Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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–: પરિપત્ર :–

વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન આંકડાશાસ્ત્ર (Statistics) કોર્સ ચલાવતી તમામ કોલેજોનાં આચાર્યશ્રીઓ તથા ડિપાર્ટમેન્ટનાં વડાશ્રીને જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર M.Sc. Statistics (Sem-1) નો & M.Sc. Applied Statistics (Sem-1) નો અભ્યાસક્રમ આંકડાશાસ્ત્ર વિષયની તા.૦૧/૦૫/૨૦૨૩ ની સભાનાં ઠરાવ ક્રમાંકઃ ૨ અન્વયે નીચે મુજબ કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાની તા.૦૨/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૪ અન્વયે સ્વીકારી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલ તા.૦૫/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃપ૯ થી સ્વીકારી મંજૂર કરેલ છે. જેની આથી જાણ કરવામાં આવે છે.

આંકડાશાસ્ત્ર વિષયની તા.૦૧/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૨

:: આથી ઠરાવવામાં આવે છે કે, શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર M.Sc.Statistics (Sem-1) નો & M.Sc. Applied Statistics (Sem-1) નો અભ્યાસક્રમ મંજૂર કરી વિજ્ઞાન વિદ્યાશાખાને ભલામણ કરવામાં આવે છે.

વિજ્ઞાન વિદ્યાશાખાની તા.૦૨/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ ૪

:: આથી ઠરાવવામાં આવે છે કે, આંકડાશાસ્ત્ર વિષયની તા.૦૧/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૨ અન્વયે કરેલ ભલામણ સ્વીકારી શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર M.Sc. Statistics (Sem-1) નો & M.Sc. Applied Statistics (Sem-1) નો અભ્યાસક્રમ મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૦૫/૦૫/૨૦૨૩ની ઠરાવ ક્રમાંકઃ પ૯

:: આથી ઠરાવવામાં આવે છે કે, વિજ્ઞાન વિદ્યાશાખાની તા.૦૨/૦૫/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંકઃ૪ અન્વયે કરેલ ભલામણ સ્વીકારી શૈક્ષણિક વર્ષ ૨૦૨૩–૨૪ થી અમલમાં આવનાર M.Sc. Statistics (Sem-1) નો & M.Sc. Applied Statistics (Sem-1) નો અભ્યાસક્રમ મંજૂર કરવામાં આવે છે.

(બિડાણઃઉપર મુજબ)

ક્રમાંક : એસ./આંકડાશાસ્ત્ર/પરિપત્ર/૧૦૯૯૮/૨૦૨૩
તા.૧૦–૦૫–૨૦૨૩

કુલસચિવ

પ્રતિ,
૧) વિજ્ઞાન વિદ્યાશાખા હેઠળની સંલગ્ન આંકડાશાસ્ત્ર કોર્સ ચલાવતી તમામ કોલેજોનાં આચાર્યશ્રીઓ. તથા ડિપાર્ટમેન્ટનાં વડાશ્રી. .....આપશ્રીની કોલેજના સંબંધિત શિક્ષકોને જાણ કરી અમલ કરવા સારૂ.
૨) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા.
૩) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ તેમજ અમલ સારૂ.

VEERNARMAD SOUTH GUJRAT UNIVERSITY, SURAT

PROPOSED SYLLABI

OF

M. Sc. (STATISTICS)

AS PER NEP-2020

TO BE IMPLEMENTED FROM THE ACADEMIC YEAR 2023-2024.

UNDER THE FACULTY OF SCIENCE

DEPARTMENT OF STATISTICS

Name of Program	Master in Science -Statistics/ Master in Arts-Statistics
Abbreviation	M. Sc. Statistics/ M.A. Statistics
Duration	2 years
Eligibility Criteria	**For M. Sc. Statistics : IN REGULAR MODE ONLY** A candidate must have passed the B.Sc. Degree examination with English as compulsory subject and statistics at least as a subsidiary subject with mathematics. A candidate shall have cleared B.Sc. Degree examination, provided, a candidate who has obtained his/her B.Sc. Degree with either (i) Statistics as principal/core subject or (ii) Mathematics as principal/core subject and Statistics as subsidiary/elective subject or (iii) both Mathematics and Statistics as subsidiary/optional/elective subjects, shall be considered eligible for admission to M.Sc. Degree course in Statistics.
Proposed AS A PART OF NEP-2020 ADD ON CERTIFICATE COURSE	➢ **Those regular batch students, who want to study extra elective papers and will clear the university exam of that particular paper with practical, will be considered as the certificate course in the respective subject.** ➢ **Separate fees will be applicable as per university decision.** ➢ **A separate certificate should be issued for that.** ➢ **No separate lectures as well as practicals will be conducted for this. Students have to study with the regular batch.**
Objective of Program	The core objective of the programme is to prepare the students to be capable of doing every kind of data analysis and to be helpful to the society and academia by providing an outstanding environment of teaching and research in the core and emerging areas of the discipline.
Program Outcome	**PO1 : Fundamental Knowledge Enrichment** Program trains students with the core statistics knowledge. It also makes students capable of using core concepts in the conceptualization of domain specific application development. **PO2 : Critical Thinking Development** The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. **PO3 : Advanced Emerging Technology Awareness** The program trains students with the latest technologies that are being used in the industry/ research. The continuous syllabi review adds value to the programme for the outgoing students and make them ready to face challenging demands of the industry. **PO4 : Advanced Tools Usage** The program teaches the students to apply the advanced tools to

PROF. A. J. RAJYAGURU
Department of Statistics
Veer Narmad South Gujarat University
SURAT - 395 007

11:30 am to 12:00 pm

solve real world problems.

