RANI CHANNAMMA UNIVERSITY, BELAGAVI

PROGRAM /COURSE STRUCTURE AND SYLLABUS

as per the Choice Based Credit System (CBCS) designed in accordance with

Learning Outcomes-Based Curriculum Framework (LOCF) of National Education Policy (NEP) 2020

for

B.A. Statistics

Academic Year 2021-22 and onwards

RANI CHANNAMMA UNIVERSITY, BELAGAVI

BOS COMMITTEE (NEP- STATISTICS)

B.A. STATISTICS (I & II SEM) PROGRAM 2021-22

1	**Prof. V. S. Shigehalli** **Department of Mathematics, RCU Belagavi**	Chairman
2	**Prof. S. M. Hancihnal** Anjuman Arts, Science and Commerce College Vijaypur	Member
3	**Prof. P. S. Chanagond** S SMamadapur Science College Badami	Member
4	**Prof. S. M. Hiremath** KRCES GGD and BMP Commerce and SVS Science CollegeBaihongal	Member
5	**Dr. Prakash R Kengnal** STC Arts and Commerce College, Banhatti	Member

BOS COMMITTEE (NEP- STATISTICS)

B.A. STATISTICS (III & IV SEM) PROGRAM 2022-23

1	**Prof. Vishwanath B. Awati,** Department of Mathematics, RCU Belagavi	Chairman
2	**Prof. N. S. Patil,** MGVC Arts, Com and Science College, Muddebihal	Member
3	**Dr. A. T. Shreenivas** - BLDE New Arts College, Tikota	Member

Preamble

Several reforms in our education system has been proposed and developed by MinistryofHRDasNationalEducationPolicy(NEP)2020whichincludesbroadbasedmultidisciplinaryundergraduate education with necessary knowledge, skills and competencies. It also proposesto bring equity, efficiency and academic excellence at different levels of education. NEP alsorecommended multidisciplinary undergraduate programmes with multiple exit and multipleentryoptions with the provision ofCertificate/Diploma/Degreesat each ofthe exits.

Probability and Statistics is the language of uncertainties, riddled modern informationage. Statistics facilitates the decision making process by quantifying the element of chance oruncertainties. Its descriptive and inferential procedures not only formulate the basis of thegrowth of almost all disciplines of the contemporary world, and also provide an array ofemploymentavenuesinallfields.ThisisarigorousprograminProbabilityTheory,StatisticalInference, Multivariate Analysis, Linear Models and Regression Analysis and Sample surveysand Design of Experimentsdesigned to give a sound foundation in fundamentals and traininginpractical Statistics leadingto statistical dataanalysis.

The six semester 166 credit program has a variety of elective courses to choose from including enough courses on statistical software. A person successfully completing the program will have enough knowledge and expertise to statistically analyze small and large univariate and multivariate data sets, work in software/data analytics industry as domain expert, independently consult for statistical data analysis. The program has proved to be one of the best in traditional Indian Universities/Institutes and has demand from students within and outside the State/Country.

Syllabus & Regulations Governing the Choice-Based Credit System (CBCS) for the Three-Years (Six Semesters) Bachelor of Arts (B.A

With Applied Statistics as Minor without practicals& other course as Major without practicalsProgram Structure

MODEL CURRICULUM

Degree Program: B.A. Degree

DisciplineCore: Statistics **Total Credits for the Program:**146 (till 6th Semester)

ProgramOutcomes

Bythe endofthe programthestudents willbeable to:

1. Acquirefundamental/systematicorcoherentunderstandingoftheacademicfieldofStatisticsand its different learningareas andapplications.
2. Develop and demonstrate an ability to understand major concepts in variousdisciplines ofStatistics.
3. Demonstrate the ability to use skills in Statistics and different practicing areas forformulatingandtacklingStatisticsrelatedproblemsandidentifyingandapplyingappropriate principles and methodologies to solve a wide range of problems associatedwith Statistics.
4. Understandproceduralknowledgethatcreatesdifferenttypesofprofessionalsrelatedtosubjecta reaofStatistics,includingprofessionalsengagedingovernment/publicserviceandprivatesectors .
5. PlanandexecuteStatisticalexperimentsorinvestigations,analyzeandinterpretdata/informatio n collected using appropriate methods, including the use of appropriatestatisticalsoftwareincludingprogramminglanguages,andreportaccuratelythefindi ngsoftheexperiment/investigations.
6. HaveaknowledgeregardinguseofdataanalyticstoolslikeExcelandR-programming.
7. Developed ability to critically assess a standard report having graphics, probabilitystatements.
8. Analyze,interpretthedataand hencehelp policymakersto takeaproperdecision.
9. Recognize the importance of statistical modelling andcomputing,andthe role ofapproximationandmathematicalapproachestoanalyzetherealproblemsusingvariousstatistic altools.
10. Demonstraterelevant genericskillsandglobalcompetenciessuchas
    (i) Problem-solving skills that are required to solve different types of Statistics relatedproblemswithwell-definedsolutions,andtackleopen-endedproblems,thatbelong

tothedisciplinary-area boundaries;

(ii) Investigative skills, including skills of independent thinking of Statistics-related issues andproblems;

(iii) Communicationskillsinvolvingtheabilitytolistencarefully,toreadtextsandreferencematerialanalyticallyandtopresentinformationinaconcisemannertodifferentgroups/audiences of technical or popular nature;

(iv) Analytical skills involving paying attention to details and ability to construct logical Arguments using correct technical language related to Statistics and ability to translate them with popular language when needed; ICT skills;

(v) Personals kills such as the ability to work both independently and in a group.

11. Undertakeresearchprojectsbyusingresearchskills-preparationofquestionnaire,conductingnationalsamplesurvey,researchprojectsusingsamplesurvey,samplingtechniques.
12. Understand and apply principles of least squares to fit a model to the given data, study theassociationbetweenthevariables,applicationsofProbabilityTheoryandProbabilityDistributions.

RANI CHANNAMMAUNIVERSITY

VIdyaSangam, NH-4, Belagavi. -591156

Proposed Curricular and Credits Structure under Choice Based Credit System [CBCS] of Statistics Discipline Scheme for the four Years BA Statistics

Undergraduate Honors Programme with effect from 2021-22

B.A. SEMESTER-I										
Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
L1	21BAL1LK1	Kannada	40	60	100	4	-	-	3	2
	21BAL1LFK1	Functional Kannada								
L2	21BA1L2LEN2	English	40	60	100	4	-	-	3	2
	21BAL2LHI2	Hindi								
	21BA1L2LSN2	Sanskrit								
	21BA1L2LTE2	Telugu								
	21BA1L2LUR2	Urdu								
DSC1	21BA1STSDSCT1	Descriptive Statistics – I	40	60	100	3	-	-	3	2
	21BA1STSDSCT2	Descriptive Statistics – I	40	60	100	3	-	-	3	2
DSC1	Another Department Code	Another Department Course Title	40	60	100	3	-	-	4	2
			40	60	100	3	-	4	2	2
SEC1	21BA1SE1CS1	Digital Fluency	25	25	50	1	-	2	2	2
VBC1	21BA1V1PE1	Physical Education- Yoga	25	-	25	-	-	2	1	-
VBC2	21BA1V2HW1	Health & Wellness	25	-	25	-	-	2	1	-
OEC	21BA1STSOECT1	Statistics in Competitive Examinations	40	60	100	3	-	-	3	2
			Total Marks		800	Semester Credits			25	

