Swami Ramanand Teerth Marathwada University, Nanded

SYLLABUS
Of
STATISTICS

Choice Based Credit System (CBCS) Course Structure (New Scheme)

B.Sc (First) Year

Semester I

CCS- I (section A) Elementary Probability Theory
(Paper-I)
CCS- I (Section B) Descriptive Statistics & Computing
(Paper II)

Semester II

CCS- II (section A) Discrete Probability Distributions
(Paper-III)
CCS- II (section B) Theory of variables and Attributes
(Paper-IV)
Practical Paper: CCSP - I

(Paper-V)

[Annual Practical Based on CCS I & II Section A & B]

w.e.f June 2016

- **Tentative Distribution of Credits for B.Sc. Statistics (Optional) Under Faulty Science**
B.Sc. Syllabus Structure
Semester Pattern Effective From June 2016
STATISTICS

semester	Paper No.	Name of the course	Instruction Hrs/week	Total Periods	Internal (ESE)	Marks of Semester	Total Marks	Credits
I	CCS- I Section A	Elementary Probability Theory(**P-I**)	03	45	10	40	50	02
	CCS– I Section B	Descriptive Statistics & Computing (**P-II**)	03	45	10	40	50	02
II	CCS – II Section A	Discrete Probability Distributions(**P-III**)	03	45	10	40	50	02
	CCS– II Section B	Theory Of variables & Attributes(**P-IV**)	03	45	10	40	50	02
	CCSP-I(CCS-I&II (Section A & B)	Practical's based on Section A & B of CCS- I &CCS-II (**P-V**)	03	20 Practical's	20	80	100	04 (02 + 02)

Total credits for semester I & II: 12

Sem	Course Code	Course Title						
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 (CCS-III &IV) Section A	Practical's based on P-VI & P-VIII **(P-X)**	3	-	10	40	50	2
	CCSP-II (CCS-III & IV) Section B	SEC 1(1 Skill/optional)			15x3 = 45	-	-	02*
IV	CCS – IV Section-A	Exact Sampling Distributions **(P-VIII)**		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)**	04	10 Practical's	10	40	50	2
	CCSP– III(CCS-III & IV) Section-B P - VII & VIII **P - XI**	SEC II (1 Skill/0ptional)			15x3 = 45			02*

Total credits semester III & IV 12(04)*

V	DECS-I **Section-A**	Sampling Methods(Compulsory) -(**P-XII**)	03	45	10	40	50	02
	DECS-I Section-B (Elective)	Linear Programming (Elective) **P-XIII** OR Statistical Quality Control(Elective)	03	45	10	40	50	02
	DECCSP -I(DECS-I & II **(Section A)**	Practical based on P-XII &P-XIV **(P-XVI)**	3	10 pract ical' s	10	40	50	2
	DECSP-II(DECS-I &IV) Section-B	SEC-III (1 skill/optional)			15x3= 45			()2)*
VI	DECS-II **Section-A**	Design & Analysis Of Experiments (Compulsory) **P-XIV**	03	45	10	40	50	2
	DECS –II **Section- B** (Elective)	Operations Research(Elective) **P- XV** OR Demography(Elective)	03	45	10	40	50	2
	DECSP-II (DECS-I &II) Section B	Practical's based on P-XIII & P-XV **(P-XVII)**	03	10 pract ical' s	10	40	50	2
	DECSP-II Section B	SEC IV (Project)			50		50	(02)*

Total credits semester V & VI = 12(04)*

STATISTICS
CCS –I Section (A)
Paper-I   Elementary Probability Theory

Credits: 02(Marks:50)   **Periods :45**

Unit- I - Probability: 10 periods

Random experiment, trial ,out come and event, Exhaustive events, favourable events, Independent events, sample space, classical definition of probability, Empirical definition of probability, Axiomatic approach to probability, Addition Theorem of probability, Extension of Addition theorem of probability (up to 3events), Conditional probability. Conditional probability and Independent events, mutually and pair wise independent events, multiplication theorem of probability for Independent finite events, Bayes theorem, Baye's Theorem for further events

Unit-II: - Random Variable (Univariate):-   10 periods

Random Variable, Distribution function, discrete random variable, Probability Mass Function, Distribution function of discrete random variable, Continuous random variable, Probability Density Function, Distribution function of Continuous random variable, Properties of distributions (Continuous and Discrete)

Unit III: Random Variable (Bivariate)   10 periods

Definition, Two Dimensional Probability Mass Function, Marginal Probability Function, Conditional Probability Function, Two Dimensional Distribution Function, Marginal Distribution Function Joint Density Function, Marginal Density Function, Stochastic Independence and related theorems

