

॥ सा विद्या या विमुक्तये ॥



# स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

“ज्ञानतीर्थ” परिसर, विष्णुपुरी, नांदेड - ४३१६०६ (महाराष्ट्र)

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED**

“Dnyanteerth”, Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

## ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०-२१ पासून लागू करण्याबाबत.

### प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७-२०२०च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे खालील विषयांचे C.B.C.S. (Choice Based Credit System) Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०-२१ पासून लागू करण्यात येत आहेत.

1. B.Sc.-II Year-Biophysics
2. B.Sc.-II Year-Bioinformatics
3. B.Sc.-II Year-Biotechnology
4. B.Sc.-II Year-Biotechnology (Vocational)
5. B.Sc.-II Year-Food Science
6. B.Sc.-II Year-Botany
7. B.Sc.-II Year-Horticulture
8. B.Sc.-II Year-Agro Chemical Fertilizers
9. B.Sc.-II Year-Analytical Chemistry
10. B.Sc.-II Year-Biochemistry
11. B.Sc.-II Year-Chemistry
12. B.Sc.-II Year-Dyes & Drugs Chemistry
13. B.Sc.-II Year-Industrial Chemistry
14. B.C.A. (Bachelor of Computer Application)-II Year
15. B.I.T. (Bachelor of Information Technology)-II Year
16. B.Sc.-II Year-Computer Science
17. B.Sc.-II Year-Network Technology
18. B.Sc.-II Year-Computer Application (Optional)
19. B.Sc.-II Year-Computer Science (Optional)
20. B.Sc.-II Year-Information Technology (Optional)
21. B.Sc.-II Year-Software Engineering
22. B.Sc.-II Year-Dairy Science
23. B.Sc.-II Year-Electronics
24. B.Sc.-II Year-Environmental Science
25. B.Sc.-II Year-Fishery Science
26. B.Sc.-II Year-Geology
27. B.Sc.-II Year-Mathematics
28. B.Sc.-II Year-Microbiology
29. B.Sc.-II year Agricultural Microbiology
30. B.Sc.-II Year-Physics
31. B.Sc.-II Year Statistics
32. B.Sc.-II Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या [www.srtmun.ac.in](http://www.srtmun.ac.in) या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

‘ज्ञानतीर्थ’ परिसर,  
विष्णुपुरी, नांदेड - ४३१ ६०६.  
जा.क्र.: शैक्षणिक-१/परिपत्रक/पदवी-सीबीसीएस अभ्यासक्रम/  
२०२०-२१/३३३

दिनांक : १५.०७.२०२०.

प्रत माहिती व पुढील कार्यवाहीस्तव :

- १) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- २) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
- ४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
- ५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
- ६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

स्वाक्षरित / -

**उपकुलसचिव**

शैक्षणिक (१-अभ्यासमंडळ) विभाग

Swami Ramanand Teerth Marathwada University, Nanded  
Choice Based Credit System (CBCS) Course Structure  
Faculty of Science  
**B. Sc. Second Year Syllabus**  
**Semester Pattern effective from June 2020**  
**Subject: Statistics**

Semester	Course No.	Name of the Course	Instruction Hrs/ week	Total period	C A	ESE	Total Marks	Credits
III	CCS III (Section A)	Applied Statistics (P-VI)	03	45	10	40	50	2
	CCS III (Section B)	Continuous Probability Distributions (P-VII)	03	45	10	40	50	2
	CCSP II [CCSIII & IV (Section A)]	Practical's based on P-VI & P-VIII (P-X)	03 03	08 08	05 05	20 20	25 25	1 1
	SECS I	SEC I (Anyone Skill from optional)	02	02	25	25	50	(02)*
IV	CCS IV (Section A)	Statistical Inference & Computing Using R (P-VIII)	03	45	10	40	50	2
	CCS IV (Section B)	Exact Sampling Distributions (P-IX)	03	45	10	40	50	2
	CCSP III [CCS III & IV (Section B)]	Practical's based on P-VII & P-IX (P-XI)	03 03	08 08	05 05	20 20	25 25	1 1
	SECS II	SEC II (Anyone Skill from optional)	02	02	25	25	50	(02)*
<b>Total credits semester III and IV</b>								<b>12(04)*</b>

~Note: 1) ESE of CCSP II, CCSP III & SECS I, SECS II should be evaluated at annual  
2) SEC Marking(a) Skill work in the form of writing - 10  
(b) Skill work presentation - 10  
(c) Submission, Visit and Others if any (Judge the skill of student worked on --- ) - 05  
**Total - 25**

# Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. second year (Semester- III)

Semester Pattern effective from June -2020

## Statistics

CCS III (Section A)

### Applied Statistics (P-VI)

Credits: 02 (Marks: 50)

Periods: 45

- **Salient features:** This paper explores the applied statistical techniques.
- **Utility:** These methods are useful in Planning and development department, health survey, longitudinal studies etc.
- **Learning objectives:** To learn this paper is to develop scientific view towards variation of the data about specific perspective. To learn this paper is to develop statistical skills for data analysis.
- **Prerequisites:** This paper requires basic of data types, organization of data, tabulation of data etc.

#### **Unit-I:-Multiple and Partial correlation coefficient:-**

Multiple and Partial Correlation (for trivariate data), Yule's Notation, Plane of Regression, residuals and its properties, Variance of the residual, coefficient of Multiple correlation, properties of Multiple correlation coefficient and Partial correlation coefficient.

#### **Unit II:- Time Series Analysis:-**

Meaning of time series, Components of time series, Trend, Seasonal variation, cyclical variation, Irregular component, Models of time series, Analysis of time series, Measurement of Trend by: Graphical Method, Method of Exponential Smoothing, Method of moving averages, Method of least squares

1. (ii) Measurement of Seasonal fluctuations by Method of simple averages, Ratio to Trend method, Ratio to moving average method, Autoregressive model AR (I) and moving average MA(1) process, Applications of time series.

#### **Unit III: - Index Numbers: -**

Introduction, problems involved in the construction of Index Numbers, calculation of price and quantity Index numbers, simple (unweighted) Aggregate method, Weighted Aggregates Method, Laspeyre's price Index, Paasche's price Index, Drobish-Bowley price Index numbers, Marshall - Edgeworth price Index, Irving Fisher's Ideal Index number, Average of Price relatives, weighted average relatives. Chain Indices, procedure of construction of chain indices. The criteria of a good Index Numbers, Unit Test, Time Reversal Test, Factor reversal test,

Circular Test, Quantity Index numbers, Value Index numbers, Uses and Limitations of Index Number

**Unit IV:- Consumers Index Number:-**

Main steps in construction of consumers Index Numbers, Weighted Aggregates methods, and Method of Weighted price relatives. Base shifting, splicing and Deflating of Index Numbers, Uses of consumers Index Number.

**Scope of syllabi:-**

(i) Fundamentals of Mathematical statistics: - S.C. Gupta V.K. Kapoor  
(Sultan Chand and Son New Delhi)

**Reference Books:.**

- i) Goon A.M. Gupta M.K. Dasgupta B.-Fundamentals of Statistics Volume-II(1991) (World Press Calcutta )
- ii) P.G. Dixit, P.S. Kapre -Statistics :- (Nirali Prakashan Pune.)
- iii) B.R. Bhat T. Shirvenkatarmane K.I. Madhav Rao Statistics :- A Beginner's Text Volume-I (New Age International (P) Ltd.)
- iv) S.P.Gupta –Statistical Methods.( Chand and Son New Delhi)
- v) Croxton .F.E. and Cowden D.J.=Applied Genral Statisitcs.(Printice Hall of India 1969)

# Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. second year (Semester- III)

Semester Pattern effective from June -2020

## Statistics

CCS III (Section B)

### Continuous Probability Distributions (P-VII)

Credits: 02 (Marks: 50)

Periods: 45

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- **Salient features:** This paper explores the various types of continuous distributions.
- **Utility:** These types of distributions useful in Planning and development department, health survey, pattern studies, Public work sector etc.
- **Learning objectives:** To learn this paper is to develop scientific view to understand the nature of the data about specific perspective.
- **Prerequisites:** This paper requires basic of types distribution and there characteristics.

#### Unit I: - Uniform and Exponential Distribution:-

i) **Rectangular or Uniform distribution:** Definition, Mean, Variance,  $r^{\text{th}}$  Moments, Moment generating function, Mean deviation about mean, examples and application, Relation with other distributions, Properties of Rectangular distribution.

ii) **Exponential Distribution:** - Probability density function, Mean and Variance, Moment Generating function, lack of memory property, numerical examples and application, Relation between exponential distribution and uniform distribution.