B.A. SEMESTER-II

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
L3	21BA2L3LK2	Kannada	40	60	100	4	-	-	3	2
	21BA2L3FKL2	Functional Kannada								
L4	21BA2L4EN2	English	40	60	100	4	-	-	3	2
	21BA2L4HI2	Hindi								
	21BA2L4SN2	Sanskrit								
	21BA2L4TE2	Telugu								
	21BA2L4UR2	Urdu								
DSC2	21BA2STSDSCT1	Statistics for Economics	**40**	**60**	**100**	**3**	**-**	**-**	**3**	**2**
	21BA2STSDSCT2	Probability and Distributions	**40**	**60**	**100**	**3**	**-**	**-**	**3**	**2**
DSC2	Another Department Code	Another Department Course Title	40	60	100	3	-	-	4	2
			40	60	100	3	-	4	2	2
AECC1	21BA2AE1ES2	Environmental Studies	25	25	50	1	-	2	2	2
VBC3	21BA2V3PE2	Physical Education- Sports	25	-	25	-	-	2	1	-
VBC4	21BA2V4NC1	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
OEC2	21BA2STSOECT1	Statistical Methods	**40**	**60**	**100**	**3**	**-**	**-**	**3**	**2**
			Total Marks		**800**	**Semester Credits**			**25**	

B.A. SEMESTER-III

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
L5	21BA3L5LK3	Kannada	40	60	100	4	-	-	3	2
	21BA3L5LFK3	Functional Kannada								
L6	21BA3L6EN3	English	40	60	100	4	-	-	3	2
	21BA3L6HI3	Hindi								
	21BA3L6SN3	Sanskrit								
	21BA3L6TE3	Telugu								
	21BA3L6UR3	Urdu								
DSC3	21BA3STSDSCT1	Exact Sampling Distributions and Statistical Inference	**40**	**60**	**100**	**3**	**-**	**-**	**3**	**2**
	21BA3STSDSCT2	Sampling Techniques	**40**	**60**	**100**	**3**	**-**	**-**	**3**	**2**
DSC3	Another Department Code	Another Department Course Title	40	60	100	3	-	-	4	2
			40	60	100	3	-	4	2	2
SEC2	21BA3SE2ES2	Artificial Intelligence	25	25	50	1	-	2	2	2
VBC5	21BA3V5PE3	Physical Education- Sports	25	-	25	-	-	2	1	-
VBC6	21BA3V6NC2	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
OEC3	21BA3STSOECT1	Data Analysis With SPSS	**40**	**60**	**100**	**3**	**-**	**-**	**3**	**2**
			Total Marks		**800**	**Semester Credits**			**25**	

B.A. SEMESTER-IV

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
L7	21BA4L7LK4	Kannada	40	60	100	4	-	-	3	2
	21BA4L7LFK4	Functional Kannada								
L8	21BA4L8EN4	English	40	60	100	4	-	-	3	2
	21BA4L8HI4	Hindi								
	21BA4L8SN4	Sanskrit								
	21BA4L8TE4	Telugu								
	21BA4L8UR4	Urdu								
DSC4	21BA4STSDSCT1	ANOVA and Design of Experiments	40	60	100	3	-	-	3	2
	21BA4STSDSCT2	Regression Analysis and Econometrics	40	60	100	3	-	-	3	2
DSC4	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	2
			40	60	100	-	-	4	2	2
AECC2	21BA4AE1ES2	Constitution of India	25	25	50	1	-	2	2	2
VBC7	21BA4V5PE4	Physical Education- Sports	25	-	25	-	-	2	1	-
VBC8	21BA4V6NC3	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
OEC4	21BA4STSOECT1	Quantitative Analysis Technique	40	60	100	3	-	-	3	2
		Total Marks			**800**	**Semester Credits**			**25**	

B.A. SEMESTER-V

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
STATISTICS AS A MINOR										
DSC5	21BA1STSDSCP5	Statistical Quality Control	40	60	100	4	-	-	3	2
DSC5	Another Department CodeasaMajorSubject	Another Department Course Title	40	60	100	4	-	-	3	2
			40	60	100	4	-	4	2	2
DSE1	Another Department	Another Department Course Title	40	60	100	3	-	4	2	2
VC1 (Any one)	21BA5VCGEG5.1A	Basics of Map Making	40	60	100	3	-	-	3	2
	21BA5VCGEG5.1B	Mobile AssetMapping								
VBC9	21BA5V5PE5	Physical Education-Sports	25	-	25	-	-	2	1	-
VBC10	21BA5V6NC4	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
SEC3	21BA5SE3CS3	Cyber Security	25	25	50	1	-	2	2	2
		Total Marks			**600**	**Semester Credits**			**22**	

B.A. SEMESTER-VI

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
STATISTICS AS MINOR										
DSC6	21BA1STSDSCP6	Operations Research	40	60	100	4	-	-	3	2
DSC6	AnotherDepartmentCode asaMajorSubject	Another Department Course Title	40	60	100	4	-	-	3	2
			40	60	100	4	-	4	2	2
DSE2	AnotherDepartmentCode	Another Department Course Title	40	60	100	3	-	4	2	2
VC2 (Any one)	21BA6VCGEG6.1A	Open Source GIS	40	60	100	3	-	-	3	2
	21BA6VCGEG6.1B	Landscape and Layout Mapping								
INT1	21BA6 INT1L	Internship	25	50	75	-	-	2	2	2
VBC1	21BA6V5PE5	Physical Education- Sports	25	-	25	-	-	2	1	-
VBC2	21BA6V6NC4	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
SEC4	21BA6SE4CS4	Professional Communication	25	25	50	1	-	2	2	2
		Total Marks			**675**	**Semester Credits**			**24**	
		Total Marks for BA Program			**4475**	**Total Credits for BA Program**			**146**	

BA

Semester 1

Course Title: B.A Statistics	
Total Contact Hours: 42	Course Credits:3
Formative Assessment Marks:40	Duration of ESA/Exam: 2hours
	Summative Assessment Marks: 60

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-12)

Course Outcomes (COs) / Program Outcomes (POs)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1. Organize, manage and present data.	X	X		X								
2. Analyze statistical data graphically using frequency distributions and cumulative frequency distributions.	X						X					
3. Analyze statistical data using measures of central tendency, dispersion.				X				X		X		
4. Understand Skewness and Kurtosis and their use in studying various characteristics of data.			X									
5. Know concept of correlation, various correlation coefficients- Pearson's correlation coefficient, Spearman's rank correlation coefficient.			X									
6. Carryout spatial analysis.							X					
7. Understand the Price and Quantity Index numbers and their different measures, understand the applicability of cost of living Index number.									X	X		
8. Know the components and Need for Time series, understand the different methods of studying trend and Seasonal Index.	X								X	X		

9. Solve problems of economics concerns using demand analysis, supply functions, Gini's coefficient and Lorenz Curve.									X	X		
10. Understand basic concepts, important theorems on probability and their use in solving problem.											X	
11.Know random variable, mathematical expectation, and numerical problems on mathematical expectation.	X										X	
12. Understand the most common discrete and continuous probability distributions and their real life applications.										X		
13. Understand the nature of data and to perform appropriate analysis.											X	X
14. Carry out time series analysis and predict the future values of given trend.											X	X
15. Analyze the Seasonal Indies by using different methods.	X										X	X

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark 'X' in the intersection cell if a course outcome addresses a particular program outcome.