PO5 : Nurturing Project Planning and Management Capabilities

The program trains students for designing and conceptualizing the statistical techniques and software architecture, planning and managing the process of complex real life problems in statistical frame work. It also makes students understand the decision making for an appropriate technique selection capability.

PO6 : Real World Problem / Project Development

Real world project provides the candidates exposure to work in the challenging and demanding environment of the industry/research. The project development training makes students employable and industry ready.

PO7 : Team Work and Leadership Development

Trains students to work in a team and also to take leadership of the of the project management team.

Program Specific Outcomes

PSO1 : Develop and strengthen the fundamental core concepts that are required to solve complex problems

PSO2 : Develop the professional and entrepreneurship skills that needs independent logical and analytical thinking, teamwork and leadership

PSO3 : Nurture the students to investigate for the design and development of a workable solution for a real world problem

PSO4 : Develop students for self-learning and practicing challenging problem solution

PSO5 : Train students to apply statistical skills to analyze and interpret output for applications/solution of statistical analysis of real life problems.

PSO6 : Train students to use recent techniques and software/programmes for application domain specific knowledge

PSO7 : Train students to take-up the real-world challenges to develop workable solution to a domain specific problem

PSO8 : Inculcate the passion for continuous learning and doing research for making a successful professional career

Mapping between POs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
PO1	///		///	///	///			///
PO2	///	///	///	///	///		///	///
PO3		///	///	///	///	///	///	///
PO4		///	///	///	///	///	///	///
PO5	///	///	///	///	///	///	///	///
PO6	///	///	///	///	///	///	///	///
PO7		///		///				///

Medium of Instruction

English

Rajyaguru A. J.

PROF & HEAD
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Veer Narmad South Gujarat University
SURAT

M. Sc. (STATISTICS)

PROPOSED SYLLABUS AS PER NEP-2020

TO BE IMPLIMENTED FROM THE ACADEMIC YEAR 2023-2024

SEMESTER-I

COURSES	NO.	TILTE	CHNGE IN THE SYLLABUS	HRS/ WEEK	EXAM SCHEDULE				
					DURATION (HRS)	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDIT
CORE-I	101	PROBABILITY THEORY	NO	4	3	30	70	100	4
CORE-II	102	UNIVARIATE DISTRIBUTIONS	NO	4	3	30	70	100	4
CORE-III	103	LINEAR ALGEBRA	NO	4	3	30	70	100	4
SELECT ANY ONE ELECTIVE PAPER:									
ELECTIVE-I	1041	REAL ANALYSIS	NO	4	3	30	70	100	4
ELECTIVE-II	1042	SAMPLING THEORY-I	YES/ MODIFIED	4					
ELECTIVE-III	1043	OFFICIAL STATISTICS	NO	4					
PRACTICAL BASED ON 101 TO 104 USING EXCEL AND JAMOVI	105	PRACTICAL PAPER-I		12	10-15	50	100	150	6
SKILL BASED ELECTIVE COURSE	106	STATISTICAL COMPUTING WITH EXCEL AND JAMOVI	YES	2	2	20	30	50	2
		TOTAL		38		190	410	600	24

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SURAT-395 007

Core I
Course 101: Probability Theory

Unit I

- **Probability measure, random variable and inequalities:**
- Probability spaces, Random variables and random vectors. Expectations. Moments.
- Holder's inequality, Minkowski's inequality, Cauchy–Schwartz inequality, Markov's inequality, Jenson's inequality, Chebychev's inequality

Unit II

- **Distribution of a random variable and Characteristic functions:**
- Distribution function, joint distribution function. Decomposition of a d.f. in its discrete, absolutely continuous and singular parts.
- Weak convergence of sequences of distribution functions. The weak compactness theorem.
- Characteristic functions and their properties.
- Inversion theorem, Uniqueness theorem, Continuity theorem (statement only) and their properties.

Unit III

- **Stochastic Independence and Conditional Expectations:**
- Independence of events, classes and random variables.
- The multiplication theorem, Borel - Cantelli lemma, Borel zero-one law
- Sequence of independent random variables, Tail σ -field and Kolmogorov zero-one law.
- Conditional Expectations and its properties

Unit IV

- **Convergence of sequences of random variables:**
- Convergence almost everywhere of sequences of random variables in probability
- Convergence of sequences of random variables in rth mean and
- Convergence of sequences of random variables in probability
- Convergence of sequences of random variables in distribution
- Inter – relationships amongst these modes of convergence.

Unit V

- **Laws of Large Numbers and Central limit theorems:**
- Weak law of Large numbers,
- Kolmogorov's inequality, Kolmogorov's strong law of large numbers.
- Central limit theorems- Liapunov's theorem. Statement of Lindbergh- Feller theorem.

