A.G & S.G SIDDHARTHA DEGREE COLLEGE OF ARTS & SCIENCE
VUYYURU – 521165
Reaccredited at 'A' level by NAAC
Autonomous -ISO 9001 – 2015 Certified

Department of Statistics

Minutes of the meeting of Board of Studies

12-03-2024

Minutes of the meeting of BOS in Statistics for B.Sc(MSCs) Degree Courses of AG & SG Siddhartha Degree College of Arts & Science, Vuyyuru, held at 2.30 PM on 12-03-2024 through online mode.

N. Siva Naga Raju   *Presiding*

Members Present:

1)_____ **(N. Siva Naga Raju)**	Chairman	Head, Department of Statistics, AG & SG S Degree College
2)_____ **(P. Ravi Kumar)**	University Nominee	Department of Statistics, SSR Degree College, Machilipatnam.
3)_____ **(G. Chakravarthi)**	Subject Expert	Head,Department of Statistics, P. B. Siddhartha College, Vijayawada
4) _____ **(N.V.Srinivasa Rao)**	Member	Head, Department of Mathematics AG & SG S Degree College.
5)_____ **(D.Sunitha)**	Member	Lecturer in Mathematics AG & SG S Degree College.
6)_____ **(A.Bhargavi)**	Member	Lecturer in Mathematics AG & SG S Degree College.
7)_____ **(Noor Mohammad)**	Member	Lecturer in Mathematics AG & SG S Degree College.

Agenda of B.O.S Meeting:

1. To discuss and recommend the Syllabi, Model Question Papers and Guidelines to be followed by question paper setters in Statistic for 4th Semester as per the guidelines and instructions prescribed APSCHE and Krishna University from the Academic Year 2023-24.

2. Discussed and recommended the teaching and evaluation methods for approval of Academic Council

3. Any other matter.

Resolutions.

1. Discussed and recommended that no changes are required in Syllabi. Changes are required in Model Question Papers and Guidelines to be followed by the question paper setters in Statistics for 4th Semester from the Academic year 2023-24.

2. To recommend the teaching and evaluation methods to be followed under Autonomous status. The maximum marks for IA is 30 and SE is 70. Each IA written examination is of 1 Hr. 30 min duration for 30 marks. The tests will be conducted centrally. To reduce two IA tests and is calculated for 20 marks. 5 marks will be allotted for attendance and 5 marks are allotted for Assignment/ Activity. There is no minimum passing for IA and there is no provision for improvement in IA. Even though the candidate is absent for two IA exams/obtain zero marks the external marks are considered (if he/ she gets 40 out of 70) and the result shall be declared as 'PASS' from the Academic year 2023-24.

3. Discussed and recommended for organizing seminars, Guest lecturers, Online Examinations and Workshops to upgrade the knowledge of students for Competitive Examinations for the approval of the Academic Council.

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Domain Subject: **STATISTICS**　　　　　　　　　　　　　　　Semester: **IV**
Offered to: **MSCs**　　　　　　　　　　　　　　　Course Type: **Core (Theory)**

Course Code	**22STAT41**	Course Delivery Method	Class Room / Blended Mode - Both
Credits	**04**	CCIA Marks	30
No. of Lecture Hours / Week	04	SEE Marks	70
Total No. of Lecture Hours	60	Total Marks	100
Year of introduction: 2022-23	Year of Offering: 2023-24	Year of Revision:	Percentage of Revision: 0%

Title of the Paper: **Sampling Techniques and Design of Experiments**

Course Prerequisites: Basic Knowledge of Mathematics, Counting principles, distributions, Estimation and Testing of Hypothesis.

Course Description: This course helps the students to understand the various sampling ideas to conduct the socio economics studies. Introduces the basic concepts and principles of experimental design

Course Objectives:
1) To impart basic concepts in Sampling Theory.
   2) To explore various sampling techniques and understand their merits and drawbacks.
   3) To understand the basic terminology in experimental design.
   4) To develop the students ability to plan an experiment.
5) Obtaining relevant information from the experiment in relation to the statistical hypothesis under study.

