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 2017

Subject: Statistics

Semester	Course No.	Name of the Course	Instruction Hrs/ week	Total period	CA	ESE	Total Marks	Credits
III	CCS III (Section A)	Continuous Probability Distributions(P-VI)	03	45	10	40	50	2
	CCS III (Section B)	Applied Statistics (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	Practicals 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)	Exact Sampling Distributions (P-VIII)	03	45	10	40	50	2
	CCS IV(Section B)	Statistical Inference & Computing Using R (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	Practicals 08 08	05 05	20 20	25 25	1 1
	SECS II	SEC II (Anyone Skill from optional)	02	02	25	25	50	(02)*
Total credits semester III and IV								**12(04)***

~Note: 1) ESE of CCSPII, CCSPIII & 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 -2017

Statistics

CCS III (Section A)

Continuous Probability Distributions (P-VI)

Credits: 02 (Marks: 50) Periods: 45

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

i) **Rectangular or Uniform distribution:** Definition, Moments, Moment generating function, Mean, Variance, Mean deviation about mean, examples, problems and application, Relation with other distributions, Properties of Rectangular distribution. Distributions of distribution function of continuous random variable.

ii) Exponential Distribution: - Probability density function, Moment Generating function, Mean and Variance, lack of memory property, problems, 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, Mode, Median, Quartiles, Moment Generating Function and Cumulant Generating Function, 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, Use of Normal Probability plot

Unit III:-Gamma Distributions-

Gamma Distribution with single and two parameters, Moment Generating Function, Cumulant Generating Function, limiting form of Gamma Distribution,

properties of Gamma Distribution, Beta Distribution of first and second kind, Moments of Beta Distributions, Relation between Exponential and Gamma Distribution as a sum of i.i.d. exponential random variables, Problems, examples, Applications, Transformation of one & Two Dimensional random variables.

Unit IV: - Weibull and Cauchy Distribution: -

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

(**ii) Cauchy Distribution:-** Probability density function of Cauchy Distribution, Characteristics of standard Cauchy Distribution, Comment on non existence, moments of standard Cauchy Distribution

Unit V: Logistic Distribution: - Central Limit theorem, Application of central limit theorm, Probability density function of Logistic distribution, moment generating function of Logistic distribution, problems, De-Moivre, Lapalce Theorem.

Scope of syllabi:-

(i) Fundamentals of Mathematical statistics S.C. Gupta V.K. Kapoor
(11 th Eduction) Sultan chand and sons Delhi
Chapter 9 :-
9.2, 9.2.1, 9.2.2, 9.2.3, 9.2.4, 9.2.5, 9.2.6, 9.2.7, 9.2.8, 9.2.10, 9.2.11, 9.2.13, 9.2.14
9.3.-, 9.3.1, 9.3.2, 9.3.4,9.8, 9.8.1, 9.5, 9.5.1, 9.5.2, 9.5.3, 9.6, 9.6.1,9.7,9.7.1,9.8,
9.8.1, 9.10, 9.10.1, 9.10.2, 9.11,9.11.1,9.12, 9.12.1, 9.12.2,
9.13,9.13.1,9.13.3,5.6,5.7

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- III)
Semester Pattern effective from June -2017
Statistics
CCS III (Section B)
Applied Statistics (P-VII)

Credits: 02 (Marks: 50) Periods: 45

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, Applications of time series, Autoregressive model AR (I)

Unit III: - Measurement of Trend & Seasonal variations:-

i)Graphical Method, Method of Exponential Smoothing, Method of moving averages, Method of least squares**(ii)**Measurement of Seasonal fluctuations by Method of simple averages, Ratio to Trend method, Ratio to moving average method

Unit IV: - Theory of 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, 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, Uses and Limitations of Index Number, Laspeyre's price Index, Paasche's price Index, Drobish-Bowley price Index numbers, Marshlleara - Edgeworth price Index, Irving Fisher's Ideal Index number. Quantity Index numbers, Value Index numbers

Unit V:- 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)
Chapter 12:- 12.4, 12.4.1, 12.5, 12.6, 12.6.1, 12.7, 12.7.1, 12.8, 12.8.1
(ii) Fundamentals of Applied Statistics: - S.C. Gupta V.K. Kapoor (Sultan chand and sons)
Chapter: 2.1, 2.2.1, 2.2.2, 2.2.3, 2.3,
2.3.1,2.4,2.4.1,2.4.2,2.4.3,2.4.4,2.5,2.5.1,2.5.2,2.5.3,2.7.1,2.7.2,
Chapter 3: - 3.1, 3.2, 3.3, 3.4, 3.6, 3.6.1, 3.6.2, 3.6.3,3.7,3.7.1,3.7.2,3.7.3 - 3.8, 3.8.1, 3.8.2, 3.8.3,3.8.4, 3.9, 3.10

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- IV)
Semester Pattern effective from June -2017

Statistics

CCS IV (Section A)

Exact Sampling Distributions (P-VIII)

Credits: 02 (Marks: 50) Periods: 45

Unit I:-Chi-square Distribution: -

Chi-Square variate, Derivation of Chi-Square Distribution (Using method of moment generating function), Nature of Chi-Square probability curve, 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