REFERENCES:

1. LoeveM. : "Probability Theory". ISBN: 978-1-4684-9466-2
2. Athreya, K. B., Lahiri, S. N. (2006). Measure Theory and Probability Theory. Ukraine: Springer. ISBN: 9780387329031
3. BASU, A. K. (2012). MEASURE THEORY AND PROBABILITY. India: PHI Learning. ISBN: 9788120343856
4. Burrill, C. W. (1972). Measure, integration, and probability. Germany: McGraw-Hill." ISBN: 9780070092235
5. Ash, R. B. (2014). Real Analysis and Probability: Probability and Mathematical Statistics. ISBN: 9781483191423
6. Chung, K. L. (2001). A course in probability theory. San Diego: Elsevier Science." ISBN: 9780121741518
7. Linde, W. (2016). Probability Theory: A First Course in Probability Theory and Statistics. Germany: De Gruyter. ISBN:9783110466195
8. Rohatgi, V. K., Saleh, A. K. M. E. (2015). An Introduction to Probability and Statistics. United States: Wiley. ISBN: 9781118799680

Core II
Course 102: Univariate Distributions

Unit I
• Laplace, Lognormal, Cauchy (Quick revision of these distributions), Weibull and Logistic distributions. Idea of truncated distributions, Truncated Binomial, Poisson and Normal distributions.
Unit II
• Univariate compound distribution: Contagious distributions: Neyman type-A, Poisson-Binomial and Poisson –Negative Binomial distribution, Univariate Power series distributions.
Unit III
• Central & Non-central distributions: Non-central t, F and χ^2
Unit IV
• Ordered statistics, their distributions and properties, distribution of Range.

REFERENCES:

1. Johnson N.L. and Kotz S.(1970): "Distributions in Statistics"; John Wiley. ISBN-13-978-0471715812
2. Rohatgi V. K. (1984): Statistical Inference, John Wiley and Sons. ISBN-13-978-0471360914
3. Rohatgi V.K. (1976): "An Introduction to Probability Theory and Mathematical Statistics"; John Wiley. ISBN- ISBN-13-978-0471272144
4. Patel J.K. et al. (1996): "Handbook of Statistics Distributions"; Marcel Dekker. ISBN-13-978-0824790469
5. Mood A.M., Graybill F. and Boes D.C. (1974): "Introduction to the Theory of Statistics"; McGraw Hill ISBN-13-978-0070380452
6. C. R. Rao (1965): Linear Statistical Inference and Its Applications, Wiley ISBN-13-978-0471754989
7. David, H. A., and Nagaraja, H. N. (2003)Arnold, B. C., Balakrishnan, N., and Nagaraja, H. N. (1992): A First Course in Order Statistics, John Wiley & Sons ISBN-13-978-0470284439
8. Johnson, N. L., S. And Balakrishnan, N. (2000): Discrete Univariate Distributions, John Wiley ISBN-13-978-0471584953
9. Johnson, N. L., S. And Balakrishnan, N. (2000): Continuous Univariate Distributions, John Wiley ISBN-13-978-0471584946

Core III
Course 103: Linear Algebra

Unit I
• Fields, Vector Spaces, subspaces, linear dependence and independence, basis and dimension of a vector space, finite dimensional vector space, completion theorem. Vector spaces with an inner product, Gram-Schmidt orthogonalization process, orthogonal basis.
Unit II
• Symmetric, skew-symmetric, Hermitian, skew-hermitian, orthogonal, unitary and normal matrices. Laplace expansion method, Matrix polynomial, Rank of a matrix, Properties of rank of a matrix, Idempotent matrices, generalized inverses, Moore-Penrose generalized inverse.
Unit III
• Real quadratic forms, reduction and classification of quadratic forms, index and signature, properties of quadratic forms.
Unit IV
• Characteristic roots and vectors, properties of characteristic roots and vectors of a real symmetric, hermitian, skew-hermitian, orthogonal, unitary and normal matrices, Algebric and geometric multiplicity of a characteristic root.

REFERENCE:

1. Johnson N.L. and Kotz S.(1970): "Distributions in Statistics"; John Wiley. ISBN-13-978-0471715812
2. Rohatgi V. K. (1984): Statistical Inference, John Wiley and Sons. ISBN-13-978-0471360914
3. Rohatgi V.K. (1976): "An Introduction to Probability Theory and Mathematical Statistics"; John Wiley. ISBN- ISBN-13-978-0471272144
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6. C. R. Rao (1965): Linear Statistical Inference and Its Applications, Wiley ISBN-13-978-0471754989
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9. Johnson, N. L., S. And Balakrishnan, N. (2000): Continuous Univariate Distributions, John Wiley ISBN-13-978-0471584946

Elective I
Course 1041: Real Analysis

Unit I

- **Set, Indicator factions and classes of sets**:
- Recap of elements of set theory and Real number system.
- Limits of sequences of sets,
- Classes of sets like Semi-rings, rings, fields, σ -rings, σ -fields, Monotone classes.
- Generated classes, Borel σ -field of R and Rk and related results.

Unit II

- **Measurable Space:**
- Measurable space, simple function, Measurable function, Borel measurable function and related results.
- Almost everywhere convergence of sequence of measurable functions and related results.

Unit III

- **Set function and Measures:**
- Finitely additive and σ -additive set functions,
- Measures & its properties
- Monotone convergence theorem,
- Absolute continuity and singularity of measures.
- Statements of 'Lebesgue Decomposition theorem' and the Radon – Nikodym theorem.

Unit IV

- Integration of Simple functions and measurable function
- Integration of Simple functions with respect to a given measure & its properties
- Integration of measurable function with respect to a given measure.
- Elementary properties of integral of measurable function and related results.

Unit V

- **Caratheodory extension theorem & its Applications:**
- Caratheodory extension theorem (statement only)
- Construction of Lebesgue measures
- Lebesgue- Stieltjes measures through distribution functions.

