Estd. 1962
"A++" Accredited by NAAC(2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004,
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शिवाजी विद्यापीठ, कोल्हापूर - ४१६००४,महाराष्ट्र
दूरध्वनी - ईपीएबीएक्स - २६०९०००, अभ्यासमंडळे विभाग दुरध्वनी विभाग २३१–२६०९०९३/९४

SU/BOS/Science/ **Date:** 13 SEP 2022

No 0 0 2 0 6

To,
The Principal,
All Affiliated Concerned Science Colleges/Institutions
Shivaji University, Kolhapur.

Subject :- Regarding syllabi of M.Sc., & B. Sc. (NEP-2020) adegree programme under the Faculty of Science and Technology as per National Education Policy, 2020 .

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi and Nature of question paper of **M.Sc., & B. Sc. (NEP-2020) System** under the Faculty of Science and Technology **as per National Education Policy, 2020 .**

Sr. No.	Faculty of Science and Technology	Programme/ Course
1	**Statistics**	**M. Sc. Part- I Statistics**
		M. Sc. Part- I Applied Statistics and Infromatics
		B. Sc. Part- I Statistics

This syllabi and nature of question paper shall be implemented from the Academic Year 2022-2023 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in (students Online Syllabus)

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy Registrar

Copy to:

1	The Dean, Faculty of Science & Technology	7	Appointment Section
2	Director, Board of Examinations and Evaluation	8	P.G.Seminar Section
3	The Chairman, Respective Board of Studies	9	Computer Centre (I.T.)
4	B.Sc. Exam	10	Affiliation Section (U.G.)
5	Eligibility Section	11	Affiliation Section (P.G.)
6	O.E. I Section	12	P.G.Admission Section

SHIVAJI UNIVERSITY, KOLHAPUR.

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CHOICE BASED CREDIT SYSTEM

Syllabus

For

B.Sc. Part – I

Statistics

SEMESTER I AND II

AS PER NEP 2020

To be implemented from academic year 2022-23

First Year Bachelor of Science (Level-5) Programme Structure
(NEP-2020 PATTERN)

Courses	Sr. No.	Course Code	TEACHING SCHEME						EXAMINATION SCHEME						
			THEORY			PRACTICAL			THEORY				PRACTICAL		
			Credits	No. of lectures	Hours	Credits	No. of lectures	Hours	Hours	Max	Total Marks	Min	Hours	Max	Min
S E M E S T E R – I (Duration – 6 Months)															
CGPA COURSES	1	DSC-A	2	5	4	2	4	3.2	2	50	100	35	PRACTICAL EXAMINATION IS ANNUAL		
	2	DSC-A	2						2	50					
	3	DSC-A	2	5	4	2	4	3.2	2	50	100	35			
	4	DSC-A	2						2	50					
	5	DSC-A	2	5	4	2	4	3.2	2	50	100	35			
	6	DSC-A	2						2	50					
	7	DSC-A	2	5	4	2	4	3.2	2	50	100	35			
	8	DSC-A	2						2	50					
	9	AECC- A	2	4	3.2	-	-	-	2	50	50	18			
		TOTAL (A)	18			8	16				450				
Non CGPA	10	SEC-1	-	-	-	2	4	4							
	11	VBC-1				1	2	2							
S E M E S T E R – II (Duration – 6 Months)															
CGPA COURSES	1	DSC-B	2	5	4	2	4	3.2	2	50	100	35	As per BOS Guide-lines	50	18
	2	DSC-B	2						2	50					
	3	DSC-B	2	5	4	2	4	3.2	2	50	100	35		50	18
	4	DSC-B	2						2	50					
	5	DSC-B	2	5	4	2	4	3.2	2	50	100	35		50	18
	6	DSC-B	2						2	50					
	7	DSC-B	2	5	4	2	4	3.2	2	50	100	35		50	18
	8	DSC-B	2						2	50					
	9	AECC- B	2	4	3.2	--	--	--	2	50	50	18		200	18
		TOTAL (B)	18			8					450				
		TOTAL (A+B)	36			16					900				
Non CGPA	10	SEC-2	-	-	-	2	4	4							
	11	VBC-2				1	2	2							