#### Unit-II- Normal Distribution:-

Probability density function, Normal Distribution as a limiting form of Binomial Distribution Important characteristics of Normal Distribution and Normal Probability curve, Mean, Mode, Median, Quartiles, Variance, Moment Generating Function and Cumulant Generating Function, Recurrence Relation Formula for Moments, Additive property for Linear combination of two independent normal variables, Mean deviation about mean, Area property (Normal probability integral), Importance of normal distribution, fitting of normal distribution.

### **Unit III:-Gamma Distributions-**

Gamma Distribution with scale and shape parameters, Moment Generating Function, Cumulant Generating Function, limiting form of Gamma Distribution, Additive properties of Gamma Distribution, Beta Distribution of first and second kind, Constants of Beta Distributions, Relation between Exponential and Gamma Distribution as a sum of i.i.d. exponential random variables, Problems, examples, Applications, Jacobian Transformation, Transformation of one & Two Dimensional random variables.

### **Unit IV: - Advanced Distribution: -**

**(i)Laplace (Double Exponential) Distribution:** - Probability Density Function of Laplace (Double Exponential) Distribution, characteristics of Standard Laplace Distribution.

**(ii) Weibull Distribution:-**Probability Density Function of Weibull Distribution with given shape and scale, parameter, Moments of standard Weibull Distribution, Characteristics of Weibull distribution.

**(iii) Logistic Distribution:** - Probability density function of Logistic distribution, moment generating function of Logistic distribution, problems,

**(iv)Cauchy Distribution:-** Probability density function of Cauchy Distribution, Characteristics of standard Cauchy Distribution, Comment on non existence, moments of standard Cauchy Distribution, Central Limit theorem, Application of central limit theorem, De-Moivre, Lapalce Theorem.

### **Scope of syllabi:-**

(i) Fundamentals of Mathematical statistics S.C. Gupta V.K. Kapoor (11th Edition) Sultan chand and sons Delhi.

### **Reference Books:-**

- 1) P.G. Dixit , P.S. Kapre -Statistics ( Nirali Publication Pune)
- 2) Freund J.E. Prentics –Mathematical Statistics Hall of India.
- 3) V.K. Rohatgi- An Introduction to Probability Theory and Mathematical Statistics
- 4) A.M. Goon Gupta and Das Gupta- Fundamentals of statistics volume-I, (world press Kolkata)
- 5) S.P. Gupta. -Statistical methods - (Sultan Chand and Sons Delhi)

# Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. second year (Semester- IV)

Semester Pattern effective from June -2020

**Statistics**

CCS IV (Section A)

**Statistical Inference & Computing Using -R (P-VIII)**

Credits: 02 (Marks: 50)

Periods: 45

- **Salient features:** This paper explores the various statistical inference and R-Software techniques.
- **Utility:** Inferential methods are useful in Planning and development department, Collection of data, validation of scientific studies etc.
- **Learning objectives:** To learn this paper is to develop scientific view to understand theoretical foundation and analyzing data through R software about specific perspective. To learn this paper is to develop computing statistical skills for data analysis.
- **Prerequisites:** This paper requires basic of data, basic concepts of R-Software.

## **Unit-I: - Theory of Point Estimation & Methods:-**

(i) Basic concept statistic, Parameter, space, difference between estimate and estimator, characteristics of Estimators, Unbiasedness, Consistency, Efficiency, Sufficiency, Factorization Theorem, Most Efficient Estimator(MEE), Minimum Variance Unbiased Estimators (MVUE)(ii)**Methods of Estimation:-** Method of Moment, Maximum likelihood estimation.

## **Unit II: - Testing of Hypothesis:**

Introduction to Hypothesis, Null Hypothesis, Simple Hypothesis, Composite hypothesis, Alternative hypothesis two types of Errors, Critical region, Level of Significance, P-value, Power of the Test, Nyman's Persons lemma, Most powerful test, and Uniformly most powerful test, Test of significance for large samples, Single proportion, difference of proportions, single mean, difference of means, Problems and Application.

**Unit III: Non Parametric Tests:** Sign test, Wilcoxon Signed rank test, Run test, Median test, Mann-Whitney U- test, Merits and Demerits of Non Parametric test.

#### **Unit IV: Fundamentals of R-Software:-**

Introduction to R, features of R, starting and ending R session, getting help in R, R commands and case sensitivity.

Vectors and vector arithmetic:

- a) creation of vectors using functions c, seq, rep
- b) Arithmetic operations on vectors using operators +, -, \*, /, ^ .
- c) Numerical functions: log10, log, sort, max, min, unique, range, length, var, prod, sum, summary, fivenum etc.
- d) Data accessing

Data frames: creation using data.frame, subset and transform commands.