REFERENCES:

1. Ash, R. B. (1972). Real analysis and probability. United Kingdom: Academic Press. ISBN: 9780120652013, 0120652013
2. Halmos, P. R. (2014). Measure Theory. United States: Springer New York, ISBN: 9781468494426, 1468494422
3. Athreya, K. B., Lahiri, S. N. (2006). Measure Theory and Probability Theory. Ukraine: Springer. ISBN-9780387329031, 038732903X
4. Taylor, S. J., Kingman, J. F. C. (2008). Introduction to Measure and Probability. United Kingdom: Cambridge University Press. ISBN: 9780521090322, 0521090326
5. Burrill , C.W. (1972) : ***Measure , Integration and Probability*** , McGraw - Hill , New York
6. Jay Cummings (2019): Real Analysis: A Long-form Mathematics Textbook, Pub.- LongFormMath.com, ISBN-1077254547, 9781077254541
7. Sherbert, D. R., Bartle, R. G. (2011). Introduction to Real Analysis. United Kingdom: Wiley, ISBN 10: 0471433314 / ISBN 13: 9780471433316
8. Folland, G. B. (2013). Real Analysis: Modern Techniques and Their Applications. Germany: Wiley. ISBN: 9781118626399, 1118626397
9. Stein, E. M., Shakarchi, R. (2005). Real Analysis: Measure Theory, Integration, and Hilbert Spaces. United Kingdom: Princeton University Press

Elective II
Course 1042: Sampling Theory I

Unit I

- **The place of sampling in census work:** the sampling process, sampling errors, Development of use of the use of sampling in censuses and surveys, methods of presentation.
- **Requirements of a good sample:** Bias, Methods of selection which give rise to bias, Avoidance of bias in selection, Examples of biased selection, Bias arising due to faulty demarcation of the sampling units, bias in estimation, Circumstances in which bias is permissible, Methods of reducing the random sampling error.
- **Practical Problems arising in the planning, execution and analysis of a survey:** Types of problems, Design of forms, Selection, training and supervision of field investigators, control of accuracy, Methods of handling the data, Questions requiring consideration, determination of the details of the information to be collected, Practicality of obtaining the required information, Methods of collecting the information and dealing with non-response, Frames for censuses, surveys, Agriculture census, undeveloped areas, economic institutions, frames from list of individuals, households, town plans, maps of rural areas, villages etc, Master samples, localized population surveys, market research and opinion surveys, crop estimation, pilot and exploratory surveys, Critical analysis of survey data.

Unit II

- Advantages of Sampling Method, Some uses of Sample surveys, The principle steps in a Sample survey, The role of Sampling Theory, Probability Sampling, Alternatives of Probability sampling, Use of Normal Distribution, Bias And its effects, The Mean square error.
- **Non-probabilistic sampling**: Meaning, need, types: convenience, quota, snowball, purposive etc. Advantages and disadvantages.

Unit III

- **Simple random sampling:**
  Simple random sampling with and without replacement, selection of a simple random sample, definitions and notations, properties of the estimates, estimation of population mean, population totals and their standard errors, finite population correction, coefficient of variation of estimator. Confidence Intervals.
- **Sampling proportions and percentages:**
  Qualitative characteristics, Variances of sample estimators, Binomial distribution, Hypergeometric distribution, Confidence limits, classification into more than two classes, proportions and totals over subpopulations.
- **The Estimation of Sample size:**
  Analysis of the problem, The specification of the precision, The formula for n in sampling for proportions and with continuous data, Inverse sampling, sample size with more than one problem, sample size in decision problems, the design effect.

Unit IV

- **Stratified random sampling:** Stratified random sampling, proportional, optimum and Neyman allocation, comparison with simple random sampling for fixed sample size. Stratified sampling for proportions, Covariance and Variance Function. Gain in precision due of stratification. Estimation of sample size with proportions, Effects of deviations from the optimum allocation, effects of errors in the stratum sizes, the problem of allocation with more than one item and its various methods, two-way stratification with small samples, controlled selection, construction of strata, number of strata, post-stratification, estimation of variance with one unit per stratum, estimating totals and means over subpopulations. Sampling from two frames.

REFERENCES:

1. Cochran, W. G. (1977). Sampling Techniques. India: Wiley. ISBN: 9788126515240, 8126515244
2. Madow, W. G., Hansen, M. H., Hurwitz, W. N. (1953). Sample survey methods and theory. United Kingdom: Wiley. ISBN: 9780471006282, 0471006289.
3. Kish, L. (1965). Survey Sampling. United Kingdom: Wiley. ISBN: 9780471489009, 047148900X
4. Murthy M. N. : "Sampling Theory and Methods"; Statistical Publishing Society, Calcutta.
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10. Cochran, W. G., Snecdecor, G. W. (1989). Statistical Methods. India: Wiley. ISBN: 9780813815619, 0813815614
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12. Chaudhuri, A. (2018). Survey Sampling. United States: CRC Press. ISBN: 9781498774758, 149877475X
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15. Fowler, F. J. (2014). Survey Research Methods. United Kingdom: SAGE Publications. ISBN: 9781452259000, 1452259003
16. International Encyclopedia of Statistical Science. (2010). Germany: Springer. ISBN: 978-3-642-04897-5
17. Daniel, J. (2011). Sampling Essentials: Practical Guidelines for Making Sampling Choices. Italy: SAGE Publications. ISBN: 9781412952217, 1412952212.