- Student contact hours per week : 32 Hrs (Minimum)
- Total Marks for B.Sc.- I : 1100
- Theory and Practical Lecture Duration: 48 min each
- Total Credits for B.Sc.-I (Sem I & II) : 52
- Practical Examination will be conducted annually for 50 marks per course.
- **AECC:** Ability Enhancement Compulsory Course (A & B) : English for communication
- **SEC:** Skill Enhancement Course (Vocational Studies): Field Projects/ Internship/ Apprentiship/ Community Engagement and Service. Any one from pool of courses. For SEC courses there shall be only practical examination of 50 marks. **VBC:** Value Based Course (NSS/NCC/Sports/Cultural, etc.)
- Except English, there shall be combined passing for two theory courses of 50 marks each. i.e. minimum 35 marks are required for passing out of 100. There shall be separate passing for theory and practical.
- ***Exit option after Level 5: Students can exit with Certificate Course in Science (with the completion of courses equal to minimum of 52 credits).***

B. Sc. Part-I: Sem-I : List of Courses

Discipline Specific Core (DSC) Courses

Course code	Name of the Course	Course code	Name of the Course
B. Sc. Part-I: Sem-I DSC : A1 to A38			
DSC A1	Physics I	**DSC A21**	Geology I
DSC A2	Physics II	**DSC A22**	Geology II
DSC A3	Chemistry I	**DSC A23**	Seed Technology I
DSC A4	Chemistry II	**DSC A24**	Seed Technology II
DSC A5	Mathematics I	**DSC A25**	Microbiology I
DSC A6	Mathematics II	**DSC A26**	Microbiology II
DSC A7	Statistics I	**DSC A27**	Industrial Microbiology I
DSC A8	Statistics II	**DSC A28**	Industrial Microbiology II
DSC A9	Electronics I	**DSC A29**	Biochemistry I
DSC A10	Electronics II	**DSC A30**	Biochemistry II
DSC A11	Computer Science I	**DSC A31**	Psychology I
DSC A12	Computer Science II	**DSC A32**	Psychology II
DSC A13	Botany I	**DSC A33**	Food Science & Quality control-I
DSC A14	Botany II	**DSC A34**	Food Science & Quality control-II
DSC A15	Zoology I	**DSC A35**	Astrophysics I
DSC A16	Zoology II	**DSC A36**	Astrophysics II
DSC A17	Biotechnology (Opt) I	**DSC A37**	Nanotechnology (opt) I
DSC A18	Biotechnology (Opt) II	**DSC A38**	Nanotechnology (opt) II
DSC A19	Geography I		
DSC A20	Geography II	**AECC – A**	English Paper – I

DSC: Discipline Specific Core Course

AECC – Ability Enhancement Compulsory Course

AECC – A – English Paper– I

Link for the pool of SEC courses from National Skills Qualification Framework (NSQF)

(You may add or delete any courses as per available facilities)
https://drive.google.com/file/d/176Vwvx4SC2ONrt69XADruzI2qnfBPI_o/view?usp=sharing

B.Sc. Part-I: Sem-II: List of Courses

Discipline Specific Core (DSC) Courses

Course code	Name of the Course	Course code	Name of the Course
B. Sc. Part-I: Sem-II DSC : B1 to B38			
DSC B1	Physics III	**DSC B21**	Geology III
DSC B2	Physics IV	**DSC B22**	Geology IV
DSC B3	Chemistry III	**DSC B23**	Seed Technology III
DSC B4	Chemistry IV	**DSC B24**	Seed Technology IV
DSC B5	Mathematics III	**DSC B25**	Microbiology III
DSC B6	Mathematics IV	**DSC B26**	Microbiology IV
DSC B7	Statistics III	**DSC B27**	Industrial Microbiology III
DSC B8	Statistics IV	**DSC B28**	Industrial Microbiology IV
DSC B9	Electronics III	**DSC B29**	Biochemistry III
DSC B10	Electronics IV	**DSC B30**	Biochemistry IV
DSC B11	Computer Science III	**DSC B31**	Psychology III
DSC B12	Computer Science IV	**DSC B32**	Psychology IV
DSC B13	Botany III	**DSC B33**	Food Science & Quality control II
DSC B14	Botany IV	**DSC B34**	Food Science & Quality control IV
DSC B15	Zoology III	**DSC B35**	Astrophysics III
DSC B16	Zoology IV	**DSC B36**	Astrophysics IV
DSC B17	Biotechnology (Opt) III	**DSC B37**	Nanotechnology (opt) III
DSC B18	Biotechnology (Opt) IV	**DSC B38**	Nanotechnology (opt) IV
DSC B19	Geography III		
DSC B20	Geography IV	**AECC – B**	English Paper – II

