>	

## B.A. Semester – VI

### Discipline Specific Course (DSC)-13

Course Title: **Operations Research**

Course Code: **016AST012**

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
<b>DSCC-13</b>	<b>Theory</b>	<b>04</b>	<b>04</b>	<b>56 hrs.</b>	<b>2hrs.</b>	<b>40</b>	<b>60</b>	<b>100</b>

**Course Outcomes (COs): At the end of the course students will be able to:**

- CO1 : Formulate a linear programming problem and solve it for optimal solution using graphical Methods.
- CO2 : Solve transportation problem and give the optimal solution.
- CO3 : Solve assignment problems and give the optimal solution.
- CO4 : Solve game problems using different techniques.

Unit	Title:	56.hrs/sem
<b>Unit I</b>	<b>Linear Programming Problem:</b> Origin, development, definition and applications of Operations research. Definition of LPP and statement of the general linear programming problem. Definition of terms- Objective function, feasible solution and Optimal solution. Mathematical formulation of linear programming problem in case of two variables with examples. Graphical method of solving LPP and merits and demerits. Simple numerical problems.	14 Hrs
<b>Unit II</b>	<b>Transportation Problem:</b> Introduction, definition of Transportation Problem (TP), balanced and unbalanced TP. Feasible solution, basic solution, basic feasible solution, degenerate solution, non-degenerate solution and optimal solution. Methods of finding initial basic feasible solution-North West Corner Rule, Matrix Minima method (lowest cost entry method) and Vogel's approximation method (Unit cost penalty method) and simple problems.	14 Hrs
<b>Unit III</b>	<b>Assignment Problem:</b> Introduction and definition of Assignment problem, mathematical model, balanced and unbalanced assignment problem, Hungarian method of solving an AP, Distinction between Transportation Problem & Assignment Problem. Simple numerical problems on assignment	14 Hrs

<b>Unit IV</b>	<b>Game Theory:</b> Introduction, two person zero sum games, Pure and mixed strategies, maximin and minimax principle, games with saddle point and without saddle points, solution of 2x2 rectangular games, 2xn and mx2 graphical method of solving game problems, dominance rule. Simple numerical problems.	14 Hrs
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**References:**

1. Kanti Swarup, Gupta, P.K. and Man Mohan: Operations Research, Sultan Chand & Sons, New Delhi.
2. Gupta, P.K. and Hira, D.S.: Operations Research, S. Chand & Company Ltd., New Delhi.
3. Gupta, R.K.: Operations Research, Krishna Prakashana Mandir, Meerut.
4. Sharma, S.D.: Operations Research, Kedarnath Ramnath & Co. Publishers, Meerut.
5. Kapoor, V.K: Operations Research, Sultan Chand & Sons, New Delhi.
6. Kapoor, V.K.: Operations Research Problems & Solutions, Sultan Chand & Sons, New Delhi.
7. Gani S. G., Sankhyshastra and Ganakayantra. Udaya Ravi Publications, Bijapur.

<b>Formative Assessment for Theory</b>	
<b>Assessment Occasion/ type</b>	<b>Marks</b>
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Quiz/ Assignment/ Small Project	10
Seminar	10
<b>Total</b>	<b>40 Marks</b>
<i>Formative Assessment as per guidelines.</i>	



## B.A. Semester – VI

### Discipline Specific Course (DSC)-14

**Course Title: Statistics for National Development**

**Course Code: 016AST013**

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
DSCC-14	Theory	04	04	56 hrs.	2hrs.	40	60	100

**Course Outcomes (COs): At the end of the course students will be able to:**

- CO 1: Different methods of collection of data
- CO 2: Role of national sample survey office
- CO 3: Knowledge of different types of sample surveys
- CO 4: Know different development indices
- CO 5: Understand some population growth models

Unit	Title:	56.hrs/sem
<b>Unit I</b>	An outline of present official statistical system in India, Role, function, and activities of Central and State Statistical organizations. Methods of collection of official statistics, their reliability and limitations. Role of Ministry of Statistics & Program Implementation (MoSPI), Central Statistical Office (CSO), National Sample Survey Office (NSSO), Registrar General Office and National Statistical Commission.	14 Hrs
<b>Unit II</b>	Scope and content of Population census of India. Population census methods, economic census. Methods of national income estimation, problems in the estimation of national income. System of collection of Agricultural Statistics. Crop yield, Production Statistics, Crop estimation and forecasting. Statistics related to industries, foreign trade, balance of payment, cost of living, inflation, educational and other social statistics.	14 Hrs
<b>Unit III</b>	Economic development: Classical growth models of Adam Smith Malthus, Devid Richardo. Growth in per capita income and distributive justice. Indices of development, Human Development Index. Estimation of National Income: product approach, income approach and expenditure approach.	14 Hrs
<b>Unit IV</b>	Poverty measurement: measures of incidence and intensity, combined measures, Kakwani and Sen indices.  Population growth models – exponential, logistic, Gompertz models. Population projection using Leslie matrix.	14 Hrs

**References:**

1. Morris H Hansen and William N Hurwitz. Sample Survey Methods and Theory, Volume 1: Methods and Applications (Wiley Classics Library).
2. Dr V K Gupta and Baidya Nath Mandal. Combinatorics in Sample Surveys VIS-A-VIS Controlled Selection.
- 3 Gupta, K. R. (2010). Economic Growth Models, Atlantic Publishers and Distributors, New Delhi.
4. Parimal Mukhopadhyay. Theory and Methods Of Survey Sampling
5. Ramkumar, R. (1986). Technical Demography, Wiley Eastern, New Delhi.
6. Sen, A. (1977). Poverty and Inequality, Stanford University Press, USA.
7. Bhende A and Kanitkar T. Principles of population studies, Himalaya publishing house.

