

ADIKAVI NANNAYA UNIVERSITY, RAJAMAHENDRAVARAM  
 B.Sc., STATISTICS (CBCS) COURSE STRUCTURE  
 With effect from 2015-2016 Admitted Batch

Year	Semester	Paper	Title of the Paper	Hours/ Week	Credits	Marks		Total
						I.A	S.E	
	VI	VII *	Elective any one (A) or (B)					
			(A) Applied Statistics	3	3	25	75	100
			Practical	2	2	-	50	50
			(OR)					
			(B) Optimization Techniques	3	3	25	75	100
			Practical	2	2	-	50	50
		VIII**	CLUSTER - A					
			A1: Demography and Vital Statistics	3	3	25	75	100
			Practical	2	2	-	50	50
			A2: Advanced Experimental Designs	3	3	25	75	100
			Practical	2	2	-	50	50
			A3: Project Work	5	5	50	50	100
			(OR)					
			CLUSTER - B					
			B1: Operations Research - I	3	3	25	75	100
			Practical	2	2	-	50	50
			B2: Operations Research - II	3	3	25	75	100
			Practical	2	2	-	50	50
			B3: Project Work	5	5	50	50	100

\*Candidate has to choose only one paper from VII(A) or VII(B)

\*\*Candidates are advised to choose Cluster (A) if they have chosen VII (A) and Choose Cluster (B) if they have chosen VII(B)

**III B.Sc., Degree Examination (at the end of VI Semester)****STATISTICS SYLLABUS****(With Mathematics Combination)****Semester – VI CBCS****Paper – VII – A: Applied Statistics****(With effect from 2015-2016 admitted Batch)****Unit – I**

**Time Series:** Time series and its components with illustrations, additive, multiplicative and mixed models. Determination of trend by least squares, moving average methods. Growth curves their fitting. Modified Exponential. Gompertz and logistic curves.

**Unit – II**

**Time Series:** Determination of seasonal indices by ratio to moving average, ratio to trend and link relative's methods.

**Official Statistics:** functions and organizations of CSO and NSSO Agricultural statistics area by yield statistics.

**Unit – III**

**Index Numbers:** Concept, construction, uses and limitations of simple and weighted index numbers. Laspeyres's, Paasche's and Fisher's index number. Criterion of a good index numbers, problems involved in the construction of index numbers.

**Unit – VI**

**Index Number:** Fisher's index as ideal index number, Reverse Tests, Fixed and chain base index numbers. Cost of living index numbers and whole sale price index numbers. Base shifting, splicing and deflation of index number.

**Unit – V**

**Demand Analysis:** Introduction, Demand and Supply, price elasticities of supply and demand. Methods of determining demand and supply curves. Lontief's Pigou's methods of determining demand curve from time series data, limitations of these methods pigou's method time series data. Pareto law of income distribution curves of concentration.

**Text Books:**

1. Telugu Academy B.A/B.Sc III year paper – III Statistics – applied statistics – Telugu academy by prof K.Srinivasa Rao, Dr D.Giri, Dr.A.Anand, Dr.V.Papaiah Sastry.
2. K.V.S.Sarma: Statistics Made Simple: Do it yourself on PC.PHI.

**Reference Books:**

1. Fundamentals of applied statistics: V.K.Kapoor and SC Gupta.
2. Indian Official Statistics- MR Saluja.
3. Anuvarthita sankyaka Sastram – Telugu Academy.

**List of Practicals:**

1. Time Series – Moving Averages Method (Even and Odd Years)
2. Time Series – Least Squares Method (Even and Odd Years)
3. Index Numbers – Calculation of Weighted Index Numbers.
4. Index Numbers – Fisher Index Number Ideal Index Number.
5. Index Numbers - Cost of Living Index Number.

# # #

**III B.Sc., Degree Examination (at the end of VI Semester)**  
**STATISTICS SYLLABUS**  
**(With Mathematics Combination)**  
**Semester – VI CBCS – CLUSTER - A**  
**Paper – VIII - A1: DEMOGRAPHY & VITAL STATISTICS**  
**(With effect from 2015-2016 admitted Batch)**

**Unit-I**

**Population Theories:** Coverage and content errors in demographic data, use of balancing equations and Chandrasekharan - Deming formula to check completeness of registration data. Adjustment of age data, use of Myer and UN indices, Population composition, dependency ratio.