AECC – B – English Paper– II

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B. Sc. Part – I Semester – I

DSC –7A – STATISTICS – I

(DESCRIPTIVE STATISTICS – I)

Theory: 30 hrs. Marks -50 (Credits: 02)

Course Outcomes: The students will acquire knowledge of

i. meaning and scope of Statistics, various statistical organizations,
ii. data and types of data, various data presenting methods,
iii. population, sample and various methods of sampling,
iv. various measures of central tendencies and dispersion,
v. moments, skewness and kurtosis.

CONTENTS:

Unit - 1 **(15 hrs.)**

1.1 Introduction to Statistics: Meaning of Statistics as a Science, Importance of Statistics, Definition of Statistics, Various fields where Statistics is used, Names of various statistical organizations in India.

1.2 Population and Sample: Statistical population. Finite population, Infinite population, Census method, Sampling method, Advantages of sampling method over census method.

Methods of sampling (Description only): Sample and Random sample, Simple random sampling with and without replacement (SRSWR and SRSWOR), Stratified random sampling, Systematic sampling.

1.3 Nature of Data: Primary and Secondary data, Time series data, Quantitative and Qualitative data, Attributes, Variables, Discrete and Continuous variables, Scales of measurement - Nominal, Ordinal, Interval and Ratio scale, illustrative examples.

1.4 Presentation of Data:

Classification: Raw data and its classification, Discrete frequency distribution, Continuous frequency distribution, Cumulative frequency distribution, Inclusive and Exclusive methods of classification, Open end classes, Relative frequency distribution, illustrative examples.

Tabulation: Parts of table, Characteristics of good table, Types of table, illustrative examples.

Diagrammatic Presentation: Introduction to Simple Bar Diagram, Multiple Bar Diagram, Sub-Divided Bar Diagram, Pie Diagram.

Graphical Presentation: Histogram, Frequency Polygon, Frequency Curve, Ogive curves and Box plot.

Unit - 2 **(15 hrs.)**

2.1 Measures of Central Tendency: Mathematical and positional, Concept of central tendency of statistical data, statistical average, requirements of good statistical average.

Arithmetic Mean (A.M.): Definition, Effect of change of origin and scale, Deviation of observations from A.M., Mean of pooled data, Weighted A.M.

Geometric Mean (G.M): Definition, illustrative examples.

Harmonic Mean (H.M.): Definition, Relation: A.M $\geq$ G.M $\geq$ H.M (proof for n = 2 positive observations), illustrative examples.

Median: Definition, Derivation of formula for grouped frequency distribution.

Mode: Definition, Derivation of formula for grouped frequency distribution. Empirical relation between mean, median and mode. Graphical method of determination of Median and Mode.

Partition values: Quartiles, Deciles and Percentiles.

Comparison between averages in accordance with requirements of good average. Situations where one kind of average is preferable to others, illustrative examples.

2.2 Measures of Dispersion: Concept of dispersion, Absolute and Relative measures of dispersion, Requirements of a good measure of dispersion.

Range: Definition, Coefficient of range.

Quartile Deviation (Q. D. or Semi-inter quartile range): Definition, Coefficient of Q.D.,

Mean Deviation (M.D.): Definition, Coefficient of M.D., Minimal property of M.D.,

Mean Square Deviation (M.S.D.): Definition, Minimal property of M.S.D.,

Variance and Standard Deviation (S.D.): Definition, Effect of change of origin and scale, variance and S.D. of pooled data (proof for two groups).

Coefficient of Variation: Definition and use. Illustrative examples.

2.3 Moments, Skewness and Kurtosis: Moments: Raw moments and central moments for ungrouped and grouped data. Effect of change of origin and scale on central moments, relation between central moments and raw moments (up to 4th order). Sheppard's corrections.

Skewness: Concept of skewness of a frequency distribution, types of skewness. Bowley's coefficient of skewness, Karl Pearson's coefficient of skewness, measure of skewness based on moments.

Kurtosis: Concept of kurtosis of a frequency distribution, Types of kurtosis, Measure of kurtosis based on moments. Illustrative examples.