<b>Formative Assessment for Theory</b>	
<b>Assessment Occasion/ type</b>	<b>Marks</b>
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Quiz/ Assignment/ Small Project	10
Seminar	10
<b>Total</b>	<b>40 Marks</b>
<i>Formative Assessment as per guidelines.</i>	

## B.A. Semester – VI

### INTERNSHIP/SEC -4\*

**Course Title: Data Science Internship**

**Course Code: 036STA091**

Type of Course	Theory / Practical	Credits	Instruction hour/ week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
<b>INTERNSHIP</b>	<b>Practical</b>	<b>02</b>	<b>04</b>	<b>56 hrs.</b>	<b>3hrs.</b>	<b>50</b>	<b>0</b>	<b>50</b>

**Course Outcomes (COs): At the end of the course students will be able to:**

CO 1: Accountable for individual and team responsibilities and deliverables.

CO 2: Exercise the ability to compromise and problem solve with involved parties.

CO 3: Formulate and use appropriate models of data analysis tools to solve hidden solutions to business-related challenges

CO 4: Interpret data findings effectively to any audience, orally, visually, and in written formats.

Expt. No	Title:	56.hrs/sem
1	Identifying key areas of statistics useful to internship	
2	Create comprehensive training materials, such as presentations and hands-on exercises, to facilitate effective learning for students	
3	Collaborate with industry	
4	Conduct assessments and evaluations to measure progress and identify areas for improvement, adapting teaching strategies accordingly	
5	Stay up-to-date with the latest developments in data science	
6	Contribute to the growth and success of our education programs	
7	Writing visit reports, filing and collecting trial documentation	
8	Report writing	

Formative Assessment for Practical	
Assessment	Distribution of Marks
Analyze data using models and descriptive statistics	10
Participate in project planning	10
Contribute to project report	10
Collection of raw data	10

Produce tables/ figures/ interpretation	10
<b>Total</b>	<b>50 Marks</b>
<i>Formative Assessment as per guidelines.</i>	

- If Internship is not feasible, SEC-4 is offered.

### **Course Title: SEC-4: Quantitative Aptitude for Competitive Examinations**

**Course Code: 016AST061**

Type of Course	Theory / Practical	Credits	Instruction hour /week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
<b>SEC-4</b>	<b>Theory</b>	<b>02</b>	<b>02</b>	<b>30</b>		<b>20</b>	<b>30</b>	<b>50</b>

**Course Outcomes (COs): At the end of the course students will be able to:**

CO 1: Develop general skills required for competitive exams

CO 2: Develop general skills required to take decision logically

CO 3: Solve critical problems related to classification, directions, etc.

<b>Unit</b>	<b>Title: for SEC</b>	<b>28.hrs/sem</b>
<b>Unit I</b>	<b>Numerical Aptitude</b> Number Systems, H.C.F. and L.C.M. of Numbers, Square Roots and Cube Roots Fundamental arithmetical operations, Percentage, Profit and Loss, Ratio and Proportion, Simple Interest, Compound Interest, time and work.	14 Hrs
<b>Unit II</b>	<b>Reasoning and Mental Ability</b> Coding-Decoding, Symbol notations, Number Series, Analog and Classification, Blood Relations, Direction Sense. Ranking and Comparison, Input and Output, Assumptions, Conclusion and Inferences.	14 Hrs

**References:**

1. Aggarwal R. S., Quantitative Aptitude for Competitive Examination, S. Chand Publication.
2. Dinesh Khattar, The Pearson Guide To Quantitative Aptitude for Competitive Examination, Pearson Publication.
3. Ningappa A. H. Mental Ability, Ashok Publication.

Formative Assessment for Theory	
Assessment Occasion/ type	Marks
Internal Assessment Test 1	5
Internal Assessment Test 2	5
Quiz/ Assignment/ Small Project	5
Seminar	5
<b>Total</b>	<b>20 Marks</b>
<i>Formative Assessment as per guidelines.</i>	

UG programme: 2023-24

**GENERAL PATTERN OF THEORY QUESTION COURSE FOR SEC**  
**(30 marks for semester end Examination with 1 hr duration)**

**Part-A**

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

**Part-B**

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

**Total: 30 Marks**

## UG programme: 2023-24

### GENERAL PATTERN OF THEORY QUESTION COURSE 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 : 10 marks

#### **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 weightage shall be given to each unit based on number of hours prescribed**