BA Semester 1

Title of the Course: BA Statistics

Course 1: Descriptive Statistics-I		Course 2:Descriptive Statistics-II	
Number of Theory Credits	**Number of lecture hours/semester**	**Number of Theory Credits**	**Number of lecture hours/semester**
3	**42**	**3**	**42**

Content of Course 1: Descriptive Statistics-I	**42 Hrs**
Unit – 1 :Introduction to Statistics and Basic Concepts	**12 Hrs**
Meaning, origin, definition, functions, limitations and applications of Statistics. Primary and secondary data, different methods of collection of primary data with merits and demerits. Sources of secondary data. Classification: meaning, objectives, types of classifications- Chronological, Geographical, Qualitative and Quantitative classifications with illustrations. Definition of some important terms - class, class limits, class intervals, width of class interval, open-end classes, inclusive and exclusive classes. Formation of discrete and continuous frequency distributions. Tabulation: meaning, objectives and rules of tabulation, format of a statistical table and its parts. Types of table, examples of preparation of a blank table and tables with numerical information.	
Unit – 2 :Diagrammatic and Graphical representation of Data	**10 Hrs**
Diagrams: Meaning, importance of diagrams and general rules of construction of diagrams. Types of Diagrams – simple, multiple, component, percentage bar diagrams and pie diagrams with simple illustrations. Graphs:TypesofGraphs–Histogram,frequencyPolygon,frequencycurveandOgives,simple problems, location of mode, median and partition values from the graphs. Difference between diagrams and graphs.	
Unit – 3:Measures of Central Tendency	**10 Hrs**

Meaning of central tendency and essentials of a good measure of central tendency. Types of measuresofcentraltendency:Arithmeticmean,Median,Mode,GeometricmeanandHarmonic mean - definition, merits and demerits. Properties of arithmetic mean. Empirical relation between mean median and mode. Problems on both grouped and ungrouped data for all the measures. Partition values-definition and types of partition values: quartiles, deciles and percentiles. Problems on Quartiles for grouped ungrouped data only.	
Unit – 4:Measures of Dispersion	**10 Hrs**
Meaningandobjectivesofmeasuresofdispersion.Essentialsofagoodmeasureofdispersion, absoluteandrelativemeasuresofdispersion.Typesofmeasuresofdispersion-Range,Quartile deviation, Mean deviation and standard deviation with relative measures – definition, merits and demerits. Properties of Standard deviation, simple problems on ungrouped and grouped data. **Skewness and Kurtosis:** Skewness- Definition, objectives and types of skewness, explanation of positive and negative skewness with diagrams. Measures of skewness- Karl Pearson's coefficient of skewness and Bowley's coefficient of skewness. Simpleproblems. Kurtosis:Definition and types of kurtosis. Explanation of types of kurtosis with neat diagrams. Measure of skewness based on moments. Difference between skewness and kurtosis.	

References

1. Gani S. G., Sankhyshastra and Ganakayantra. Udaya Ravi Publications,Bijapur.
2. Gupta S. C. Fundamentals of Statistics, Himalaya Publishing House,Bombay
3. Mukhopadhaya, P. Applied Statistics, New Central Book Agency (P) Ltd.,Calcutta
4. Gupta S P. and V K Kapoor Fundamentals of Mathematical Statistics, Sultan Chand,New Delhi

Pedagogy

1. The course is taught using traditional chalk and talk method using problem solvingthrough examples andexercises.
2. Students are encouraged to use resources available on open sources.

Content of Course 2:Descriptive Statistics-II	42 Hrs
Unit – 1 :Correlation	**12 Hrs**
Definition of relationship, Definition, Types of correlation, Methods of measuring correlation, Scatter diagram, Correlation Coefficient for quantitative data: Prof. Karl Pearson's coefficient of linear correlation, its properties, Correlation Coefficient for qualitative data: Spearman's rank correlation coefficient, its properties. Simple regression analysis-regression equations by method of least squares, linear regression coefficients and its properties. Angle between the regression lines.	
Unit – 2: Association of Attributes	**10 Hrs**
Meaning of association of attributes, definition of class of the first order and second order. Methods of studying association. Yule's coefficient of association and its interpretation. Determination of Yule's coefficient of association in case of two attributes.	
Unit – 3: Spatial Statistics	**10 Hrs**
History and introduction, spatial characterization, spatial dependence, spatial auto correlation, spatial association, spatial scaling, spatial sampling, errors in spatial analysis.	
Unit:4: Multivariate data Analysis	**10 Hrs**
Introduction: Yule's notations, distribution of two variables, distribution of three or more variables, primary and secondary subscripts, Plane of regression and its derivation, estimation of regression coefficients a and b in case of three variables, partial regression coefficient in terms of delta, Residual, properties of residuals, Standard deviation of residuals, Multiple and partial correlation, definition, derivation and their standard properties.	

References

1. Agresti, A. (2010): Analysis of Ordinal Categorical Data, 2nd Edition,Wiley.
2. Anderson T.W. and Jeremy D. Finn (1996). The New Statistical Analysis of Data,Springer
3. Freedman, D., Pisani, R. and Purves, R. (2014), Statistics, 4th Edition, W. W. Norton & Company.
4. Gani S. G., Sankhyshastra and Ganakayantra. Udaya Ravi Publications,Bijapur.
5. Gupta S. C. Fundamentals of Statistics, Himalaya Publishing House,Bombay
6. Gupta S P. and V K Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand, New Delhi

Pedagogy

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Title of the Course: BA Statistics

Course 3: Statistics for Economics		Course 4:Probability and Distributions	
Number of Theory Credits	**Number of lecture hours/semester**	**Number of Theory Credits**	**Number of lecture hours/semester**
3	**4**	**3**	**4**