Books Recommended:

1. Bhat B. R., Srivenkatramana T. and Madhava Rao K. S. (1996): Statistics: A Beginner's Text, Vol. 1, New Age International (P) Ltd.
2. Croxton F. E., Cowden D.J. and Kelin S. (1973): Applied General Statistics, Prentice Hall of India.
3. Goon A.M., Gupta M.K., and Dasgupta B.: Fundamentals of Statistics Vol. I and II, World Press, Calcutta.
4. Gupta S. P. (2002): Statistical Methods, Sultan Chand and Sons, New Delhi.
5. Gupta V.K. & Kapoor S.C.: Fundamentals of Mathematical Statistics.- Sultan & Chand.
6. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics Ed.4.
7. Hoel P. G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.

8. Kore B. G. and Dixit P. G.: "Descriptive statistics-I", Nirali Prakashan, Pune.
9. Mood A. M., Graybill F. A. and Boes D. C. (1974): Introduction to the Theory of Statistics, McGraw Hill.
10. Snedecor G.W. and Cochran W. G. (1967): Statistical Methods, Lowa State University Press.
11. Waiker and Lev.: Elementary Statistical Methods.

Note: 1. In theory examination, the weightage to numerical problems should not exceed 30%.
2. Students can use scientific calculators in theory examination.

B. Sc. Part – I Semester – I

DSC –8A – STATISTICS – II

(ELEMENTARY PROBABILITY THEORY)

Theory: 30 hrs. Marks -50 (Credits: 02)

Course outcomes: Students will be able to;

i. distinguish between random and non-random experiments
ii. acquire knowledge of concepts of probability
iii. use the basic probability rules, including additive and multiplicative laws
iv. understand concept of conditional probability and independence of events.
v. understand concept of univariate random variable and its probability distributions
vi. acquire knowledge of mathematical expectation of univariate random variable.

CONTENTS:

Unit – 1 **(15 hrs.)**

1.1 Sample space and events: Concepts of experiments and random experiments. Definitions: Sample space, Discrete sample space (finite and countably infinite), Event, Elementary event, Compound event. Algebra of events (Union, Intersection, Complementation). Definitions of mutually exclusive events, Exhaustive events, Impossible events, Certain event. Power set |P(Ω) (sample space consisting at most 3 sample points). Symbolic representation of given events and description of events in symbolic form. Illustrative examples.

1.2 Probability: Equally likely outcomes (events), apriori (classical) definition of probability of an event. Equiprobable sample space, simple examples of computation of probability of the events based on permutations and combinations. Definition of probability in terms of odd ratio with illustrative examples. Axiomatic definition of probability. Proof of the results: i) $P(\Phi) = 0$, ii) $P(A^C) = 1 - P(A)$, iii) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (with proof) and its generalization (Statement only), iv) If $A \subseteq B$, $P(A) \leq P(B)$, v) $0 \leq P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$.

Unit – 2 **(15 hrs.)**

2.1 Conditional Probability and Independence of events: Definition of conditional probability of an event. Multiplication theorem for two events. Examples on conditional

probability. Concept of independence of two events. Proof of the result that if A and B are independent then, i) A and B^C are independent, ii) A^C and B are independent, iii) A^C and B^C are independent. Pairwise and Mutual independence for three events. Elementary examples.

Partition of sample space. Idea of posteriori probability, statement and proof of Baye's theorem, illustrative examples on Baye's theorem.

2.2 Univariate Probability Distributions (finite sample space): Definition of discrete random variable. Probability mass function (p.m.f.) and cumulative distribution function (c.d.f.) of a discrete random variable, Properties of c.d.f. (statements only). Probability distribution of function of random variable. Median and mode of a univariate discrete probability distribution. Examples.

2.3 Mathematical expectation (Univariate random variable): Definition of expectation of a random variable. Expectation of a function of a random variable, Results on expectation of a functions of a random variable: i) E (c) = c, where c is a constant, ii) E(aX + b) = aE(X) + b, where a and b are constants, definitions of mean, variance of univariate distribution, $V(aX + b) = a^2V(X)$, definition of raw, central moments, definition of probability generating function (p.g.f.) of a random variable, obtaining mean and variance by using p.g.f. Effect of change of origin and scale on p.g.f.