**Unit-II**

**Vital Statistics:** Introduction and sources of collecting data on vital statistics, errors in census and registration data. Measurement of population, rate and ratio of vital events, Measurements of Mortality: Crude Death Rate (CDR), Specific Death Rate (SDR), Infant Mortality, Rate (IMR) and Standardized Death Rates.

**Unit – III**

**Vital Statistics:** Stationary and Stable population, Central Mortality Rates and Force of Mortality. Life (Mortality) Tables: Assumption, description, construction of Life Tables and Uses of Life Tables.

**Unit-IV**

**Vital Statistics:** Abridged Life Tables; Concept and construction of abridged life tables by Reed-Merrell method, Greville's method and King's Method. Measurements of Fertility: Crude Birth Rate (CBR), General Fertility Rate (GFR), Specific Fertility Rate (SFR) and Total Fertility Rate (TFR).

**Unit –V**

**Vital Statistics:** Measurement of Population Growth: Crude rates of natural increase, Pearl's Vital Index Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR).

**Suggested Reading:**

1. Mukhopadhyay P. (1999): Applied Statistics, Books and Allied (P) Ltd.
2. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2008): Fundamentals of Statistics, Vol. II, 9<sup>th</sup> Edition, World Press.
3. Biswas, S. (1988): Stochastic Processes in Demography & Application, Wiley Eastern Ltd.
4. Croxton, Fredrick E., Cowden, Dudley J. and Klein, S. (1973): Applied General Statistics, 3<sup>rd</sup> Edition. Prentice Hall of India Pvt. Ltd.,
5. Keyfitz N., Beckman John A.: Demogrphy through Problems S-Verlag New York.

**List of Practicals:**

1. Measurements of Mortality
2. Measurements of Fertility:
3. Life Tables
4. Measurement of Population Growth

**# # #**

## III B.Sc., Degree Examination (at the end of VI Semester)

## STATISTICS SYLLABUS

(With Mathematics Combination)

Semester – VI CBCS - CLUSTER - A

Paper – VIII - A2: Advanced Experimental Designs

(With effect from 2015-2016 admitted Batch)

## Unit –I

**Design of Experiments:** Review of Completely randomized Design (C.R.D) Randomized Block Design (R.B.D) and Latin Square Design (L.S.D).

## Unit –II

**Missing plot technique:** Analysis of Randomized Block Design (R.B.D) with one and two missing observations and Latin Square Design (L.S.D.) with one missing observation.

## Unit –III

**Analysis of Covariance (ANCOVA):** Analysis of covariance for a one-way classification with one concomitant variable in C.R.D. Layout and for two-way classification with one concomitant variable in R.B.D.

## Unit –IV

**Factorial Designs:** Estimation of main effects interactions and analysis of  $2^2$ ,  $2^3$ ,  $3^2$  and  $3^3$  Factorial experiments.

## Unit –V

Balanced Incomplete Block Design (BIBD) and Partially Incomplete block design (PBIBD).

**Books for Reference:**

1. S.C. Gupta and V.K. Kapoor, *Fundamentals of Applied Statistics*, Sultan Chand and Sons.
2. Das, M.N. and N.C. Giri *Design and Analysis of Experiments*, 2<sup>nd</sup> edition, New Age International (P) Limited Publishers, 11986.
3. Montgomery, D.C.: *Design of Analysis of Experiments*, John Wiley.
4. Murthy, M.N. *Sampling theory and methods*, Tata McGraw Hill, New Delhi, 1967.
5. Des Raj, *Sampling Theory*, Tata McGraw Hill, New Delhi, 1976.

**List of Practicals:**

1. RBD – Single Missing Observation.
2. LSD – Single Missing Observation.
3.  $2^2$  – Factorial Experiment.
4.  $2^3$  – Factorial Experiment.
5.  $3^2$  – Factorial Experiment.

**# # #**

**III B.Sc., Degree Examination (at the end of VI Semester)****STATISTICS SYLLABUS****(With Mathematics Combination)****Semester – VI CBCS****Paper – VII – B: Optimization Techniques****(With effect from 2015-2016 admitted Batch)****Unit –I**

**Operations Research:** Origin and development of O.R., Nature and features of O.R., Scientific method and Modeling in O.R., Advantages and limitations of models, General solution methods for O.R., models.

**Unit –II**

**Linear Programming Problem:** Definition, components, basic assumptions, Mathematical formulation of the problem, Illustrations on mathematical formulation of L.P.P. L.P.P. – graphical solution method, some exceptional cases in graphical method-Alternative optima, unbounded solution and infeasible solution.