Elective III
Course 1043: Official Statistics

Unit I
• Official statistics: Meaning, Need, Uses, Users, Reliability, Relevance, Limitations, Transparency, its visibility, Compilation, Collection, Processing, Analysis and Dissemination, Agencies Involved, Methods. • Introduction to National and International official statistical system. Role, function and activities of Central and State statistical organisations. Nodal Ministry of India: MOSPI. • National Statistical Organization: Vision and Mission, NSSO and CSO; roles and responsibilities; Important activities, Publications etc. • National Statistical Commission: Need, Constitution, its role, functions etc; Legal Acts/ Provisions/ Support for Official Statistics; Important Acts
Unit II
• Index Numbers: Different Types, Need, Data Collection Mechanism, Periodicity, Agencies Involved, Uses. • Sector Wise Statistics: Agriculture, Health, Education, and prices, Labour, Industry, Women and Child etc. Important Surveys related them, Indicators, principal publications, Agencies and Usages etc.
Unit III
• National Income – Measures of national income - Income, expenditure and production approaches - Applications in various sectors in India. Measurement of income inequality: Lorenz curves, Application of Pareto and Lognormal as income distribution. • National Accounts of India: Definition, Basic Concepts; issues; the Strategy, Collection of Data and Release.
Unit IV
• Population Census: Need, Data Collected, Periodicity, Methods of data collection, dissemination, Agencies involved. • Socio Economic Indicators, Gender Awareness/Statistics, Other Important Surveys and census. Organization of large scale sample surveys. General and special data dissemination systems.

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1. https://unstats.un.org : Historical Perspective of Official Statistics in India
2. https://www.mospi.gov.in : Official statistical System in India, Reports, publications and surveys, NSO and its divisions, NSC.
3. https://censusindia.gov.in : Population census in India
4. Goon A. M., Gupta M. K., and Dasgupta. B. (2001), Fundamentals of Statistics, Vol. 2, World Press, India.
5. Mukhopadhyay P. (2011). Applied Statistics, Second Edition, Books & Allied Ltd, India
6. United Nations. "Economic and development statistics" http://www.un.org/esa/progareas/stats
7. Fundamental Principles of Official Statistics http://www.unece.org

Skill based Elective Course

Course 106: Statistical Computing with Excel and JAMOVI

Unit I

1.1 WINDOWS

- 1.1.1. Typing, Editing, Proofing & Reviewing
- 1.1.2. Formatting Text & Paragraphs, Automatic Formatting and Styles
- 1.1.3. Working with Tables, Graphics and Frames
- 1.1.4. Mail Merge

1.2 POWERPOINTPRESENTATION

- 1.2.1 Preparation of Slides, Inserting Elements into Slides
- 1.2.2 Inserting Animation
- 1.2.3 Preparing Slideshows

Unit II

2.1 EXCEL

- 2.1.1. Working & Editing in Worksheets
- 2.1.2. Creating Formats & Links
- 2.1.3. Formatting a Worksheet & Creating Graphic Objects
- 2.1.4. Creating Charts(Graphs), formatting and analyzing data
- 2.1.5. Organizing Data in a List(Data Management)
- 2.1.6. Sharing & Importing Data
- 2.1.7. Printing

Unit III

3. JAMOVI
   - 3.1 Introduction to Jamovi
   - 3.2 Data management in Jamovi
   - 3.3 Functions in Jamovi
   - 3.4 One-way ANOVA
   - 3.5 Two-way ANOVA
   - 3.6 Correlation and linear regression

Unit IV

4.1.Introduction to Internet

- 4.1.1. Internet Protocols: HTTP, FTP,TCP/IP, etc.
- 4.1.2. Internet Utilities: e-mail, chat, searching, etc.

4.2.Web Browsers and Web Server

4.3.HTML

- 4.3.1. Introduction to
- 4.3.2. HTML Tags

References:

1. Dienes:Work6forwindowsquick&easyreference-Mansfield-BPBISBN:8170292972,ISBN-13:9788170292975
2. LaymanHart(1995):WordPerfect6.0ForWindows/bookAndQuickReference,ISBN:0130346535, ISBN-13: 9780130346537
3. Ron Mansfield(1994):Mastering Word 6 for windows- Mansfield – BPB, ISBN: 8170292980,ISBN-13:9788170292982
4. Townsend:MasteringExcel-4ForWindows,-Townsend–BPB,SBN:8170292301,ISBN-13: 9788170292302
5. Learning statistics with Jamovi (2018)-Danielle Navarro and David R. Foxcroft
6. The jamovi quickstart guide-Jonas Rafi

VEERNARMAD SOUTH GUJRAT UNIVERSITY, SURAT

PROPOSED SYLLABI

OF

M. Sc. (APPLIED STATISTICS)

AS PER NEP-2020

TO BE IMPLEMENTED FROM THE ACADEMIC YEAR 2023-2024.

UNDER THE FACULTY OF SCIENCE

DEPARTMENT OF STATISTICS

Name of Program	**Master of Science (Applied Statistics)**
Abbreviation	**M.Sc. (Applied Statistics)**
Duration	**2 Years**
Eligibility Criteria	A candidate must have passed the Bachelor's Degree examination with English as compulsory subject and statistics at least as a subsidiary subject.
Proposed AS A PART OF NEP-2020 ADD ON CERTIFICATE COURSE	➢ **Those regular batch students, who want to study extra elective papers and will clear the university exam of that particular paper with practical, will be considered as the certificate course in the respective subject.** ➢ **Separate fees will be applicable as per university decision.** ➢ **A separate certificate should be issued for that.** ➢ **No separate lectures as well as practicals will be conducted for this. Students have to study with the regular batch.**
Objective of Program	The core objective of the programme is to prepare the students to be capable of doing any kind and every kind of data analysis and to be helpful to the society and academia by providing an outstanding environment of teaching and research in the core and emerging areas of the discipline.
Program Outcome	**PO1 : Fundamental Knowledge Enrichment** The Program trains students with the core statistics knowledge. It also makes students capable of using core concepts in the conceptualization of domain specific application development. **PO2 : Critical Thinking Development** The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. **PO3 : Advanced Emerging Technology Awareness** The program trains students with the latest technologies that are being used in the industry/ research. The continuous syllabi review adds value to the programme for the outgoing students and make them ready to face challenging demands of the industry. **PO4 : Advanced Tools Usage** The program teaches the students to apply the advanced tools to solve real world problems. **PO5 : Nurturing Project Planning and Management Capabilities** The program trains students for designing and conceptualizing the statistical techniques and software architecture, planning and managing the process of complex real life problems in statistical frame work. It