Books Recommended

1. Bhat B. R., Srivenkatramana T. and Madhava Rao K. S. (1996): Statistics: A Beginner's Text, Vol. 1, New Age International (P) Ltd.
2. Edward P. J., Ford J. S. and Lin (1974): Probability for Statistical Decision-Making, Prentice Hall.
3. Goon A.M., Gupta M.K., and Dasgupta B.: Fundamentals of Statistics Vol. I and II, World Press, Calcutta.
4. Gupta V.K. & Kapoor S.C. Fundamentals of Mathematical Statistics.- Sultan & Chand.
5. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics Ed.4.
6. Hoel P. G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.
7. Kore B. G. and Dixit P. G.: "Elementary Probability Theory", Nirali Prakashan, Pune.
8. Meyer P.L. (1970): Introductory Probability and Statistical Applications, Addision Wesley.
9. Mukhopadhyay P. (2006): Probability. Books and Allied (P) Ltd.
10. Rohatgi V. K. and Saleh A. K. Md. E. (2002): An Introduction to probability and statistics. John wiley & Sons (Asia).
11. Snedecor G.W. and Cochran W. G. (1967): Statistical Methods, Lowa State University Press.

Note:

1. In theory examination, the weightage to the numerical problems should not exceed 30%.
2. Students can use scientific calculators in theory examination.

B. Sc. Part – I Semester – II

DSC –7B – STATISTICS – III

(DESCRIPTIVE STATISTICS – II)

Theory: 30 hrs. Marks -50 (Credits: 02)

Course Outcomes: Students will acquire knowledge of;

i. correlation coefficient and interpret its value.
ii. regression coefficients, interpret its value and use in regression analysis.
iii. qualitative data including concept of independence and association between two attributes
iv. vital statistics and concept of mortality and fertility and growth rates.

CONTENTS:

Unit – 1 **(15 hrs.)**

1.1 Correlation: Bivariate data, Need of analysis of bivariate data, Concept of correlation between two variables, Types of correlation.

Methods of studying correlation: 1) Scatter diagram, its utility, Covariance: Definition, Effect of change of origin and scale, 2) Karl Pearson's coefficient of correlation (r): Definition, Computation for ungrouped and grouped data. Properties: i) $-1 \leq r \leq 1$, Interpretation for different values of r, ii) Effect of change of origin and scale, 3) Spearman's rank correlation coefficient: Definition, Computation (with and without ties). Derivation of the formula for without ties and modification of the formula for with ties. Illustrative examples.

1.2 Regression: Concept of regression, Lines of regression of Y on X (Y=a + bX + ε) and X on Y, fitting of lines of regression by the least square method, Regression coefficients b_{xy}, b_{yx} and their geometric interpretations

Properties: i) $b_{xy} \times b_{yx} = r^2$, ii) $b_{xy} \times b_{yx} \leq 1$, iii) $\frac{b_{xy} \times b_{yx}}{2} \geq r$, iv) Effect of change of origin and scale on regression coefficients, The point of intersection of two regression lines, Derivation of acute angle between the two lines of regression, Concept of residual, Mean residual sum of squares, Residual Plot (Residual versus fitted value) and its interpretation, Explained and unexplained variation, coefficient of determination, Illustrative examples.

Unit – 2 **(15 hrs.)**

2.1 Attributes: Introduction and Notations of Attribute, Dichotomy, class, order of class, positive and negative class, class frequency, ultimate class frequency, fundamental set of class frequency, relationships among different class frequencies (up to three attributes), Concept of consistency, Concept of independence and association of two attributes, Yule's coefficient of association (Q): Definition, $-1 \leq Q \leq +1$, interpretation, Coefficient of colligation (Y): Definition, interpretation, Relation between $Q$and Y: 1) $Q = \frac{2Y}{1+Y^2}$, 2) $|Q| \geq |Y|$, Correlation Coefficients: 1) Point Biserial Correlation

Coefficient, 2) Phi Coefficient, 3) Tetrachoric Correlation Coefficient, Illustrative examples.