Unit IV: Mathematical Expectations: 10 periods

Definition, Expected value of random Variable, Expected value of Function of random variable properties of Expectations, Various measures of Central Tendency, Dispersion, skewness and Kurtosis for Discrete and continuous probability distribution, Basic concepts, Variance, Properties of variance, covariance, Variance of a Linear combination of Random variable, conditional expectations

Unit -V: **Probability Generating function:**-   05 periods

Probability Generating function, Moment Generating Function- Definition, Properties of moment generating function, Cumulants, cumulant generating function properties of cumulants problems

Scope of Syllabus:
Fundamentals of Mathematical Statistics - S.C. Gupta & V.K. Kapoor
(11th Edition June 2012) Sultan Chand & Sons New Delhi
Chapter 3:-3.1,3.2, 3.3, 3.4, 3.4.1, 3.5,3.5.1,3.8, 3.8.1, 3.8.2, 3.8.5, 3.9, 3.9.1, 3.10.
3.11, 3.12, 3.13, 3.14.1, 3.15, 3.15.1
Theorem: - 3.2, 3.3, 3.4, 3.5, 3.6, Cor.1. Cor.2, 3, 10, 3.11, 3.12, 3.13,
3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.20, 4.2, 4.2.1
Chapeter: 5 5.1, 5.2, 5.2.1, 5.3, 5.3.1, 5.3.2, 5.4, 5.4.1, 5.4.2, 5.4.3
5.5, 5.5.1, 5.5.2, 5.5.3, 5.5.4, 5.5.5, 5.5.6 Theorem 5.2 (Statement only)
Chapter 6:- 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.6.1, 6.8
Chapter 7:- 7.1, 7.1.3,7.1.2,7.2,7.2.1,7.11
Reference Books:-
1. Fundamentals of statistics volume- II- Goon A.M. Gupta M.K, and DasguptaB(The World press Pvt. Ltd. Kolkatta)
2. Modern Elementary Statistics- Miller and Friends
3. Introductory Statistics by Neil Weiss Pearson Publication.
4. Programmed statistics - B.L. Agrawal (New Age International Publication New Delhi.)
5. Introduction to the theory of Statistics, Mood A.M., Graybill F.A. and Boes F.A
6. Introductory Probability and Statistical applications- Addision Wesley.
7. Statistical Method, S.P. Gupta, (Sultan Chand & Sons New Delhi.)
8. Statistics - A Begineer's Text, Volume II : B.R. Bhat,T. Shrivenkataramana, K.S. Madhav Rao. (New Age International (p) Ltd.)

STATISTICS
CCS –I Section (B)
Paper-II   Descriptive Statistics & Computing

Credits: 02(Marks:50)   **Periods :45**

Unit I: - Basic Statistics & Data Condensation: 15 periods
Meaning of statistics, Importance and scope of Statistics in Industry, Medical Science, Social Sciences, Management Science, Agriculture and Insurance, Information Technology, education & Psychology, Statistical Organizations in India and their functions Central Statistical Organization(CSO), Indian Statistical Institute (ISI), National Sample Survey Organization(NSSO),Indian Institute of Population Studies(IIPS),Bureau of Economics and Statistics, Frequency distributions (continuous and discrete), Methods of Grouped and Ungrouped Data, Presentation of data, Graphical presentation of data by histogram Frequency curve, Frequency polygon, Ogives, Box plot and Bar Charts, Stem and Leaf Chart, Graphical method to represent bivariate data, problems

Unit –II:- Measures of central tendency: 10 periods
Measures of central tendency Arithmetic mean (simple and weighted), Combined mean, Geometric Mean, Harmonic Mean, Median ,Mode, Derivation of Median formula for grouped frequency distribution, Quartiles, Calculating quartiles by analytical and graphical method, Uses of Mean, Median, Mode, Harmonic Mean, Geometric Mean, Relation between means, Merits and demerits of measures of central tendency, problems

Unit - III Measures of Dispersion: 10 periods
Concepts of measures of dispersion, Types of measures of dispersion, Range, Quartile Deviation, Mean absolute deviation, Standard deviation, Variance, Root mean square deviation, Properties of variance, relation between Root Mean Square deviation and Standard Deviation, Coefficient of variation, Problems

Unit IV: - Moments: 05 periods
Raw and central moments, Relation between raw moments & central Moments (Up to 4th order), Effect of change of origin and scale on moments, Sheppard's correction for moments, Pearsonian coefficients Measures of skewness, kurtosis Problems

Unit V: -Statistical Computing Using Excel:-   05 periods
Compute various measures of central tendency, dispersion, skewness and kurtosis, To compute correlation coefficient of Regression, To fit Binomial Distribution, To analyze data pertaining to discrete and continuous variables and to interpret the results,To compute probabilities of bivariate distributions, to interpret summary Statistics of computer output.