Content of Course 3: Statistics for Economics	**42 Hrs**
Unit – 1 :Supply and Demand	**10 Hrs**
How Markets Work, Markets and Welfare Markets and competition; determinants of individual demand/supply; demand/supply schedule and demand/supply curve; market versus individual demand/supply; shifts in the demand/supply curve, demand and supply together; how prices allocate resources; elasticity and its application; controls on prices; taxes and the costs of taxation; consumer surplus; producer surplus and the efficiency of the markets.	
Unit – 2:Measuring income inequality: Lorenz curve & Gini Coefficient	**10 Hrs**
Measuring income inequality: Pareto law of Distribution, Lorenz curve and Gini's Coefficient, Limitations and interpretations of GC.	
Unit – 3:Index numbers	**12 Hrs**
Definition, Problems involved in the construction of index numbers, methods of constructing index numbers of prices and quantities, simple aggregate and price relatives method,weightedaggregateandweightedaverageofrelativesmethod,importanttypes of weighted index numbers: Laspeyre's, Paasche's, Bowley's, Marshall- Edgeworth, Fisher's,methodofobtainingpriceandquantityindexnumbers,testsconsistencyofindex numbers, time reversal test, factor reversal test, and Circular test for index numbers,Uses and limitations of index numbers. Consumer price index number: Problems involved in the construction of cost of living index number, advantages and disadvantages, Aggregative expenditure method and Family budget method for the constructionof consumer price index numbers. Applications of Cost of Living Index numbers. Definition and measurement of Inflation rate – CPI and GNPDeflator.	
Unit 4:Time Series Analysis	**10 Hrs**

Introduction, definition and components of Time series, illustrations, Additive, Multiplicativeandmixedmodels,analysisoftimeseries,methodsofstudyingtimeseries: Secular trend, method of moving averages, least squares method – linear, quadratic, exponential trend fittings to the data. Seasonal variation - definition, illustrations, measurements, simple average method, ratio to moving average method, ratio of trend method, link relatives method, Cyclical variation- definition, distinction fromseasonal variation, Irregular variation- definition, illustrations.	

References

1. Gupta S. C. Fundamentals of Statistics, Himalaya Publishing House,Bombay
2. Mukhopadhaya, P. Applied Statistics, New Central Book Agency (P) Ltd.,Calcutta
3. Gupta S P. and V K Kapoor Fundamentals of Mathematical Statistics, Sultan Chand, New Delhi.

Pedagogy

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2. Students are encouraged to use resources available on opensources.

Content of Course 4: Probability and Distributions	**42 Hrs**
Unit – 1 :Introduction to Probability Introduction to probability, Basic concepts: Random experiment, Sample space, Mutually exclusive, exhaustive, equally likely events, complimentary events, classical, statistical and axiomatic definition of probability, properties, Addition theorem of Probability and Definition of independent, dependent events, Conditional probability, Multiplication theorem of Probability without proof. Simple numerical problems.	**10 Hrs**
Unit – 2:Random Variable and Mathematical Expectation Definitionofarandomvariable,discrete&continuousrandomvariable,probabilitymassfunction, probability density function, distribution function. Definition of mathematical expectation, expected mean and variance of discrete random variable. Properties of Mathematical expectation. Statement of addition and multiplication theorem of expectation. Numerical problems on mathematicalexpectation.	**10 Hrs**

Unit – 3:Discrete Distributions **Binomial Distribution:** Definition of Binomial Distribution, mean and Variance of Binomial distribution, numerical problems on binomial distribution. Uses of binomial distribution. Fitting of Binomial distribution and obtaining expected probabilities. Simple problems. **Poisson Distribution:** Definition of Poisson distribution. Mean, Variance and its properties of Poisson variate. Uses of Poisson distribution. Simple problems on Poisson distribution. Computing probabilities for large and small p for the given λ, finding λ for given two successive probabilities. Conditions for Poisson distribution as limiting form of Binomial distribution. Fitting of Poisson distribution.	**12 Hrs**
Unit – 4 : Normal Distribution Definition of normal variate. Application of Normal distribution Definition of standard normal variate, standard normal distribution and properties of normal curve. Conditions under which binomial distribution tend to normal distribution (Statement only). Finding probabilities and expected numbers when mean and variance are given quartile deviation, mean deviation and standard deviation and problems.	**10 Hrs**

References

1. Gupta S. C. Fundamentals of Statistics, Himalaya Publishing House,Bombay
2. Mukhopadhaya, P. Applied Statistics, New Central Book Agency (P) Ltd.,Calcutta
3. Gupta S P. and V K Kapoor Fundamentals of Mathematical Statistics, Sultan Chand, NewDelhi.
4. Gani S. G., Sankhyshastra and Ganakayantra. Udaya Ravi Publications, Bijapur.

Pedagogy

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Formative Assessment: 40 marks	
Assessment Occasion/ type	**Weightage in marks**
1st Internal Assessment Test for 30 marks 1 hr after 8 weeks and 2ndInternalAssessmentTestfor30marks1hrafter15weeks.Average oftwotestsshouldbeconsidered.	30
Assignment/Seminar (7 marks)+Attendance(3marks)	10
Total	40

Question Paper Pattern:

RANICHANNAMMAUNIVERSITY

Department of Statistics

I Semester B.A Statistics

Sub: **Code:** **MaximumMarks: 60**

a. Answer any Six Questions from Question1
b. Answer any Three each Questions from Question2,3,4 and 5

Q.No.1.	**Answer any Six Questions (At least Two question from EachUnit)** **a.** **b.** **c.** **d,** **e.** **f.** **g.** **h.**	**2X6=12**
Q.No.2.	**(Should cover Entire Unit-I)** **a.** **b.** **c.** **d.**	**4X3=12**
Q.No.3.	**(Should cover Entire Unit-II)** **a.** **b.** **c.** **d.**	**4X3=12**
Q.No.4.	**(Should cover Entire Unit-III)** **a.** **b.** **c.** **d.**	**4X3=12**
Q.No.5.	**(Should cover Entire Unit-IV)a.** **b.** **c.** **d.**	**4X3=12**

List of Open Electives

1. Statistics in Competitive Examinations
2. Statistical Methods
3. Business Statistics
4. Quantitative Aptitude

1. Statistics in Competitive Examinations (Open Elective)

Course Objectives

To train the students to solve the problems of statistics that appear in most of the competitive exams conducted by Banking, State and Central Governments and other agencies.

Course Outcomes (CO)

Afterthesuccessfulcompletionofthecourse,thestudentswillbeabletodevelopthedataanalysis skills required for Competitive Examinations.

Pedagogy

1. The course is taught using traditional chalk and talk method using problem solving through examples and exercises.

2. Students are encouraged to use resources available on open sources.

Contents

Unit 1: Collection Classification and Presentation of Statistical Data (6 hours)
Primary and Secondary data, Methods of data collection; Tabulation of data; Graphs and charts; Frequency distributions; Diagrammatic presentation of frequency distributions.

Unit 2: Measures of Central Tendency and Dispersion (12 hours) Meaning of central tendency and essentials of a good measure of central tendency. Types of measures of central tendency, Arithmetic mean, Median, Mode, Geometric mean and Harmonic mean - definition, merits and demerits. Properties of arithmetic mean. Empirical relation between mean median and mode. Problems on both grouped and ungrouped data for all the measures.

Partition values-definition and types of partition values: quartiles, deciles and percentiles. Problems on Quartiles for grouped ungrouped data only.