Learning Outcomes: At the end of the course, the student will
1) Acumen to apply for collecting data for various studies.
2) Ability to understand the design for comparing the various fields.
3) Develop the skill of identifying important inputs that impact the output.

S. No	Program Outcomes
PO1.	**Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology
PO2.	**Effective Citizenship**: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO3.	**Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO4.	**Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development
PO5.	**Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO6:	**Specialized Skills / Transferable Skills:** Acquisition of communication and soft, analytical and technological skills that aid in enhancing
PO7.	**Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Course Outcomes:		
Course Outcome	Upon successful completion of this course, students should have the knowledge and skills to:	**Programme Outcomes Mapping**
CO 1	To understand the principles and principal steps of sampling, and different sampling techniques. Apply different sampling techniques to take samples and compute unbiased estimates and confidence limits of population parameters.	PO - 5
CO 2	To analyse the unbiasedness and efficiencies of estimates obtained using different sampling techniques.	PO - 6
CO3	To understand the basic concepts and principles of experimental designs.	PO - 5
CO 4	To Analyze the various design of experiment concepts and missing plot techniques.	PO - 6
CO 5	To Identify the factors and variable for the experiment for building statistical model.	PO - 7

Syllabus

Unit	Learning Units	Lecture Hours
I	**Introductory Concepts of sampling :** Concepts of Population and Sample, Basic principles of sample survey, The principles steps in a sample survey, Complete enumeration Vs Sampling, Sampling and non-sampling errors, Limitations of sampling, Types of sampling, Non Probability sampling methods, Probability sampling methods **Simple Random sampling:** SRSWR definition and procedure of selecting a sample, SRSWOR definition and procedure of selecting a sample , expectation of sample mean and variance of sample mean in srswor and srswr, advantages and disadvantages.	12
II	**Stratified random sampling:** Stratified random sampling, Advantages and Disadvantages Allocation and types of allocation. Estimation of population mean, and its variance. Comparison between proportional and optimum allocations with SRSWOR. **Systematic sampling:** Procedure of construction, types, merits and demerits of systematic sampling. Comparison of systematic sampling with Stratified and SRSWOR	12
III	**Analysis of variance :** Analysis of variance(ANOVA) –Definition and assumptions. One-way classification, Two way classification.(one observation per cell) **Design of Experiments:** Terminology, Principles of design of experiments, CRD: Layout, advantages and disadvantage and Statistical analysis of Completely Randomized Design(C.R.D)	12
IV	Randomized Block Design (R.B.D) and Latin Square Design (L.S.D) with their layouts, advantages and disadvantage and Statistical analysis, Missing plot technique in RBD and LSD. Efficiency RBD over CRD, Efficiency of LSD over RBD and CRD.	12
V	**Factorial experiments** – Main effects and interaction effects of 2^2 and 2^3 factorial experiments and their Statistical analysis. Yates procedure to find factorial effect totals.	12

Text Book:
Fundamentals of Applied Statistics, 11th Edition, 2010, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, New Delhi

Reference Books:
1. B.A/B.Sc. Second Year Statistics(2010) , Telugu Akademi, Hyderabad.
2. Mathematical Statistics with Applications, 2009, K.M.Ramachandran and Chris P.Tsokos Academic Press(Elsevier), Haryana .
3. Probability and Statistics, Volume I & II, D. Biswas, New central book Agency (P) Ltd, NewDelhi.
4. An outline of Statistical theory, Volume II,3rd Edition,2010(with corrections) A.M.Goon,M.K. Gupta, B.Dasgupta ,The World Press Pvt.Ltd., Kolakota.
5. Sanjay Arora and Bansi Lal:. New Mathematical Statistics, Satya Prakashan , New Delhi.