	also makes students understand the decision making for an appropriate technique selection capability. **PO6 : Real World Problem / Project Development** Real world project provides the candidates exposure to work in the challenging and demanding environment of the industry/research. The project development training makes students employable and industry ready. **PO7 : Team Work and Leadership Development** Trains students to work in a team and also to take leadership of the of the project management team.
Program Specific Outcomes	PSO1 : Develop and strengthen the fundamental core concepts that are required to solve complex problems PSO2 : Develop the professional and entrepreneurship skills that needs independent logical and analytical thinking, teamwork and leadership PSO3 : Nurture the students to investigate for the design and development of a workable solution for a real world problem PSO4 : Develop students for self-learning and practicing challenging problem solution PSO5: Train students to apply statistical skills to analyze and interpret output for applications/solution of statistical analysis of real life problems. PSO6 : Train students to use recent techniques and software/programmes for application domain specific knowledge PSO7 : Inculcate the passion for continuous learning and doing research for making a successful professional career
Mapping between POs and PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
PO1							
PO2							
PO3							
PO4							
PO5							
PO6							
PO7							

Rajagopal A.J.

M. Sc. (APPLIED STATISTICS)

PROPOSED SYLLABUS AS PER NEP-2020

TO BE IMPLIMENTED FROM THE ACADEMIC YEAR 2023-2024

SEMESTER-I

COURSES	NO.	TILTE	CHNGE IN THE SYLLABUS	HRS/ WEEK	EXAM SCHEDULE				
					DURATION (HRS)	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDIT
CORE-I	101	BASIC MATHEMATICS AND ELEMENTS OF PROBABILITY THEORY	NO	4	3	30	70	100	4
CORE-II	102	PROBABILITY DISTRIBUTIONS	NO	4	3	30	70	100	4
CORE-III	103	OPERATIONS RESEARCH-I	NO	4	3	30	70	100	4
SELECT ANY ONE ELECTIVE PAPER:									
ELECTIVE-I	1041	POPULATION STUDIES	NO	4	3	30	70	100	4
ELECTIVE-II	1042	SAMPLING THEORY-I	YES/ MODIFIED	4					
ELECTIVE-III	1043	OFFICIAL STATISTICS	NO	4					
PRACTICAL BASED ON 101 TO 104 USING EXCEL AND JAMOVI	105	PRACTICAL PAPER-I		12	10-15	50	100	150	6
SKILL BASED ELECTIVE COURSE	106	STATISTICAL COMPUTING WITH EXCEL AND JAMOVI	YES	2	2	20	30	50	2
		TOTAL		38		190	410	600	24

Core I

Course 101: Basic Mathematics and Element of Probability Theory

Unit I

- Concepts of Function, Algebra of functions, Algebra of functions Polynomial and Exponential functions &Logarithmic functions.
- Concept of Derivative of a function. Derivatives of xn, eX, logx. Algebra of differentiation. Interpretation of derivative as rate of change & Applications.
- Integration as an inverse operation of differentiation. Definite Integral. Integral as the area under a curve. Properties of Integral. Integrals of some standard functions & its Applications.

Unit II

- Sums of some standard series of positive terms.
- **Numerical Methods:** Solution of algebraic and transcendental equations, Numerical integration, Concept of interpolation, Simpson 1/3 rule & 3/8 rule & its Applications.

Unit III

- Determinants, Matrices, Algebra of matrices: Determinants & its properties. Scalar multiplication, addition and multiplication of matrices. Inverse of a square matrix. Concept of rank of a matrix. Rank determination. Linear equations, Systems of linear equations as matrixequations. Characteristic roots and vectors.

Unit IV

- Permutations and Combinations.

  Probability: Sample space of a chance experiment, Elementary outcomes, Events, Representation of events as sets, Combination of events (Complements, Intersections, Unions). Probability functions over a sample space (Discrete case). Case of Equally likely, elementary outcomes: Laplace definition of probability of an event, Axioms of probability. Combinatorial problems of Probability calculation. Conditional Probability. Bayes Theorem. Independent events.