Resident data sets: Accession and summary p, q, d, r

functions, graphical and Diagrammatic representation of Data.

#### **Scope of syllabi:-**

- (i) Fundamentals of Mathematical statistics :- S.C. Gupta V.K. Kapoor (Sultan Chand and Son New Delhi)
- (ii) Statistical Methods –A.R.Chandekar (S.Chand & Co.Ltd Delhi)

#### **Reference Books:.**

- i) Goon A.M. Gupt M.K. Dasgupta B.-Fundamentals of Statistics Volume-I,(1991) (World Press Calcutta )
- (ii) Mood A.M.Graybill F.A. Boes D.C.- Introduction to the Theory of Statistics:- Mc GrawHill ( 1974)
- (iii) Hodges J.L., Lehman E.L.-Basic Concepts of Probability and Statistics: \_ - , Holden Day.
- iv) B.R. Bhat T. Shirvenkatarmana K.S. Madhav Rao.- Statistics :- A Beginner's Text Volume- II (New Age International (P) Ltd.)
- v) Gopal K Kanji- 100 Statistical Tests(SAGE Publications)
- vi) S.G.Purohit,S.D.Gore,S.R.Deshmukh: Statistics Using R : Narosa Publishing House ( 1<sup>st</sup> edition 2008)



# Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. second year (Semester- IV)

Semester Pattern effective from June -2020

**Statistics**

CCS IV (Section B)

**Exact Sampling Distributions (P-IX)**

Credits: 02 (Marks: 50)

Periods: 45

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- **Salient features:** This paper explores the various exact sampling distributions.
- **Utility:** These distributions useful in experimental validation studies.
- **Learning objectives:** To learn this paper is to develop theoretical foundations of exact distributions.
- **Prerequisites:** This paper requires basic of data types, organization of data, tabulation of data, knowledge of measures of central tendency and dispersion etc.

## **Unit I:-Chi-square Distribution: -**

Chi-Square variate, Derivation of Chi-Square Distribution (Using method of moment generating function), moment generating function, cumulant generating function, limiting form of Chi-Square Distribution for large Degrees of Freedom Moments, Mode and Skewness of Chi- Square Distribution, Additive property of Chi-Square Distribution, Chi-Square probability curve.

## **Unit II:-Chi-square test for testing of hypothesis:-**

Chi-square test for Testing of Hypotheses (i) Population variance (ii) goodness of fit (iii) Test of independence of attributes, contingency table, Yates correction for 2x2 contingency table (iv) Homogeneity of three or more correlation Coefficients, Examples.

## **Unit III: - t- Distribution:-**

Students' t' statistic, Derivation of student's t distribution, Fisher's t, Distribution of Fisher's t, moments of Fishers t- distribution, limiting form of t-distribution, graph of t- distribution. Applications of t – distribution for testing of hypothesis.(1)t-test for single mean, (2) t-test for difference of means (paired & unpaired), (3) t-test correlation coefficient , Examples.

#### **Unit-IV:-Snedecor's F and Fisher's Z Distribution:-**

F- Statistic, Derivation of F distribution, Probability density function, moments of F-distribution, mode of F- distribution, F- test for equality of two variances, Relation between F & t- distribution, F and Chi-Square Distribution, Examples. Probability density function of Fisher's Z Distribution, Moment generating function of Z- distribution, Fisher's Z Transformation, Examples.

#### **Scope of syllabi:-**

(I) Fundamentals of Mathematical statistics S.C. Gupta V.K. Kapoor  
(11 th Education) Sultan chand and sons Delhi

#### **Reference Books:-**

- 1) Freund J.E. Prentics -Mathematical Statistics Hall of India.
- 2) V.K. Rohatgi -An Introduction to Probability Theory and Mathematical statistics - ( Wiely Estem ltd)
- 3) A.M. Goon, Gupta and DasGupta -Fundamentals of statistics volume-I (world press Kolkotta)
- 4) S.P. Gupta -Statistical methods -. (Sultan chand and sons Delhi)
- 5) Kulkarni M.B. Ghatpande S.B, Gore S.D.,Common Statistical Tests. (Satyajeeet Prakashan Pune-29)
- 6) Gopal K Kanji- 100 Statistical Tests(SAGE Publications)
- 7)Dr.V.A.Jadhav- Exact Sampling Distributions.(Statsperson Publications)

# Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second year Semester Pattern effective from June -2020