**Unit –III**

**Linear Programming Problem-Simplex Method-I :**General L.P.P. –Objective function, constraints, non-negative restrictions, Solution of L.L.P, feasible solution and optimum solution, Canonical and Standard forms of L.P.P., Basic solution- definition, degenerate solution, basic feasible solution, Associated cost vector, improved basic feasible solution, optimum basic feasible solution and net evaluation, Fundamental theorem of L.P.P, The computational procedure- Simplex Algorithm, Simple linear programming problems.

**Unit –IV**

**Linear Programming Problem Simplex Method –II:** Artificial Variable Technique, The Big  $M$  Method or Penalties, Degeneracy, Alternative optima, unbounded solutions, Non existing or infeasible solutions.

**Unit –V**

**Duality in Linear Programming:** General primal – Dual pair, formulating a dual problem, Primal-Dual Pair in Matrix form, Duality



**List of Reference Books:**

1. Quality, Reliability & Operations Research, First Edition (2010), Published by Telugu Academy, Hyderabad.
2. Operations Research Theory, Methods and Applications, S.D. Sharma, Himanshu
3. Sharma, improved and enlarged edition, Kedar Nath Ram Nath & Co., Meerut.
4. Krishna's Operations Research, Dr.R.K.Gupta, 27<sup>th</sup> Edition ,2010, Krishna Prakashan Media (P) Ltd., Meerut.
5. Operations Research: theory and Applications, J.K.Sharma, 5th Edition, 2013, Macmillan.
6. Operations Research: An Introduction, Hamy A.Taha, 9<sup>th</sup> edition, 2010, prentice Hall.

**List of Practicals:**

1. Linear Programming Problem
2. Graphical Method
3. Simplex Method
4. BIG – M Method
5. Duality Method.

**# # #**

**III B.Sc., Degree Examination (at the end of VI Semester)****STATISTICS SYLLABUS****(With Mathematics Combination)****Semester – VI CBCS- CLUSTER - B****Paper – VIII - B1: Operations Research – I****(With effect from 2015-2016 admitted Batch)****Unit –I**

**Linear Programming Problem – Advanced Techniques:** Revised Simplex Method – Algorithm, Simple Problems (2 and 3 variables), Simplex method versus revised simplex method, Bounded Variables- Computational procedure, Simple problems (2 and 3 variables).

**Unit –II**

**Transportation Problem:** L.P. formulation of the Transportation problem, Tabular Representation, Initial Basic Feasible Solution (I.B.F.S) to Transportation Problem, North west Corner, least cost and Vogles approximation Methods.

**Unit –III**

**Transportation Problem:** The Optimality Test – Transportation Algorithm – MODI (Modified Distribution Method), Degeneracy Transportation Problem.

**Unit –IV**

**Assignment Problem:** Mathematical Formulation of the problem, Hungarian method for assignment problem, Special cases in Assignment problems – Unbalanced, Prohibited, Maximization. Travelling Salesman Problem.

**Unit –V****Sequencing Problem:**

Problem of Sequencing, Principal Assumptions, Solution of Sequencing, Problem – Processing n jobs through 2-Machines and Processing n jobs through 3-Machines-Johnson's Optimal sequence Algorithm, Processing n jobs through k-Machines – Johnson's Optimal sequences Algorithm, Simple Problems.

**List of Reference Books:**

1. Quality, Reliability & Operations Research, First Edition (2010), Published by Telugu Academy, Hyderabad.
2. Operations Research Theory, Methods and Applications, S.D. Sharma, Himanshu
3. Sharma, improved and enlarged edition, Kedar Nath Ram Nath & Co., Meerut.
4. Krishna's Operations Research, Dr.R.K.Gupta, 27<sup>th</sup> Edition ,2010, Krishna Prakashan Media (P) Ltd., Meerut.
5. Operations Research: theory and Applications, J.K.Sharma, 5th Edition, 2013, Macmillan.
6. Operations Research: An Introduction, Hamy A.Taha, 9<sup>th</sup> edition, 2010, prentice Hall.

**List of Practicals:**

1. Transportation Problem – North West Corner Rule Method
2. Transportation Problem – Least Cost Method
3. Transportation Problem – Vogles Approximation Method
4. Transportation Problem – MODI Method
5. Assignment Problem – Balanced and Unbalanced
6. Sequencing Problem - n jobs through 2 machines.
7. Sequencing Problem - n jobs through 3 machines.