2.2 Demography: Introduction, vital events and need of vital statistics, Measures of fertility: Crude Birth Rate (CBR), Age Specific Fertility Rate (ASFR), General Fertility Rate (GFR), Total Fertility Rate (TFR), Measures of reproduction: Gross Reproduction rate (GRR), Net Reproduction Rate (NRR), Measures of mortality: Crude death rate (CDR), Specific Death Rate (SDR) by i) Direct method ii) Indirect method, Standardized Death Rate (STDR), Population projection at time t, Life Table - construction and its applications in insurance, Use and Applications

Books Recommended:

1. Bhat B. R., Srivenkatramana T and Madhava Rao K. S. (1997): Statistics: a Beginner's Text, Vol. I, New Age International (P) Ltd.
2. Croxton F. E., Cowden D.J. and Kelin S. (1973): Applied General Statistics, Prentice Hall of India.
3. Goon A. M., Gupta M. K., Das Gupta B. (1999): Fundamentals of Statistics, Vol. I and II, World Press, Calcutta.
4. Gupta S. P. (2002): Statistical Methods, Sultan Chand & Sons Pvt. Ltd. New Delhi.
5. Gupta V.K. & Kapoor S.C. Fundamentals of Mathematical Statistics.- Sultan Chand & Sons Pvt. Ltd. New Delhi.
6. Kapur, J. N and Gupta, H. C, : Fundamentals of Mathematical Statistics, S. Chand and sons, New Delhi.
7. Kore B. G. and Dixit P. G.: "Descriptive Statistics-II", Nirali Prakashan, Pune.
8. Srivastav D. S: A Text book of Demography
9. Snedecor G.W. and Cochran W. G. (1967): Statistical Methods, Iowa State University Press.
10. Waiker and Lev.: Elementary Statistical Methods.

Note:

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2. Students can use scientific calculators in theory examination.

B. Sc. Part – I Semester – II

DSC –8B – STATISTICS – IV

(DISCRETE PROBABILITY DISTRIBUTIONS)

Theory: 30 hrs. Marks -50 (Credits: 02)

Course Outcome: Student will be able to acquire knowledge of;

i. bivariate discrete distributions, independence of bivariate r.vs., Mathematical expectation of bivariate discrete random variable.

ii. one point distribution, two point distribution, Bernoulli distribution,
iii. Uniform distribution, Binomial distribution, Hypergeometric distribution,
iv. Poisson distribution, Geometric distribution and Negative binomial distribution.

CONTENTS:

Unit – 1 **(15 hrs.)**

1.1 Bivariate Discrete Distribution: Definition of bivariate discrete random variable (X, Y) on finite support, Joint p.m.f., and c.d.f., Properties of c.d.f. (without proof), computation of probabilities of events in bivariate probability distribution, marginal and conditional probability distribution. Independence of two discrete r.v.s.,

1.2 Mathematical Expectation: Definition of expectation of function of r.v. in bivariate distribution. Theorems on expectations: (i) $E(X+Y) = E(X) + E(Y)$, (ii) $E(XY) = E(X)\cdot E(Y)$ when X and Y are independent. Expectation and variance of linear combination of two discrete r.v.s., Definition of conditional mean, conditional variance. Covariance and correlation coefficient. Cov (aX+bY, cX+dY). Distinction between uncorrelated and independent variables, Proof of the p.g.f. of sum of two independent r.v. as the product of their p.g.f.

Unit – 2 **(15 hrs.)**

2.1 Some Standard Discrete Probability Distributions: (finite support):

One point distribution: p.m.f., mean and variance,

Two point distribution: p.m.f., mean and variance,

Bernoulli distribution: p.m.f., p.g.f., mean, variance.

Discrete Uniform Distribution: p.m.f., mean and variance.

Binomial Distribution: Binomial random variable, p.m.f. with parameters (n, p), recurrence relation for obtaining successive probabilities, mean, and variance, skewness, p.g.f., Additive property of binomial variates, distribution of sum of independent and identically distributed Bernoulli variables.

Hyper geometric Distribution: p.m.f. with parameters (N, M, n), Computation of probability of different events, recurrence relation for successive probabilities, mean and variance of distribution assuming $n \leq N - M \leq M$, Approximation of hypergeometric to binomial distribution (Statement only).

2.2 Some Standard Discrete Probability Distributions: (Countable infinite support):

Poisson Distribution: Definition of Poisson with parameter λ, mean, variance, probability generating function (p.g.f.). Recurrence relation for obtaining successive probabilities. Additive property of Poisson distribution. Poisson distribution as a limiting case of Binomial distribution (Statement Only).

Geometric Distribution: Definition of Geometric distribution with parameter p, mean and variance, cumulative distribution function. p.g.f. Lack of memory property.

Negative Binomial Distribution: Definition of Negative binomial distribution with parameters (k, p). Geometric distribution is a particular case of Negative binomial distribution, mean, variance, p.g.f., Recurrence relation for obtaining successive probabilities.