Websites of Interest: http://onlinestatbook.com/rvls/index.html

Co-Curricular Activities in the class:
1. Pictionary
2. Case Studies on topics in field of statistics
3. Snap test and Open Book test
4. Architectural – To be build the procedures
5. Extempore – Random concept to students
6. Interactive Sessions
7. Teaching through real world examples

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Model Question Paper Structure for SEE

Course Code: **22STAT41**   Max.: **70** Marks

Max Time: **3** hrs   Min.Pass : **28** Marks

Sampling Techniques and Design of Experiments

Section – A

Answer the following   **5 x 4M = 20M**

1.(a). Define the terms Population and Sample with examples (CO-1,L-2)

(OR)

(b). Write the advantages of simple random sampling (CO-1,L-2)

2.(a). Write a short note on Stratified random sampling (CO-2,L-2)

(OR)

(b). Write the merits and demerits of Stratified random sampling(CO-2,L-2)

3.(a). Define the terms (i) Treatments (ii) Blocks (iii) Experimental error (CO-3,L-1)

(OR)

(b).Define ANOVA and Write its assumptions (CO-3,L-1)

4.(a).Write the applications of Completely randomized design (CO-4,L-2)

(OR)

(b).Explain the layout of Latin square design (CO-4,L-2)

5.(a).Define Factorial experiments and write its uses (CO-5,L-2)

(OR)

(b).Explain the Yates Procedure for Factorial effect totals. (CO-5,L-2)

Section – B

Answer the following   **5 x 10M =50M**

9 a) Explain basic principles of sampling (CO-1,L-2)

(OR)

b) In SRSWOR, the sample mean square is an unbiased estimate of the population mean square (CO-1,L-2)

10 a) Show that $V(\overline{y_{st}})_{Ney} \leq V(\overline{y_{st}})_P \leq V(\overline{y_n})_R$ (CO-2,L-2)

(OR)

b) If the population consists of a linear trend then Show that (CO-2,L-2)

$$V(\overline{y_{st}}) \leq V(\overline{y_{sys}}) \leq V(\overline{y_n})_R$$

11 a) Explain the principles of design of experiments (CO-3,L-2)

(OR)

b) Explain analysis of Completely randomized design (CO-3,L-2)

12 a) Explain analysis of Randomized block design (CO-4,L-2)

(OR)

b) Explain analysis of Latin square design (CO-4,L-2)

13 a)   Explain analysis of 2^2 – factorial design (CO-5,L-2)

(OR)

b) Explain analysis of 2^3 – factorial design (CO-5,L-2)

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Domain Subject: **STATISTICS**   Semester: **IV**
Offered to: **MSCs**   Course Type: **Core (Practical)**

Course Code	**22STAP41**	CCIA Marks	10
Credits	**01**	SEE Marks	40
Practical Hrs./Week	02	Total Marks	50

Sampling Techniques and Design of Experiments

Course Prerequisites (if any): Nil

Course Outcomes:		
Course Outcome	Upon successful completion of this course, students should have the knowledge and skills to:	**Programme Outcomes Mapping**
CO 1	To draw the sample from the population using sampling techniques	PO – 5
CO 2	To Construct suitable designed experiment for a given real life data.	PO - 6

List of Practicals:

1. Simple random sampling with and without replacement. Comparison between SRSWR & SRSWOR
2. Stratified random sampling – proportional & optimum allocations. Comparison between proportional & optimum allocations with SRSWOR
3. Systematic sampling with N = nk. Comparison of systematic sampling with stratified and SRSWOR
4. Analysis of CRD
5. Analysis of RBD. Relative efficiency of RBD over CRD
6. Estimation of single missing observation in RBD and its analysis
7. Analysis of LSD. Relative efficiency of LSD over CRD and RBD
8. Estimation of single missing observation in LSD and its analysis
9. Analysis of 2^2 with RBD layout

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Domain Subject: **STATISTICS**   Semester: **IV**
Offered to: **MSCs**   Course Type: **Core (Theory)**

Course Code	22STAT01	Course Delivery Method	Class Room / Blended Mode - Both
Credits	**04**	CCIA Marks	30
No. of Lecture Hours / Week	04	SEE Marks	70
Total No. of Lecture Hours	60	Total Marks	100
Year of introduction: 2022-23	Year of Offering: 2023-24	Year of Revision: ……	Percentage of Revision: 0%

Title of the Paper: **Applied Statistics**

Course Prerequisites: Students required knowledge in Mathematics and Statistical techniques
Course Description: This course provides the study of data related to population growth, construction index numbers. Also this course deals with industry problems and analyse and get solutions.
Course Objectives:
1) To enable the students to develop basic knowledge in Applied Statistics
   2) To provide understanding in some advanced statistical techniques which are used for solving business problems.
   Learning Outcomes: At the end of the course, the student will
1) Have the hands on practice of working on the data and interpreting the results.
2) Acquire to apply the techniques related solve the real business problems.