**Statistics**

**Practical Paper: CCSP II [CCS III & IV (Section A)]**

Credits: 02

**(P-X)**

(Marks: 50)

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(Annual practical Based on [CCS III & IV (Section A)])

(Practical syllabus requires three periods per batch per week for 2 consecutive days)

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1. Measurement of Trend by method of Exponential smoothing
2. Measurement of Trend by moving averages
3. Measurement of linear Trend by method of least squares
4. Fitting of AR (1) model
5. Measurement of seasonal variation by method of simple averages
6. Measurement of seasonal variation by ratio to trend method
7. Measurement of seasonal variation by Ratio to moving average method
8. Unweighted Index number
9. Weighted Index number by Laspeyre's and Passche's Index number
10. Weighted Index number Fisher's Ideal Index formula
11. Cost of Living Index number
12. Multiple Correlation coefficient Fitting of regression plane
13. Partial Correlation coefficient
14. Estimation by method of moments
15. Estimation by method maximum likelihood estimation
16. Construction of confidence interval for mean and proportion
17. Large sample test for single mean
18. Large sample test for difference of means
19. Large sample test for single proportions
20. Large sample test for difference of proportions

**(Note: Results should be verified by Using R- Software.)**

# Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure  
B. Sc. Second year Semester Pattern effective from June -2020

## Statistics

### Practical Paper: CCSP III [CCS III & IV (Section B)]

Credits: 02

(P-XI)

(Marks: 50)

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(Annual practical Based on [CCS III & IV (Section B)])

(Practical syllabus requires three periods per batch per week for 2 consecutive days)

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1. Fitting of Normal distribution
2. Problems based on area property of Normal distribution
3. Chi-square test for population variance
4. Chi-square test for goodness of fit
5. Chi-square test for 2x2 contingency table also using Yates correction
6. Chi-square test for Independence of attributes
7. Chi-square test of Homogeneity of Correlation coefficients
8. t - Test for single mean
9. t - Test for difference of means
10. Paired t – test
11. t - Test for testing the significance of sample correlation coefficient
12. F-Test for equality of two population variances.
13. Wilcoxon signed rank test
14. Sign test for single sample & two sample
15. Run Test
16. Median Test
17. Mann - Whitney U Test
18. Applications of Fisher's Z-Transformation

**(Note: Results should be verified by Using R- Software.)**

# Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. second year (Semester- III)

Semester Pattern effective from June -2020

## Statistics

### Skill Enhancement Course SECS-I (A)

#### Research Methodology

- **Salient features:** This course introduces the handling of data in pharmaceutical sector.
- **Utility:** It is useful in pharmaceutical industrial sector to analyze drug discovery data.
- **Learning objectives:** Students should have knowledge of statistical techniques implementation using clinical trials.
- **Prerequisites:** Descriptive and Inferential statistics, Knowledge of hypothesis.

Objectives : Objectives of this course is to help the under graduate students appreciate , learn & practice Data based Research skills that will help them in writing term papers project reports etc. in their discipline & Generic Elective Courses.

I Nature of Research

II. Formulating The Research Topic

III. Review of literature

IV. Approaches to research & research strategy

V. Research Ethics

VI. Using Secondary data

VII. Using the Primary Data-Collecting data through observation/ interviews/ questionnaire

VIII. Sample Selection methods

IX. Analyzing Data

X. Writing Project Report-Referencing Styles.

Suggested Reading:

1. Ranjit Kumar(2014), Research Methodology: A Step –by-step Guide for Beginner’s 4<sup>th</sup> Edition Sage Publication
2. Uwe Flick (2012), Introducing Research Methodology : A Beginner’s Guide to Doing a Research Project, Sage Publication
3. Bethlehem.J.(2009),Applied Survey Methods : A Statistical Perspective,Wiley.
4. Cochran,William.G.(2008), Sampling Techniques, Thrid Edition,Wiley-Indida,ISBN 978-81-265-1524-0,Reprint 2008
5. Groves R..M.Fowler,F,J,Couper,M.P Lepkowski,J.M.Singer, & Tourangeau.R(2009) , Survey Methodology,Wiley.

OR

Skill Enhancement Course SECS-I (B)

Data Collection and Interpretation

- **Salient features:** This course introduces the handling of data in various sectors of government and non government agencies.
- **Utility:** It is useful in pharmaceutical industrial sector to analyze the data.
- **Learning objectives:** Students should have knowledge of statistical techniques implementation using clinical trials.
- **Prerequisites:** Descriptive and Inferential statistics, Distribution theory.