1. **Fundamentals of Mathematical Statistics:** - S.C. Gupta & V.K. Kapoor
(Sultan Chand and sons New Delhi)
Chapter 2:- 2.4, 2.4.1, 2.5, 2.5.1, 2.5.2, 2.5.3, 2.6, 2.6.1, 2.6.2, 2.7, 2.7.1, 2.7.2, 2.8, 2.8.1, 2.8.2, 2.9, 2.9.1, 2.11, 2.11.1., 2.12, 2.12.1, 2.13, 2.13.1, 2.13.2, 2.13,.3,2.13.4,2.14,2.14.1, 2.15,2.15.1,2.15.2,2.15.5,2.16,2.16.1, 2.17
2. Descriptive Statistics:-P.G.Dixit, Dr.Mrs.V.R. Prayag.D.L. Limaye
(Nirali Prakashan, 41 Budhwar Peth Pune-02)
Chapter1:- 1.1, 1.2, 1.3, 1.4, 1.5
Chapter2:- 2.1, 2.2, 2.3, 2.4
Chapter3:- 3.1, 3.2, 3.4,
3 Excel 2010 Simple Steps kogent learning Solutions
(Wile India Private Ltd)
Reference Books:-
1. Fundamentals of statistics volume-(1) Goon A.M. Gupta M.K. Dasgupta
(The World Press Pvt. Ltd. Kolkatta)
2. Modern Elementary Statistics- Freund J.E. (Prentice Hall New Jersy 1979)
3. Introductory Statistics- Neil Weiss (Pearson Publications.)
4. Programmed statistics - B.L. Agrawal (New Age Internatinal Publication New Delhi.)
5. Research Methodology - Kothari C.R. (Wiley Eastern Limited)
6. Statistics- A Beginner's Text, Volume I : B.R. Bhat. T. Shirvenkataramana K.S. MadhavRao.
7. Statistical Medhods- S.P. Gupta.(Sultan Chand & Sons New Delhi).

STATISTICS
CCS –II Section (A)
Paper-III   Discrete Probability Distributions

Credits: 02(Marks: 50)   **Periods: 45**

Unit I Uniform Distribution: 07 periods

Uniform Discrete Distribution: - Definition, Mean, Variance and Moment Generating Function, Examples on real life situation

Unit II Binomial Distribution: -   10 periods

Bernoulli Distribution: Definition, Mean, Variance and Moment Generating function, Examples on real life situation, Binomial Distribution: Definition, Moments, Moment Generating Function, Cumulants, Additive property of Binomial Distribution, Recurrence Relation for the Probabilities of Binomial Distribution, Mode, Problems, Examples on real life situation

Unit III: Poisson distribution: -   10 periods

Poisson distribution as a limiting case of Binomial Distribution, moments of Poisson distribution, mode of Poisson Distribution, recurrence relation for moment of Poisson distribution, moment Generating and cumulant generating function, additive property of Poisson Distribution, recurrence formula for the probabilities of Poisson distribution

Unit IV: Negative Binomial & Geometric Distribution: -   10 periods

(i)Definition, Moment Generating Function, cumulants, Moments, Relation between negative binomial and binomial distribution

(ii) Geometric Distribution definition, lack of memory, Moments of geometric distribution moment generating function, mean, variance, Applications of geometric distribution in the real life situation and relation with the binomial distribution,

Unit V: Hyper geometric Distribution & Multinomial Distribution: -   08 periods

(I)Hyper geometric Distribution: Definition, Mean and variance, relation with Binomial distribution, Recurrence relation for the probabilities of Hyper Geometric Distribution, Examples on real life.(II) Multinomial Distribution:- Introduction, moments of Multinomial Distribution,Examples.

Scope of Syllabus:-

(i) **Fundamental of Mathematical Statistics** (S.C. Gupta V.K. Kapoor)

(11 th Edition) ((Sultan Chand & Sons New Delhi)

Chapter 8:- 8.1,8.3, 8.3.1, 8.4, 8.4.1, 8.4.5, 8.4.6, 8.4.7, 8.4.9, 8.4.12,

8.5, 8.5.2, 8.5.5,8.5 .7,8.5.8,8.5.10,8.6,8.6.1,8.6.2, 8.7,8.7.1,8.7.2,8.7.3,8.8,8.8.1 8.9,8.9.1

Reference Books:-

(i) Mathematical Statistics: - H.C. Saxena (Sultan Chand & Sons New Delhi)

(ii) New Mathematical Statistics (First Edition) Arora Sanjay and Bansilal.