Meaning and objectives of measures of dispersion. Essentials of a good measure of dispersion, absolute and relative measures of dispersion. Types of measures of dispersion- Range, Quartile deviation, Mean deviation and standard deviation with relative measures – definition, merits and demerits. Properties of Standard deviation, simple problems on ungrouped and grouped data.

Unit 3: Aptitude Ability and Reasoning **(14 hours)**

Area, Banker's Discount, Surds and Indices, Ratio and Proportion, Simple Interest, Problems on Trains, Profit and Loss, Compound Interest.

Reasoning: Number series, Analogy, Classifications, Blood relations Coding-decoding, Puzzle test, Logical Venn diagram. Alphabet-test, Alpha-numerical sequence puzzle, Mathematical operations, Numbers, ranking & time sequence test, Logical sequence test, Arithmetical operations.

Unit 4: Introduction to Probability (10hours)

Introduction to probability, Basic concepts: Random experiment, Sample space, Mutually exclusive, exhaustive, equally likely events, complimentary events, classical, statistical and axiomatic definition of probability, properties, Addition theorem of Probability and Definition of independent, dependent events, Conditional probability, Multiplication theorem of Probability without proof. Simple numerical problems.

References

1. Freedman, D., Pisani, R. and Purves, R. (2014), Statistics, 4th Edition, W. W. Norton & Company.
2. Gupta S. C. Fundamentals of Statistics, Himalaya Publishing House, Bombay.
3. Gani S. G., Sankhyshastra and Ganakayantra. Udaya Ravi Publications, Bijapur.

2. Statistical Methods (Open Elective)

Course Objectives

This is an open elective course for social science and life science students.

The students will learn the elements of descriptive statistics, probability, statistical methods such as tests of hypotheses, correlation and regression.

Course Outcomes (CO)

Students will be able to

CO1. Acquire the knowledge of statistical methods.

CO2.Identify types of data and visualization, analysis and interpretation. CO3.Know about elementary probability and probability models.

CO4.Employ suitable test procedures for given data set.

Pedagogy

The course is taught using traditional chalk and talk method using problem solving through examples and exercises. Students are encouraged to use resources available on open sources.

Contents

Unit 1:Introduction **(10Hours)**

Definition and scope of statistics. Data: quantitative and qualitative, attributes, variables, scales of measurement - nominal, ordinal, interval and ratio. Presentation: tabular and graphic, including histogram an dogives. Concepts of statistical population and sample. Sampling from finite population-Simplerandom sampling, Stratified and systematic random sampling procedures (definitions and methods only). Concepts of sampling and non-sampling errors.

Unit 2: Univariate and Bivariate Data Analysis **(10 Hours)**

Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, moments, skewness and kurtosis. Bivariate data, scatter diagram, Correlation, Karl-Pearson's correlation coefficient, Rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponentialcurves.

Unit 3: Probability and Distributions **(12Hours)**

Probability: Random experiment, trial, sample space, events-mutually exclusive and exhaustive events. Classical, statistical and axiomatic definitions of probability, addition and multiplication theorems, Bayes theorem (only statements). Discrete and continuous random variables, probability mass and density functions, distribution functions, expectation of a random variable. Standard univariate distributions: Binomial, Poisson and Normal distributions (Elementary properties and applications only).

Unit 4: Sampling Distributions and Testing of Hypothesis **(10 Hours)**

Distribution of sample mean from a normal population, Chi-square, t and F distributions (No derivations) and their applications. Statistical Hypothesis –null and alternative hypothesis, simple and composite hypothesis. Type I and Type II errors, level of significance, critical region, P-value and its interpretation. Test for single mean, equality of two means, single variance, and equality of two variances for normal populations.

References

1. Daniel, W. W. (2007 Biostatistics - A Foundation for Analysis in the Health Sciences,Wiley
2. T.W. Anderson and Jeremy D. Finn(1996). The New Statistical Analysis of Data,Springer.
3. MukhyopadyayaP(1999). Applied Statistics, New Central book Agency ,Calcutta.
4. Ross,S.M.(2014) Introduction to Probability and Statistics For Engineers andScientists.
5. Cochran, W G (1984): Sampling Techniques, Wiley Eastern, NewDelhi.

3. Business Statistics (Open Elective)

Course Objectives

1. Provide an introduction to basics of statistics within a financialcontext.
2. To enable students to use statistical techniques for analysis and interpretation ofbusiness data.

Course Outcomes (CO)

Upon the completion of this course students should be able to:
CO1.Frame and formulate management decision problems.
CO2.Understand the basic concepts underlying quantitative analysis.
CO3.Use sound judgment in the applications of quantitative methods to management decisions.

Pedagogy

1. The course is taught using traditional chalk and talk method using problem solving through examples andexercises.

2. Students are encouraged to use resources available on opensources.

Contents

Unit 1: Statistical Data and Descriptive Statistics (12 hours)

Nature and Classification of data: univariate, bivariate and multivariate data; time-series and cross-sectional data. Measures of Central Tendency: mathematical averages including arithmetic mean geometric mean and harmonic mean, properties and applications. Positional Averages Mode and Median (and other partition values including quartiles, deciles, and percentiles). Measures of Variation: absolute and relative. Range, quartile deviation, mean deviation, standard deviation and their coefficients, Properties of standard deviation/variance Skewness: Meaning, Measurement using Karl Pearson and Bowley's measures; Concept of Kurtosis.

Unit 2: Simple Correlation and Regression Analysis (10 Hours)

Correlation Analysis: Meaning of Correlation: simple, multiple and partial; linear and non-linear, Correlation and Causation, Scatter diagram, Pearson's co-efficient of correlation; calculation and properties (Proof not required). Correlation and Probable error; Rank Correlation.

Regression Analysis: Principle of least squares and regression lines, Regression equations and estimation;Propertiesofregressioncoefficients;RelationshipbetweenCorrelationandRegression coefficients; Standard Error of Estimate and its use in interpreting theresults.

Unit 3:IndexNumbers (10 hours)

Definition,Problemsinvolvedintheconstructionofindexnumbers,methodsofconstructingindex numbersofpricesandquantities,simpleaggregateandpricerelativesmethod,weightedaggregate and weighted average of relatives method, important types of weighted index numbers: Laspeyre's, Paasche's, Bowley's, Marshall- Edgeworth, Fisher's, method of obtaining price and quantity index numbers, tests consistency of index numbers, time reversal test and factor reversal test for index numbers, Uses and limitations of index numbers. Consumer price index number: Problems involved in the construction of cost of living index number, advantages and disadvantages, Aggregative expenditure method and Family budget method for the construction of consumer price index numbers. Applications of Cost of Living Index numbers.Definition and measurement of Inflation rate – CPI and GNPDeflator.

Unit 4: TimeSeries Analysis (10hours)

Introduction, definition and components of Timeseries, illustrations, Additive, Multiplicative and mixed models, analysis of time series, methods of studying time series: Secular trend, method of moving averages, least squares method – linear, quadratic, exponential trend fittings to the data. Seasonal variation - definition, illustrations, measurements, simple average method, ratio to moving average method, ratio of trend method, link relatives method, Cyclical variation- definition, distinction from seasonal variation, Irregular variation- definition, illustrations.