S. No	Program Outcomes
PO1.	**Effective Communication**: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology
PO2.	**Effective Citizenship**: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
PO3.	**Ethics:** Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.
PO4.	**Environment and Sustainability**: Understand the issues of environmental contexts and sustainable development
PO5.	**Critical Thinking**: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
PO6:	**Specialized Skills / Transferable Skills:** Acquisition of communication and soft, analytical and technological skills that aid in enhancing
PO7.	**Self-directed and Life-long Learning:** Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Course Outcomes:		
Course Outcome	Upon successful completion of this course, students should have the knowledge and skills to:	**Programme Outcomes Mapping**
CO 1	Measure the Mortality and Fertility rates and the construction of Life tables	PO - 4
CO 2	construct the Quality Control charts for Variables.	PO –6
CO3	construct the Quality Control charts for Attributes	PO –6
CO 4	Obtain the knowledge on asses the population growth by using vital statistics	PO - 7
CO 5	Helps asses the normalization processes of different scores and estimating the IQ levels.	PO - 6

Syllabus

Course Details Unit	Learning Units	Lecture Hours
I	**Index Numbers** Basic problems involved in the construction of index numbers. Construction of index numbers - Simple aggregate, Weighted aggregate, Simple price relative and Weighted price relative methods. The criteria of good index number. Cost of living index number. Uses and Limitations of index numbers.	**12**
II	**Statistical Quality Control – I** Introduction. Basis of SQC. Uses of SQC. Types of controls – Process & Product. Construction of 3-σ limits. Construction of Mean ($\bar{x}$) and Range (R) charts. Interpretation of $\bar{x}$ and R charts	**12**
III	**Statistical Quality Control – II** Construction of p and c charts - Fixed control limits. Interpretation of p and c - charts. Natural and Specification limits. Acceptance sampling inspection plans – AQL, LTPD, AOQL and ASN. OC curves.	**12**
IV	**Vital Statistics** Introduction, definition and uses of vital statistics, sources of vital statistics. Measures of different Mortality and Fertility rates, Measurement of population growth. Life tables: construction and uses of life tables.	**12**
V	**Statistics in Psychology & Education** Introduction. Scaling procedures – Scaling of scores – Z or σ scores, Standard and normalized scores, T and Percentile scores. Reliability of test scores – Def. index and parallel tests. Methods of determining test reliability. Validity of test scores.	**12**

Text Book:

1. S.C. Gupta, (2016), Seventh Edition, Fundamentals of Statistics, Mumbai: Himalaya Publishing House.
2. Fundamentals of Applied Statistics, 2014, S.C.Gupta and V.K. Kapoor; Sutan Chand &Sons , New Delhi

Reference Books:

1. Levine, D.M., Berenson, M. L. & Stephan, D. (2012*), Statistics for managers using Microsoft Excel*, New Delhi: Prentice Hall India Pvt.

2. Aczel, A. D. &Sounderpandian, J. (2011), *Complete Business Statistics*, New Delhi: Tata McGraw Hill.

3. Sharma, J. K. (2013), *Business statistics*, New Delhi: Pearson Education

4. Anderson, D., Sweeney, D., Williams, T., Camm, J., & Cochran, J. (2013), *Statistics for Business and Economics*, New Delhi: Cengage Learning.