Books Recommended:

1. Bhat B. R., Srivenkatramana T and Madhava Rao K. S. (1997): Statistics: a Beginner's Text,Vol. II, New Age International (P) Ltd.
2. Edward P. J., Ford J. S. and Lin (1974): Probability for Statistical Decision-Making, Prentice Hall.
3. Goon A. M., Gupta M. K., Das Gupta B. (1999): Fundamentals of Statistics, Vol. I and II, World Press, Calcutta.
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5. Gupta V.K. & Kapoor S.C. Fundamentals of Mathematical Statistics, Sultan & Chand
6. Hogg R. V. and Crag R. G.: Introduction to Mathematical Statistics Ed.4.
7. Hoel P. G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.
8. Kapur J. N. and Gupta H. C. : Fundamentals of Mathematical Statistics, S. Chand and sons, New Delhi.
9. Kore B. G. and Dixit P. G.: Discrete Probability Distributions, Nirali Prakashan, Pune.
10. Meyer P. L. (1970): Introductory Probability and Statistical Applications, Addision Wesley.
11. Mood A. M., Graybill F. A. and Boes D. C. (1974): Introduction to the Theory of Statistics, McGraw Hill.
12. Mukhopadhyay P. (2006): Probability. Books and Allied (P) Ltd
13. Rohatgi V. K. and Saleh A. K. Md. E. (2002): An Introduction to probability and statistics. John wiley & Sons (Asia)

Note: 1. In theory examination, the weight age to the numerical problems should not exceed 30%.

2. Students can use scientific calculators in theory examination.

Practical Paper-I (Credit 2+2)

Pre requisites: Knowledge of the topics in the theory papers.

Course Outcomes: Students will able to;

i. acquire knowledge of computations using MS-Excel.
ii. represent statistical data diagrammatically and graphically.
iii. compute various measures of central tendency, dispersion, moments, skewness and kurtosis.
iv. compute correlation coefficient, regression coefficients.
v. understand consistency, association and independence of attributes.
vi. interpret summary Statistics of computer output.
vii. know applications of some standard discrete probability distributions.
viii. compute the various fertility rates, mortality rates and growth rates.

List of Practicals:

1. Data handling using MS-Excel
2. Computations using MS-Excel

3. Diagrammatic and Graphical presentation.
4. Measures of central tendency
5. Measures of the dispersion
6. Moments, skewness and kurtosis.
7. Use of random numbers to draw SRSWOR, SRSWR, Stratified and Systematic sample.
8. Computation of probabilities using Baye's theorem.
9. Correlation coefficient, and regression (ungrouped data)
10. Correlation coefficient and regression (grouped data)
11. Spearman's rank correlation coefficient
12. Attributes (Missing frequencies, consistency, association and independence).
13. Demography (Computations of Fertility rates, Mortality rates and Growth rates)
14. Applications of Uniform, Binomial and Hypergeometric distribution.
15. Applications of Poisson, Geometric and Negative Binomial distribution.
16. Bivariate Discrete distribution I. (Marginal and conditional distribution, computation of probabilities of events).
17. Bivariate Discrete distribution II (Expectation /conditional expectation / variance / conditional variance /covariance / correlation coefficient)
18. Case study equivalent to 3 practicals.

Notes:

a. Students must complete all experiments using MS-EXCEL.
b. Case study - Different data sets from newspapers, internet, magazines may be collected and students will be asked to use statistical techniques/tools which they have learnt.
c. MS-EXCEL should be used at the time of practical examination for calculation.
d. Student must complete the entire practical to the satisfaction of the teacher concerned.
e. Student must produce laboratory journal along with completion certificate signed by Head of the Department, at the time of practical examination.

Laboratory Requirements:

Laboratory should be well equipped with at least 20 computers along with necessary Software's, at least two printers, sufficient back up facility (UPS/ Inverter/ Generator).

Nature of Practical Question Paper:

a) In the practical question paper there shall be four questions each of 16 marks, a student has to attempt any two questions.
b) Computations should be completed using MS-EXCEL and should be demonstrated to examiner. Experiment aim, formulae, results etc. should be written on practical answer paper.
c) 8 marks are reserved for case study, 5 marks are reserved for the journal and 5 marks for the oral examination.
d) Practical examination is of four hours duration which includes viva (oral) examination and on line demonstration.