**# # #**

**III B.Sc., Degree Examination (at the end of VI Semester)****STATISTICS SYLLABUS****(With Mathematics Combination)****Semester – VI CBCS - CLUSTER - B****Paper – VIII - B2: Operations Research – II****(With effect from 2015-2016 admitted Batch)****Unit –I**

**Games and Strategies:** Introduction, Two person zero sum games, some basic terms, the Maxima-Minima Principle, Games without saddle points – Mixed strategies, Graphical Solutions of  $2 \times n$  and  $m \times 2$  Games, Dominance property.

**Unit –II**

**Inventory Control – I:** Basic concept of inventory problem, Types of inventories and Cost associated with inventories, Factors affecting inventory control, the concept of EOQ (Economic Order Quantity), Deterministic inventory Problems (Static Demand Model).

**Unit –III**

**Inventory Control – II:** Price Breaks (Quantity Discounts): Problems of EOQ with – One price break and More than one price break, Simple problems, Probabilistic inventory models, Instantaneous demand, No setup cost model – Discrete case and Continuous case, Newspaper Boy Problem, Simple Problem.

**Unit –IV**

**Network Scheduling – I:** Basic steps in PERT/CPM technique Basic components, Logical sequencing (errors in drawing networks), Rules for network construction, Critical path analysis – Forward pass Method Backward pass Method, Determination of floats and slack times, Simple problems.

**Unit –V**

**Network Scheduling – II:** Probability considerations in PERT (Project Evaluation and Review Technique), Distinction between PERT and CPM, Applications of network techniques, Limitations and difficulties in using Network, Project Cost, Time Cost optimization algorithm, Simple Problems.

**List of Reference Books:**

1. Quality, Reliability & Operations Research, First Edition (2010), Published by Telugu Academy, Hyderabad.
2. Operations Research Theory, Methods and Applications, S.D. Sharma, Himanshu
3. Sharma, improved and enlarged edition, Kedar Nath Ram Nath & Co., Meerut.
4. Krishna's Operations Research, Dr.R.K.Gupta, 27<sup>th</sup> Edition ,2010, Krishna Prakashan Media (P) Ltd., Meerut.
5. Operations Research: theory and Applications, J.K.Sharma, 5th Edition, 2013, Macmillan.
6. Operations Research: An Introduction, Hamy A.Taha, 9<sup>th</sup> edition, 2010, prentice Hall.

**List of Practicals:**

1. Game theory – Dominance Method
2. Game theory – Graphical Method
3. Inventory Control – EOQ
4. Network Scheduling – CPM
5. Network Scheduling - PERT

**# # #**

**III B.Sc., Degree Examination (at the end of VI Semester)****STATISTICS****(With Mathematics Combination)****Semester – VI CBCS****(With effect from 2015-2016 admitted Batch)****Guidelines for Project of the Cluster:**

The student who wants to do the project should follow the following.

- To select the topic with clear Aim & objectives.
- To collect the previous information regarding the topic.
- To get the clear idea after getting the reference material.
- Before going to discuss the topic, every student has to do at least three seminars on chosen topic.
- Finally to come with Results & Conclusions.
- Bibliography (Reference Journals/Books should be mentioned).

**Evaluation Pattern for Project Work:****Total : 100 Marks****Step 1: Seminars 25 Marks (Internal)**

- 1<sup>st</sup> Seminar 5 Marks
- 2<sup>nd</sup> Seminar 10 Marks
- 3<sup>rd</sup> Seminar 10 Marks

**Step 2: Project Report 50 Marks:****(Internal 25 Marks + External 25 Marks)**

- Introduction (Selection of the topic, Aim & objectives)
- Review of information
- Methodology
- Analysis & Discussion Suggestions
- Conclusion

**Step 3: Project Viva-Voice (External) 25 Marks**

- Presentation 15 Marks
- Viva 10 Marks

**Some of the Suggested Topics for Projects Work:**

1. The project work shall be done on any one of the following topics.
  - Population Statistics
  - Crime Statistics
  - Census Statistics
  - Medical Statistics
  - Election Statistics
  - Educational Statistics
  - Accidents Statistics
  - Population Statistics
  - Agricultural Statistics etc.,
2. The project work shall be submitted as one book.
3. The project analysis and reports can be created using Excel or Stat disk Software. If needed, Mintab or SPSS Statistical Softwares can be used.

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