References

1. Levin, Richard, David S. Rubin, Sanjay Rastogi, and H M Siddiqui. Statistics for Management. 7th ed., PearsonEducation.
2. David M. Levine, Mark L. Berenson, Timothy C. Krehbiel, P. K.Viswanathan, Business Statistics: A First Course, PearsonEducation.
3. Siegel Andrew F. Practical Business Statistics. McGraw HillEducation.
4. Gupta,S.P.,andArchanaAgarwal.BusinessStatistics,SultanChandandSons,NewDelhi.
5. Vohra N. D., Business Statistics, McGraw Hill Education.
6. Murray R Spiegel, Larry J. Stephens, Narinder Kumar. Statistics (Schaum's Outline Series), Mc Graw HillEducation.
7. Gupta, S.C. Fundamentals of Statistics. Himalaya PublishingHouse.
8. Anderson, Sweeney, and Williams, Statistics for Students of Economics and Business, Cengage Learning.

4. Quantitative Aptitude (Open Elective)

Course Objective

To train the students in the aspects of numerical ability, reasoning techniques and mental ability for competitive examinations conducted by various public and private boards.

Course Outcomes (CO)

After the successful completion of the course, the students will be able to develop hegeneral skills required to Competitive Examinations.

Pedagogy

Activity based teaching and learning along with theoretical aspects using classroom teaching, group discussions and seminars.

Contents

Unit 1: Numerical Aptitude I (10 hours)

Number Systems, Computation of Whole Numbers, Decimals and Fractions and relationship between Numbers, Fundamental arithmetical operations.

Unit 2: Numerical Aptitude II (12hours)

Percentages, Ratios and Proportions, Average, interest, Profit and Loss, Discount use of Tables and Graphs Time and Distance, Ratio and Time, Time and Work.

Unit 3: Reasoning and Mental ability I (10 hours)

Coding-Decoding, Symbol notations, Number Series, Analogy & Classification , Blood relations, Direction Sense, Liner arrangement.

Unit 4: Reasoning and MentalAbility II (10hours)

Ranking and Comparison, Input & output, Assumptions, Conclusion & Inferences.

References:

1. Aggarwal R.S., Quantitative Aptitude: by, Publication by S,Chand
2. Ningappa A H ,Mental Ability: AshokPublication.

COURSE-WISE SYLLABUS

Semester – III

BA Statistics

The course STATISTICS in III semester has two papers (Paper V & VI) for 06 credits: Each paper has 03 credits. Both the papers are compulsory. Details of the courses are as under.

Course No.5 (Paper-I): Title of the Course (Paper-I): **21BA3STSDSCT1**
: Title of Paper: EXACT SAMPLING DISTRIBUTIONS AND STATISTICAL INFERENCE

Year	II	**Course Code: 21BA3STSDSCT1**	**Credits**	03
Sem.	III	**Course Title: Title of Paper: EXACT SAMPLING DISTRIBUTIONS AND STATISTICAL INFERENCE**	**Hours**	42
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 40		Summative Assessment Marks: 60		Duration of ESA:.03 hrs.

Number of TheoryCredits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours/semester
3	42	0	0

Syllabus- Course 5: 21BA3STSDSCT1 : Title- EXACT SAMPLING DISTRIBUTIONS AND STATISTICAL INFERENCE	**Total Hrs: 42**
UNIT-I Sampling distribution and Estimation	**20 hrs**
Definition of basic concepts: population, sample, parameter and statistic. Definition of a Random Sample, Sampling distribution of a Statistic along with examples, Definition of standard error, Standard error of mean, standard deviation, proportion, difference of means and difference of proportions. Uses of standard error and simple problems. Definition of the terms – Estimate, Estimation, Point estimation and interval estimation. Meaning of confidence interval, confidence limits and confidence co-efficient with examples. Construction of 95% and 99% confidence intervals - mean, difference of means, proportion and difference of proportions for large samples only and their numerical problems on the construction of 95% and 99% confidence limits.	
UNIT-II Testing of Hypothesis	**10 hrs**
Explanation of terms – Statistical hypothesis, Null hypothesis, Alternative hypothesis, Level of significance, critical region, size of the test, power of the test with examples. Definition of type–I and type–II errors. Large sample tests- Test of significance of population mean, test of significance of equality of means of two populations, test of significance of population proportion and test of significance of equality proportion of two populations.	

Unit-III Chi-Square, *t* - test and F-test Distributions	12 hrs
Introduction to Chi-square distribution, definition of Chi-square variate. Properties of Chi-square distribution. Applications of Chi-square distribution. Chi-square test of goodness of fit. Problems on Chi-square test of Goodness of fit and independence of attributes. Definition, assumption and properties of t-test. t-test for testing population mean, equality of sample means and paired t-test. Applications of t-test. Simple problems. Definition, assumption and properties of F-statistic. F-test for equality of variances and its applications. Numerical problems.	

Books recommended.

1. Ramchandran, K.M. and Tsokos C. P. (2009). Mathematical Statistics with Applications, Academic Press.

2. Gupta S. P. (2021). Statistical Methods, Sultan Chand and Sons, New Delhi, 46th edition.

3. Mukhopadhyaya, P. (2011). Applied Statistics, Books and Allied Ltd.

4. Gupta, S C. and V. K. Kapoor. (2018). Fundamentals of Mathematical Statistics, Sultan Chand, New Delhi, 11th Edition.

5. Gani S. G.(2003). Sankhyshastra and Ganakayantra, Udaya Ravi Publications, Bijapur.

Semester – III

Subject: BA STATISTICS
Discipline Specific Course (DSC)

Course No.-6 (Paper No. II): Title of the Course : 21BA3STSDSCT2: SAMPLING TECHNIQUES

Year	II	**Course Code: 21BA3STSDSCT2**	**Credits**	03
Sem.	III	**Course Title: SAMPLING TECHNIQUES**	**Hours**	42
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 40		Summative Assessment Marks: 60	Duration of ESA:.02 hrs.	

Course Outcome (CO):

After successful completion of this course, students will be able to:

CO 1 : Know the concept of Population, Sample, Sampling unit, sampling design, sampling frame, sampling scheme, need for samping.

CO 2 : Apply different sampling methods for designing and selecting a sample from a population.

CO 3 : Design good questionnaire relevant to a survey for a specific investigation.

CO 4 : Explain sampling and non-sampling errors.