Unit II:-Applications of Chi-square distribution:-

Chi-square Distribution 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, Problems

Unit III: - t- Distribution:-

Students‘t’ statistic, Derivation of student’s t distribution, Fisher’s t, Distribution of Fisher’s t, moments of 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 ,problem

Unit-IV:-F- Distribution:-

F- Statistic, 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, problem

Unit-V:-Fisher's Z –Distribution: -

Probability density function of Fisher's Z Distribution, Moment generating function of Z- distribution, Fisher's Z Transformation, problems

Scope of syllabi:-

(I) Fundamentals of Mathematical statistics S.C. Gupta V.K. Kapoor
(11 th Eduction) Sultan chand and sons Delhi
Chapter 15:- 15.1, 15.2, 15.3, 15.3.1, 15.3.2, 15.3.4
15.3.5, 15.3.6 , 15.6, 15.6.1, 15.6.2, 15.6.3, 15.6.4, 15.6.6
(III) Chapter16:- 16.1, 16.2, 16.2.1,16.2.2,16.2.3, 16.2.4, 16.2.5, 16.2.6,
16.3.1, 16.3.2, 16.3.3, 16.3.4 ,16.2.2, 16.2.3 16.5, 16.5.1, 16.5.2, 16.5.3, 16.6.1,
16.7, 16.8 16.9,16.9.1,16.10,16.10.1

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. (Satyajeet 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- IV)
Semester Pattern effective from June -2017

Statistics

CCS IV (Section B)

Statistical Inference & Computing Using -R (P-IX)

Credits: 02 (Marks: 50) Periods: 45

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

(i) Basic concept Parameter, space, statistic, difference between estimate and estimator, characteristics of Estimators, Unbiasedness, Consistency, Efficiency, Sufficency, Factorization Theorm, 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, 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.

Unit III: - Large Sample Tests:- Test of significance for large samples, Single proportion, difference of proportions, single mean, difference of means, Problems and Application.

Unit IV: Non Parametric Tests: Sign test, Wilcox on Signed rank test, Run test, Median test, Mann-Whitney U- test, Merits and Demerits of Non Parametric test.

Unit V: . 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) accessing vectors

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

Resident data sets : Accession and summary

p, q, d, r functions.

Scope of syllabi:-

(i) Fundamentals of Mathematical statistics :- S.C. Gupta V.K. Kapoor (Sultan Chand and Son New Delhi)
Chapter 17:-17.1, 17.2, 17.2.1, 17.2.2, 17.2.3, 17.3, 17.2.4, 17.3, 17.6.2,17.6.3,17.7,17.7.1
Chapter 14:- 14.6, 14.7, 14.7.1, 14.7.2, 14.8.3, 14.8.4, 14.8.5
Chapter 18:- 18.1, 18.2, 18.2.1, 18.2.2, 18.2.3, 18.2.4, 18.2.5, 18.2.6, 18.2.7, 18.3, 18.4., 18.4.2
(ii)Statistical Methods –A.R.Chandekar (S.Chand & Co.Ltd Delhi)
11.1, 11.2, 11.3, 11.4, 11.5, 11.7
(iii) A book of Statistical Methods and Use of R-Software-Prof V.R.Pawgi & Prof P.S.Kapre(Nirali Prakashan)

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 Statisitcs:- Mc GrawHill (1974)
(iii) Hodges J.L., Lehman E.L.-Basic Concepts of Probability and Statistics: _- , Holden Day.
iv) P.G. Dixit, P.S. Kapre ---Statistics :- (Nirali Prakashan Pune.)
v) B.R. Bhat T. Shirvenkatarmana K.S. Madhav Rao.-Statistics :- A Beginner's Text Volume- II (New Age International (P) Ltd.)
vi) Gopal K Kanji- 100 Statistical Tests(SAGE Publications)
vii) S.G.Purohit,S.D.Gore,S.R.Deshmukh: Statistics Using R : Narosa Publishing House (1st edition 2008)

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure

B. Sc. Second year Semester Pattern effective from June -2017

Statistics

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

Credits: 02 **(P-X)** (Marks: 50)

(Annual practical Based on [CCS III & IV (Section A)]
(Practical syllabus requires three periods per batch per week for 2 consecutive days

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. Estimation by method of moments
14. Estimation by method maximum likelihood estimation
15. Construction of confidence interval for mean and proportion
16. Large sample test for single mean
17. Large sample test for difference of means
18. Large sample test for single proportions
19. 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 -2017

Statistics

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

Credits: 02 **(P-XI)** (Marks: 50)

(Annual practical Based on [CCS III & IV (Section B)]
(Practical syllabus requires three periods per batch per week for 2 consecutive days

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. Wilcoxcon signed rank test
15. Sign test for single sample & two sample
16. Run Test
17. Median Test
18. Mann - Whitney U Test
19. 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 -2017
Statistics

Skill Enhancement Course SECS-I (A)

Research Methodology

Ojectives : 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 Methodplogy: A Step –by-step Guide for Beginner's 4th 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

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, 4th 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

Skill Enhancement Course SECS-II (A)

DATA ANALYSIS USING R-SOFTWARE

Course Outline:

I : Introduction : History or 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

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 : Fundmamentals of Mathematical Statistics, S Chand and Company.