The objective of the course is that, The Student to collection & presentation of data. It also discusses how data can be summarized and analyzed for drawing statistical inference. The students will be introduced to important data sources that are available & will also be trained in the use of free statistical software to analyze data.

**Course Outline:**

1. Sources of data, Population census versus sample surveys, Random Sampling.
2. Univariate frequency distribution, Measures of central tendency: mean, median & mode, Arithmetic Mean, Geometric Mean & Harmonic Mean, Measures Of Dispersion, Skewness & Kurtosis.
3. Bivariate Frequency distribution, Correlation & Regression, Rank Correlation.
4. Introduction to Probability theory, Notation of random experiment, sample space, event, probability of event ,Conditional Probability, Independence of events, Random variables & probability distribution, Binomial & Normal Distributions.
5. Estimation of population parameters from sample data. Unbiased estimators for population mean and variance.
6. Basics of index numbers : price and quantity index numbers.

Readings:

1. P.H. Karmel and M. Polasek (1978), Applied Statistics for Economics, 4<sup>th</sup> edition, Pitman.
2. M.R. Spiegel (2003), Theory and Problems of Probability and Statistics (Schaum Series).

# Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. second year (Semester- IV)

Semester Pattern effective from June -2017

## Statistics

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Skill Enhancement Course SECS-II (A)

DATA ANALYSIS USING R-SOFTWARE

- **Salient features:** This course introduces the handling of data using R software.
- **Utility:** It is useful in IT sector to analyze and to find information of available data.
- **Learning objectives:** Students should have elementary information of data and their handling using R software.
- **Prerequisites:** Descriptive and Inferential statistics, Applications of distribution.

### Course Outline:

I : Introduction : History of R Programming, starting and ending R, R commands, Data types, Getting help in R, R use as calculator. Descriptive Statistics: Diagrammatic representation of data, measures of central tendency, measures of dispersion, measures of skewness and kurtosis.

II : Probability and probability distribution: problems on finding basic probabilities, some special discrete distribution and continuous probability distribution, probabilities and inverse for various distributions, sketching graph for various distributions.

III : Statistical inference : Sampling distribution of sample means, estimation of parameters, hypothesis testing, goodness of fit tests.

IV : Correlation, inference procedure for correlation coefficient, bivariate correlation, multiple correlations. Linear regression and its inference procedure. Simple optimization method.

### REFERENCES :

- 1) Normal Maltoff (2009) The art of R programming.
- 2) Purohit S.G. , Gore S. D. and Deshmukh S. K. (2010) Statistics using R, Narosa.
- 3) W. John Braun, John Braun, Duncan James Murdoch (2007) First Course in Statistical programming with R, Cambridge University Press.
- 4) M.D. Ugarte , A. F. Militino, A.T. Arnholt (2008) Probability and Statistics with R, CRC Press.
- 5) Peter Dalgard (2008) Introductory Statistics with R, Springer.
- 6) Michael J. Crawley (2007) The R Book. John Wiley and Sons.

OR

Skill Enhancement Course SECS-II (B)

### STATISTICAL STUDY OF METEOROLOGY

- **Salient features:** This course introduces the concept of meteorology data.
- **Utility:** It is useful in meteorological department, agricultural department to analyze data.
- **Learning objectives:** Students should have elementary information of meteorological data and their handling using ITSM software.
- **Prerequisites:** Method to collect data and tabulation, Descriptive statistics, distribution theory, basics of time series.

#### Course Outline:

I) Basic concepts of Meteorological Statistics, Physical climatology, climatic classification , Indian climatology, winter , Pre- monsoon , South-west monsoon season, Post Monsoon season, Synoptic Climatology .

II) Visit to official website of Indian metrological department, Pune and regional metrological central, Mumbai

II) Introduction to Statistics : The purpose of statistics , Population and sample, Censuses and surveys Descriptive statistics and inductive statistics, fields of applications, Statistical variables – qualitative and quantitative, discrete and continuous variables.

IV) Definition of Time Series , different component of time series, stationary time series , auto covariance and autocorrelation , method of trend removing , moving average method , differencing ,ITSM Software (Introduction)

V) Basic Probability and Probability Distributions.

#### REFERENCES :

1. Brokwell , Peter J and Devis, Richard : Introduction to time series and forecasting 2002, Springer series in statistics, second edition.
2. S.C .Gupta & V.K . Kapoor : Fundamentals of Mathematical Statistics, S Chand and Company.