Stya prakashan 16/ 7698 New Market New Delhi 5 (1989)

(iii) Statistics: - a Beginners Text Volume - II B.R. Bhat T. Shivenkataramena

K.S. Madhav Rao.(New Age International (p) Ltd.iv)Introduction to Discrete Probability and Probability Distributions:-

Madhav B. Kulkarni , Surendra B. Ghatpande. (SIPE Academy, Nasik.)

STATISTICS
CCS –II Section (B)
Paper-IV Theory of Variables and Attributes

Credits: 02(Marks: 50)   **Periods: 45**

Unit-I: - **Bivaraiate Data:**   03 periods
Graphical method to represents bivariate data, scatter diagram

Unit II: - Correlation:-   10 periods
Concept of Correlation, Karl persons' product moment correlation and its properties, Independence and un cor relatedness, Spearman rank correlation coefficient and its properties, Derivation of rank correlation coefficient formula, problem

Unit –III Linear Regression: -   10 periods
Regression coefficients, Lines of Regression & their properties, properties of regression coefficients, problems, Derivation of lines of regression, Residuals and their properties, Residuals plot

Unit -IV:- **Method of least squares ;**   10 periods
Legendre's principle of least squares, Fitting of straight line, Second degree curve, an Exponential curve, Power curve, Logistic curve $y = k/1+Exp(a+ b x)$, Interpretation of Regression coefficients, most plausible solution of system of
liner equations

Unit : V:- Theory of Attributes:-   12 periods
Concepts of attributes, Notation, Classification dichotomy, class frequency, order of classes, positive and negative class frequencies, ultimate class frequencies, relation between class frequencies, consistency of attributes, (threeattributes) Independence and association of two attributes, Yule's coefficient of association **Q**. Coefficient of colligation **Y**. Relation between them and problems.

Scope of Syllabus:-.
(i**) Fundamentals of Mathematical Statistics** : S.C. Gupta V.K. Kapoor (11 th Edition) Sultan chand and sons New Delhi.
Chapter10:-10.1,10.2,10.3,10.4,10.4.1,10.4.2,10.7,10.7.1,10.7.3, Theorem 10.1,10.2
Chapter 11:- 11.1,11.2,11.2.1,11.2.2,11.2.3
Chapter13:-13.2, 13.3,13.4,13.4.1,13.4.2,13.4.3, 13.5,13.5.1,13.6,13.7,13.7.1,13.7.2
(ii) **Mathematical Statistics** : Ray Sharma, Choudhari (Ramprasad and sons Agra)
Chapter 13 :- 13.2, 13.4, 13.5, 13.6, 13.12

Reference Books :
i) Statistics : A Begineers Text volume I B.R. Bhat, T Shrivenkataramana, K.S.
Madhav Rao (New Age International Publications)
ii) Descriptive Statistics : (first edition July – 2008) P.G. Dixit, Dr. V.R. Prayag, D.L. Limaya (Nirali Publication Prakashan Pune).
iii)Descriptive Statistics-II(first edition February 2014) Prof P.G. Dixit, Prof S.J.Alandkar, Prof N.I.Dhanshetti(Nirali Publication Prakashan Pune).

B.A./ B.Sc. First Year
STATISTICS
Practical - I Paper CCSP – I Paper - V
Annual Practical Based on [CCS I & II (Section A & B)]

Credits: 04(Marks 100)

Sr. No.	Title of Experiments	No. of Experiments
1	Construction of Frequency distributions	2
2	Bar Chart, Frequency polygon, Frequency Cruve, Ogives Histogram. (Also using MS-EXCEL/Spread Sheet)	3
3	Measures of central tendencies Mean, Median and Mode. (Also using MS-EXCEL/Spread Sheet)	3
4	Compute Quartiles by analytical and graphical method	1
5	Compute measures of dispersions Range, Quartile deviation, Mean deviation Standard deviation (Also using MSEXCEL/ Spread Sheet	3
6	Coefficient of variation	2
7	Moments	1
8	Correlation coefficient (Results to be verified by using computer)	2
9	Regression (Results to be verified by using computer	2
10	Spearman's rank correlation coefficient (For repeated and unrepeated ranks)	2
11	Fitting of Binomial distribution	2
12	Fitting of Poisson distribution	1
13	Fitting of Curves (i) $Y=a+bx$ (ii) $Y=ab^x$ (iii) Second degree curve	2
14	Attributes	3
15	Computation of probabilities of bivariate distribution	1
16	Most Plausible values of system of liner equations	1