5. Agarwal, B.L. Basic Statistics, New Age International Publishers, New Delhi, 6th edition 2013

Websites of Interest: http://onlinestatbook.com/rvls/index.html

Co-Curricular Activities in the class:

1. Pictionary
2. Case Studies on topics in field of statistics
3. Snap test and Open Book test
4. Architectural – To be build the procedures
5. Extempore – Random concept to students
6. Interactive Sessions
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Model Question Paper Structure for SEE

Course Code: **22STAT01**   Max.: **70** Marks
Max Time: **3** hrs   Min.Pass : **28** Marks

Applied Statistics

Section – A

Answer the following   **5 x 4M = 20M**

1. Define SQC and write its uses (L- 1, CO – 2)
   OR
   Explain 3 –σ limits (L – 2, CO – 2)
2. What are the applications of C- chart (L – 3, CO – 3)
   OR
   Briefly explain ASN and OC curves (L – 3, CO – 3)
3. Explain base shifting in index numbers (L – 2, CO – 1)
   OR
   From the following data calculate Index Number by simple (i) aggregate and (ii) relative method (L – 3, CO – 1)

Commodity	A	B	C	D
Price in 1980	162	256	257	132
Price in 1981	171	164	189	145

4. Explain the sources of vital statistics (L – 2, CO – 4)
   OR
   Explain reproduction rates (L – 2, CO – 4)
5. Explain scaling methods (L – 2, CO – 5)
   OR
   Explain concept of t and percentile scores (L – 2, CO – 5)

Section – B

Answer the following   **5 x 10M = 50M**

6. (a) Explain the basic problems involved in the construction of index numbers (L – 2, CO – 1)
   OR
   (b) Find the cost of living index number by family budget method from the following data (L – 5, CO – 1)

Commodities	Base Year Price	Current Year Price	% of Weights
A	20	26	17
B	28	31	29
C	34	40	20
D	92	95	34

7. (a) Explain different fertility rates (L – 2, CO – 4)
   OR

(b) Fill in the blanks of the following table which are marked with ?   (L – 2, CO – 4)

Age	l_x	d_x	q_x	p_x	L_x	e_x^o
20	693435	?	?	?	?	35081126
21	690673	-	-	-	-	?

7. (a) Explain the construction of mean and range charts (L – 2, CO – 2)

OR

(b) Explain the statistical basis of SQC (L – 2, CO – 2)

9. (a) Explain the construction of fraction defective chart (L – 2, CO – 3)

OR

(b) Explain the construction of number of defects per unit chart (L – 2, CO – 3)

10. (a) Letter grades A,B,C,D and E are assigned by two teachers X and Y to the students of class for Honesty. The table gives the distribution of the proportion of individuals in each rating
(L – 5, CO – 5)

Teacher	A	B	C	D	E
X	0.10	0.15	0.50	0.20	0.05
y	0.20	0.40	0.20	0.10	0.10

OR

(b) Define reliability and validity tests. (L – 2, CO – 5)

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Domain Subject: **STATISTICS**   Semester: **IV**
Offered to: **MSCs**   Course Type: **Core (Practical)**

Applied Statistics

Course Code	**22STAP01**	CCIA Marks	10
Credits	**01**	SEE Marks	40
Practical Hrs./Week	02	Total Marks	50

Course Prerequisites: Students required knowledge in Mathematics and Statistical techniques
Course Description: This course provides the study of data related to population growth, construction index numbers. Also this course deals with industry problems and analyse and get solutions.
Course Objectives:
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2) To provide understanding in some advanced statistical techniques which are used for solving business problems.
Learning Outcomes: At the end of the course, the student will
1) Have the hands on practice of working on the data and interpreting the results.
2) Acquire to apply the techniques related solve the real business problems.

Course Outcomes:		
Course Outcome	Upon successful completion of this course, students should have the knowledge and skills to:	**Programme Outcomes Mapping**
CO 1	Measure the Mortality and Fertility rates and the construction of Life tables	PO - 5
CO 2	construct the Quality Control charts for Variables and attribute charts	PO - 6
CO 3	Construct the various types of index numbers	PO - 6

Practical No	Theme	Key Topics
Applied Statistics		
1	Control Charts	Construction of Mean & Range charts
2	Control Charts	Construction of p & c charts
3	Index Numbers	Construction of Weighted index numbers
4	Index Numbers	Testing of good index number
5	Index Numbers	Construction of Whole sale price index number
6	Vital Statistics	Determining of Mortality rates
7	Vital Statistics	Determining of Fertility & reproduction rates
8	Vital Statistics	Construction of life tables
9	Psychology & Education	Scaling of ratings using Normal distribution