Syllabus-Course 6: 21BA3STSDSCT2 : Title- SAMPLING TECHNIQUES	Total Hrs: 42
Unit-I Basic Concepts of Sampling	**08 hrs**
Meaning of population, population size, finite population, infinite population, sample, sample size, sampling, sampling technique, sampling unit, sampling frame, census and sample survey, advantages of sampling. Examples of sampling. Types of errors in sample survey-Sampling errors and non-sampling errors, non response errors, response errors and tabulation errors. Advantages of sampling over complete census. Limitation of sampling. Planning of sample survey and its execution.	
Unit-II Simple Random Sampling	**14 hrs**
Introduction and definition of Simple Random Sampling (SRS), Notations and formulae for estimating population mean, total and variance. Methods of obtaining simple random sample-Lottery method and Random numbers table method. Merits and demerits of Simple Random Sampling. Simple problems on simple random sampling method.	
Unit-III Stratified Random and Systematic Random Sampling Techniques	**20 hrs**
Need for stratification, stratifying factors, improvement of method over SRS, Definition of strata, stratification, and stratified random sampling. Notations and formulae for estimating population mean, total and variance. Methods of allocation and sample size in different strata-Equal allocation, Proportional allocation and Optimal allocation. Determination of Bowley's formulae for proportional allocation and Neyman's formula for optimal allocation. Advantages and disadvantages of stratified random sampling method. Simple problems on stratified random sampling method, Proportional and Optimal allocation. Definition of systematic random sampling. Explanation of methods of obtaining systematic random samples. Examples of systematic random sample. Formulae for estimating population mean, total and variance. Applications of systematic random sampling method. Merits and demerits of systematic random sampling method. Simple problems on systematic random sampling method.	

Books recommended.

1. Parimal Mukhopadhyay (2008). Theory and methods of Survey Sampling, PHI publications.
2. Gupta S. P. (2021). Statistical Methods, Sultan Chand and Sons, New Delhi, 46th edition.
3. Gupta S. C. and V. K. Kapoor (2018). Fundamentals of Applied Statistics, Sultan Chand, New Delhi
4. Gani S. G.(2003). Sankhyshastra and Ganakayantra. Udaya Ravi Publications, Bijapur.

Title of the Course: OEC-3: DATA ANALYSIS WITH SPSS

(Open Elective)

OEC-3 : Title of the Course : 21BA3STSOECT1: Data Analysis With SPSS

Year	II	**Course Code: 21BA3STSOECT1**	**Credits**	03
Sem.	III	**Course Title: Data Analysis With SPSS**	**Hours**	42
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 40		Summative Assessment Marks: 60	Duration of ESA:.02 hrs.	

Course Outcome (CO):

After the completion of this course, students will be able to:

CO 1 : Use SPSS software for cleaning and presentation of data.

CO 2 : Present the data in the form of diagrams and graphs.

CO 3 : Analyze univariate, bivariate and multivariate data.

Syllabus-Course OEC-3 : 21BA3STSOECT1 : Title- DATA ANALYSIS WITH SPSS	**Total Hrs: 42**
Unit-I Introduction	**18 hrs**
Need of SPSS, preparation of coding sheet of the questionnaire, defining the type of variable and data, constructing the database – defining variable name, type of variable, width of variable name, labeling, assigning the numeric value to the characteristic, declare measurement of scale of data. **Data Editing in SPSS**: Enter the data based on type of data case wise for different variables, defining the grouping of variable for repeated measures. transforming the data into same variable and different variable,	
Unit-II Tabulation and Graphical representation	**12 hrs**
Formation of frequency distribution, representation of frequency distribution by graphs, construction cross table, P-P plots and Q-Q Plots.	
Unit-III Univariate, Bivariate and multivariate Data analysis	**12 hrs**
Calculation of Measures of central tendency, Dispersion, Karl-Pearson's correlation, Regression, fitting different curves, testing of hypothesis- t-test for single mean, difference of means for independent samples, one-way ANOVA.	

Note: Various techniques studied in the paper has to be demonstrated using SPSS software.

Books recommended.

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig (2007). Introduction to Mathematical Statistics, Pearson Education, Asia.
2. Irwin Miller and Marylees Miller, John E. Freunds (2006). Mathematical Statistics with Applications, 7th Ed., Pearson Education, Asia.
3. Sheldon Ross (2007). Introduction to Probability Models, 9th Ed., Academic Press, Indian Reprint.
4. Gardener, M (2012). Beginning R: The Statistical Programming Language, Wiley Publications.
5. Cunningham, B.J (2012). Using SPSS: An Interactive Hands-on approach.

Details of Formative assessment (IA) for DSCC/OEC/SEC: 40% weightage for total marks

Type of Assessment	Weightage	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th 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 Social 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

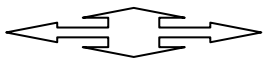
2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

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



Semester-IV

Course : BA STATISTICS
Discipline Specific Course (DSC)

The course STATISTICS in IV semester has two papers (Paper VII & VIII) for 06 credits: Each paper has 03 credits. Both the papers are compulsory. Details of the courses are as under.

Course No.7 (Paper-I): Title of the Course (Paper-I): **21BA4STSDSCT1: Title of Paper: ANALYSIS OF VARIANCE AND DESIGN OF EXPERIMENTS**

Year	II	**Course Code: 21BA4STSDSCT1**	**Credits**	03
Sem.	IV	**Course Title: Title of Paper: ANALYSIS OF VARIANCE AND DESIGN OF EXPERIMENTS**	**Hours**	42
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 40		Summative Assessment Marks: 60	Duration of ESA:.03 hrs.	

Course Outcome (CO):

After the successful completion of the course, the students will be able to:

CO 1 : Develop strategic plans for experimentation in scientific research projects.

CO 2 : Apply the principles of Design of Experiment to generate experimental designs.

CO 3 : Develop problem solving skills for the application of Design of experiments to Agriculture and controlled laboratory experiments.

Syllabus-Course 7: 21BA4STSDSCT1: Title of Paper: ANALYSIS OF VARIANCE AND DESIGN OF EXPERIMENTS	**Total Hrs: 42**
Unit-I Analysis of Variance: One-Way and Two-way Classification	**18 hrs**
Definition of analysis of variance and its basic assumptions. Meaning of assignable and chance variations. ANOVA for one-way classified data-definition, linear mathematical model, assumptions, statement of hypothesis, splitting up of total sum of squares into various component sum of squares, degrees of freedom and ANOVA table. Simple numerical problems one-way classified data. Analysis of variance for two-way classification – definition, linear mathematical model, assumptions, statement of hypothesis, splitting up of total sum of squares into various component sum of squares. Degrees of freedom and ANOVA table. Simple numerical problems on two way classified data.	
Unit-II Design of Experiments: Completely Randomized Design	**12 hrs**
Definition of terms - Experiment, treatment, experimental unit, experimental	

material, yield, block, precision, experimental error, uniformity trials, and efficiency. Basic principles of design of experiments – Replication, Randomization and Local control. Completely Randomized Design (CRD) -definition, layout, linear mathematical model, assumptions, hypothesis, splitting up of sum of squares into various component sum of squares, degrees of freedom and ANOVA table. Merits, demerits and applications of CRD. Simple numerical problems.	
Unit-III Randomized Block Design	**12 hrs**
Introduction and definition of Randomized Block Design (RBD), layout, linear mathematical model, assumptions, statistical hypothesis, splitting up of total sum of squares into various component sum of squares, degree of freedom, and ANOVA table. Merits and demerits of RBD. Applications of RBD. Comparison between CRD and RBD. Simple problems.	

Books recommended.

1. Das, M.N. and Giri, N.C. (1986). Design and Analysis of Experiments, II Edition Wiley Eastern Ltd., New Delhi

2. Goon, A.M., Gupta, M.K. and Dasgupta, B. (1998). Fundamentals of Statistics, Vol. II, The world Press Pvt. Ltd. Kolkatta.

3. Gupta S. P. (2021). Statistical Methods, Sultan Chand and Sons, New Delhi, 46th edition.

4. Gupta S. C. and V. K. Kapoor (2018). Fundamentals of Applied Statistics, Sultan Chand, New Delhi.

5. Mukhopadhaya, P. (2011). Applied Statistics, Books and Allied Ltd.

6. Gani S. G.(2003). Sankhyshastra and Ganakayantra. Udaya Ravi Publications, Bijapur.

Semester – IV

Course : BA STATISTICS
Discipline Specific Course (DSC)

Course No.-8 (Paper No. II): Title of the Course: 21BA4STSDSCT2 : REGRESSION ANALYSIS AND ECONOMETRICS

Year	II	**Course Code: 21BA4STSDSCT2**	**Credits**	03
Sem.	IV	**Course Title: Title of Paper: REGRESSION ANALYSIS AND ECONOMETRICS**	**Hours**	42
Course Pre-requisites, if any		NA		
Formative Assessment Marks: 40		Summative Assessment Marks: 60	Duration of ESA:.03 hrs.	

Course Outcome (CO):

After completion of the course, students will be able to:

CO 1 : Provide a wider and deeper exposure to the econometric techniques and their application to the discipline of Economics.

CO 2 : Gain an understanding of how to solve problems using econometrics that are common to economic modeling.

CO 3 : Develop ability to accurately translate complex economic problems into models and so as to solve them by applying econometric techniques.

Syllabus-Course 8: 21BA4STSDSCT2: Title- REGRESSION ANALYSIS AND ECONOMETRICS	**Total Hrs: 42**
Unit-I: Introduction to Econometrics and Simple Regression Analysis	**18 hrs**
Econometrics – definitions – scope – methodology – types. Quantification of hypothetical linear relationship using appropriate data. Two variable regression model, assumptions, method of least squares properties. maximum likelihood method, testing of hypotheses using point and interval estimates, forecasting solving problems using SPSS.	
Unit-II : Multiple Regression Analysis	**12 hrs**
Nonlinear relationships – transformation of variables – functional forms – three variable regression model – applications using SPSS. General linear model (matrix approach) – specification – OLS estimators –The properties of the estimated regression coefficients, hypothesis testing and the construction of confidence intervals of the regression model, problems.	

Unit-III: Problems in regression analysis	12 hrs
Violation of classical assumptions – multicollinearity – autocorrelation — problems – causes – consequences – remedial measures – model specification and diagnostic testing.	

Books recommended.

1. Damodar N. Gujarathi (2009). Basic Econometrics, New Delhi: Tata McGraw Hill
2. Companies Johnston, J. (1972). Econometric Methods, 2nd Edition, McGraw Hill International.
3. Koutsoyiannis, A. (2004). Theory of Econometrics, 2nd Edition, , Palgrave Macmillan Limited
4. Maddala, G.S. and Lahiri, K. (2009). Introduction to Econometrics, 4th Edition, John Wiley & Sons
5. G.M.K. Madanani (1980). Introduction to Econometrics, second edition, Oxford & IBH Publishing company, New Delhi.
6. Gupta, S.C. and Kapoor, V. K. (2020). Fundamentals of Applied Statistics, Sultan Chand & Sons, New Delhi.

Semester – IV

Course : BA STATISTICS

OEC-4: Title of the Course: 21BA4STSOECT1: Quantitative Analysis Techniques

Year	II	Course Code: 21BA4STSOECT1	Credits	03
Sem.	IV	Course Title: Title of Paper: Quantitative Analysis Techniques	Hours	42

Course Pre-requisites, if any	NA	
Formative Assessment Marks: 40	Summative Assessment Marks: 60	Duration of ESA:.03 hrs.

Course Outcome (CO):

After the completion of this course, students will be able to:

CO 1 : Carryout correlation and regression analysis

CO 2 : Formulate and solve linear programming problems

CO 3 : Formulate and solve transportation and assignment problems

Syllabus-Course OEC-4 : 21BA4STSOECT1: Title- Quantitative Analysis Techniques	Total Hrs: 42
Unit-I Correlation and regression analysis	**18 hrs**
Correlation- Definition, Types - Simple, multiple, partial. Causation - Spurious, positive, negative, perfect and no correlation, explanation with examples. Importance of	

correlation analysis. Measurement of correlation- scatter diagram, Karl Pearson's coefficient of correlation, Properties of coefficient of correlation, interpretation. Spearman's coefficient of rank correlation – with and without ties, interpretation. Coefficient of determination and its interpretation. **Regression**-Definition, regression lines/equations of X on Y and Y on X. Properties of regression coefficients and regression lines/equations. Principle of least squares and fitting of linear, quadratic and exponential curves. Uses of regression analysis. Comparison between correlation and regression.	
Unit-II Linear programming problem (LPP)	**12 hrs**
Definition and scope of Operations Research (OR). Modeling and solution. Linear Programming Problem (L.P.P): Definition, Standard forms. Formulation of LPP. Basic Solutions, degenerate and non-degenerate solutions. Graphical method of solving LPP. Criteria for unbounded, Multiple and infeasible solutions.	
Unit-III Transportation problem and Assignment Problem	**12 hrs**
Transportation problem: Mathematical formulation. Existence of feasible solution. Finding initial basic feasible solution: North West Corner Rule, matrix minima method and Vogel's method. Unbalanced transportation problem. **Assignment Problem:** Mathematical Formulation and Hungarian algorithm. Unbalanced assignment problem.	

Books recommended.

References

1. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2002). Fundamentals of Statistics, Vol. I, 8th Ed., The World Press, Kolkata.
2. Ross, S.M. (2014). Introduction to Probability and Statistics for Engineers and Scientists, 5th Edition, AcademicPress.
3. KanthiSwaroop, Manmohan and P. K. Gupta (2013). Operation Research, Sultan Chand New Delhi.
4. Mustafi, C.K.(2006). Operations Research Methods and Practice, 3/e.NewAge Publication.
5. Narag. A.S.(1970). Linear Programming and Decision Making. Sultan Chand and Co.
6. Sharma, J K.(2013). Operations Research: Theory and Applications (5/e). New Delhi: Laxmi Publications.

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

Type of Assessment	Weight age	Duration	Commencement
Written test-1	10%	1 hr	8th Week
Written test-2	10%	1 hr	12th 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 Social Science
04 - Year UG Honors programme: 2022-24

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

Part-A

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

Part-B

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

Part-C

9. 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.