REFERENCES:

1. John Scheick(1997):Linear Algebra With Applications, Mcgraw-hill, ISBN: 10:0071155309, ISBN-13: 9780071155304,
2. Strang(2008):Linear Algebra And Its Applications, Cengage Learning (Thompson), ISBN: 10:8131501728,ISBN-13: 9788131501726
3. Dutta K. B.(2003) : "Matrix and Linear Algebra"; Prentice Hall India, ISBN: 10:8120306368, ISBN-13: 9788120306363
4. Thomas S. Shores(2007): Applied Linear Algebra And Matrix Analysis, Springer Verlag Publication, ISBN:10: 0387331956, ISBN-13:9780387331959,
5. S. Lang, Serge A. Lang (1997): Introduction To Linear Algebra, Springer Publication, ISBN-10: 0387962050, ISBN-13: 9780387962054
6. K.M. Abadir& J.R. Magnus (2005): Matrix Algebra. Cambridge University Press: ISBN-10: 0521822890; ISBN-13: 978-0521822893. [MR2408356]
7. Fuzhen Zhang (1999):Matrix theory: basic results and techniques:, Springer Verlag new York, ISBN: 0387986960

Core II
Course 102: Probability Distributions

Unit I
Random Variables & their Distributions : Definition of random variable, Discrete and continuous random variable. Probability distribution of a random variable. Concept of Probability mass function and Probability density function, Distribution Function (d.f.) of a random variable. **Expectations & Moments of a Distribution :** Expectation of a random variable & a function of a random variable (Discrete and Continuous case). Moments, Different types of moment generating functions, Mean, Variance, Standard deviation, Skewness and Kurtosis of a random variable (distribution). Independence of variables. Linear transformation of variable, Moments under linear transformation, Problems on calculation of mean, variance, S.D. and other moments of a distribution.
Unit II
Frequency Distributions : Frequency distribution of a discrete and continuous random variable (Grouping of data in terms of class intervals). Mean, variance and Moments of a frequency distribution. Bivariate frequency distribution, Conditional distributions and their properties.
Unit III
Some Common Discrete Distributions: (proofs for p.m.f., mean & variance only): Bernoulli distribution, Binomial distribution, Poisson distribution (Quick revision of this three distributions), Hyper-geometric distribution, Negative Binomial distribution, Geometric distribution. General concept of m.g.f. & other important properties of distributions (without proof).
Unit IV
Some Common Continuous Distributions: (proofs for p.d.f., mean & variance only): Uniform distribution, Normal distribution (Quick revision), Exponential distribution, Beta and Gamma distribution. General concept of m.g.f. & other important properties of distributions (without proof) **Sampling Distributions:** Chi-square, t, and F – distribution, Distribution of sample mean and S^2 for Normal distribution (proof for pdf only)

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1. Mood A. M., Graybill F. A. and Boes D. C. (2001): "An Introduction to Theory of Statistics"; McGraw Hill and Tata McGraw Hill. ISBN: 100070445206, ISBN-13:9780070445208.
2. Goon A. M., Gupta M. K. and Dasgupta B. : "An Outline of Statistical Theory"; Vol. 1 & 2, World press. ISBN:10- 8187567260, ISBN-13: 9788187567264, 978-8187567264
3. Valery Nevzorov, Vicki B. Galloway, V. B. Nevzorov: A Primer On Statistical Distributions ISBN: 10: 0471427985, ISBN-13: 9780471427988.
4. A.k. Md. Ehsanes Saleh Vijay K. Rohatgi(2008): An Introduction To Probability And Statistics, 2nd Ed ISBN: 10- 8126519266, ISBN-13: 9788126519262.
5. Norman L. Johnson, Adrienne W. Kemp, Samuel Kotz(2008):Univariate Discrete Distributions, Set: III-Ed., John Wiley & Sons, ISBN:10: 0470383372, ISBN-13: 9780470383377.
6. Norman L Johnson, Samuel Kotz (2004); Continuous Univariate Distributions,2e, John Wiley, ISBN:10:9812530762, ISBN-13: 9789812530769.
7. Peter Dalgaard (2008): Introductory Statistics with R Statistics and computing, II-Ed., Springer, ISBN: 0387790535, 9780387790534.
8. Julian James Faraway(2006): Extending the linear model with R: generalized linear, mixed effects and nonparametric regression models, CRC Press, ISBN: 158488424X, ISBN-13:9781584884248

Core III
Course 103: Operations Research I

Unit I
Linear Programming Problem (LPP): Basics of LPP with concept and definition (Quick revision), LPP Theorem (without proof), Mathematical Formulation & solution of LPP by Graphical and Simplex Method, Big-M and Two-phase methods, Complications in LPP & their resolution.
Unit II
Duality: Definition of Dual Problem, Rules for converting any Primal into its Dual, Properties of Duality (without Proof) & Dual-Simplex Method **Replacement and Maintenance Model:** Types of Replacement Problem, Replacement Policy of Items whose Efficiency Deteriorates with time and money value changes with constant rate during a Period, Replacement of Items that fails completely
Unit III
Transportation Problems (TP): Definition of Transportation Problem TP, LP formulation of the TP, Methods for getting basic feasible solution to TP, Methods for getting optimum solution to TP, Unbalanced TP, Degeneracy in TP, new methods for initial solution of TP as MIN-MAX & MAX-MIN algorithm. **Assignment Problems (AP):** Definition of AP, Mathematical formulation of the assignment problem, Algorithm for solving an AP, Balanced & Unbalanced AP, Solution methods of AP, Travelling Salesman Problem
Unit IV
Inventory Management Systems: Definition, Costs involved in Inventory Problems, Classical EOQ Models without and with shortages, Multi-item Deterministic Models, Probabilistic Inventory Models, Inventory Models with Price Breaks (without proof) **Theory of Games:** Two person zero-sum games, pure strategies & mixed strategies, Rules of Dominance, Solution Methods of games without Saddle point

REFERENCE:

1. K. Swarup, Gupta P.K. and Man Mohan(2017): "Operations Research"; S. Chand & Co., New Delhi, ISBN: 978-93-5161-101-1
2. G. Hadley (2002): "Linear Programming"; Narosa Book Distributors Pvt Ltd, ISBN: 8185015910, ISBN-13: 9788185015910
3. Murthy K.G.(1988): Linear complementarily, linear and nonlinear programming, Heldermann Verlag, ISBN: 3885384035, 9783885384038
4. Kasana H.S. and Kumar K.D.(2005) : "Introductory Operations Research: Theory & Applications"; Springer Verlag , ISBN: 8181282827, 9798181282827.
5. Kapoor V.K. (2006) : "Operations Research"; 7th Edition, Jain Book Depot, ISBN : 8170148286.
6. Sharma S.D.(2005):Operations Research"; 15th Ed., Kedar Nath Ram Nath & Co. Publishers, Meerut ISBN-13-978-8121902818
7. Hira, D.S., Gupta, P. K.(2007): OPERATIONS RESEARCH, S. Chand & Co., New Delhi, ISBN: 81-219-0281-9

Elective I
Course 1041: Population Studies

Unit I

- **Introduction:**
  The nature of demography, demographic view of population, techniques of population studies. Basic demographic measures, sex-ratio, child-women ratio, cruderates, specific rates.
- **Life Tables :**
  Concepts of Life Tables, Assumptions related to life tables, The columns of life tables, Complete and Abridged life tables, Construction of life tables.

Unit II

- **Mortality :**
  Infant Mortality, Neonatal mortality, Perinatal mortality, Maternal mortality, death rates, standardized death rates.
- **Fertility and Reproduction :**
  Crude Birth Rate (CBR), General fertility rate (GFR), Age specific fertility rate, Total fertility rate (TFR), Gross reproduction rate (GRR), Net reproduction rate (NRR).

  Marriage rates, divorce rates, age pattern of marriage, types of migration, migration rates, migrant components, migrant streams,internal migration, international migration.

Unit III

- **Growth of Population and Models of Population :**
  Introduction, Simple Birth and Death Process, Stationary population models, Stable population models, intrinsic rate of growth, intrinsic age distribution, Quasi stability.
- **Population Estimates and Projections :**
  Inter - censal and Post - censal estimates, population projections, mathematical methods, component methods, mortality basis for projections, fertility basis for projections, migration basis for projections.

Unit IV

- **Census and Sample Surveys :**
  Definition of Census and its features, Organizing the Census, methods of enumeration, Census in India, Indian Census in 1991 and2001.

  Defining the objectives and scope of sample surveys. Questionnaire design, sample design, organization of field work, collecting and processing the data, reporting.

REFERENCES:

1. Barkley G.W. (1958): "Techniques of Population Analysis"; John Wiley & Sons Inc; First Edition, ISBN-10: 0471048186 ,ISBN-13: 978- 0471048183
2. Pathak K. B. and F. Ram (1998) : "Techniques of Demographic Analysis"; 2nd Edition, Himalaya Publishing House, ISBN : 81-7493- 472-3
3. R. Ramakumar (1986): "Technical Demography"; Wiley Eastern Ltd., ISBN: 0852267436
4. H. Raj (1986): "Fundamentals of Demography"; Surjeet Publication.
   ISBN: 8122903363, **ISBN-13:** 9788122903362
5. Cox. P.R. (1970): "Demography"; Cambridge University Press.
6. Keyfitz N. and Caswell H. (2005): "Applied Mathematical Demography"; 3rd Edition, Springer.
7. Keyfitz N. and Beekman J. A.(1984) : "Demography through Problems"; Springer-Verlag, New York, **ISBN10:** 0387908366,**ISBN13:** 9780387908366

Elective II
Course 1042: Sampling Theory I

Unit I

- **The place of sampling in census work:** the sampling process, sampling errors, Development of use of the use of sampling in censuses and surveys, methods of presentation.
- **Requirements of a good sample:** Bias, Methods of selection which give rise to bias, Avoidance of bias in selection, Examples of biased selection, Bias arising due to faulty demarcation of the sampling units, bias in estimation, Circumstances in which bias is permissible, Methods of reducing the random sampling error.
- **Practical Problems arising in the planning, execution and analysis of a survey:** Types of problems, Design of forms, Selection, training and supervision of field investigators, control of accuracy, Methods of handling the data, Questions requiring consideration, determination of the details of the information to be collected, Practicality of obtaining the required information, Methods of collecting the information and dealing with non-response, Frames for censuses, surveys, Agriculture census, undeveloped areas, economic institutions, frames from list of individuals, households, town plans, maps of rural areas, villages etc, Master samples, localized population surveys, market research and opinion surveys, crop estimation, pilot and exploratory surveys, Critical analysis of survey data.

Unit II

- Advantages of Sampling Method, Some uses of Sample surveys, The principle steps in a Sample survey, The role of Sampling Theory, Probability Sampling, Alternatives of Probability sampling, Use of Normal Distribution, Bias And its effects, The Mean square error.
- **Non-probabilistic sampling**: Meaning, need, types: convenience, quota, snowball, purposive etc. Advantages and disadvantages.

Unit III

- **Simple random sampling:**
  Simple random sampling with and without replacement, selection of a simple random sample, definitions and notations, properties of the estimates, estimation of population mean, population totals and their standard errors, finite population correction, coefficient of variation of estimator. Confidence Intervals.
- **Sampling proportions and percentages:**
  Qualitative characteristics, Variances of sample estimators, Binomial distribution, Hypergeometric distribution, Confidence limits, classification into more than two classes, proportions and totals over subpopulations.
- **The Estimation of Sample size:**
  Analysis of the problem, The specification of the precision, The formula for n in sampling for proportions and with continuous data, Inverse sampling, sample size with more than one problem, sample size in decision problems, the design effect.

Unit IV

- **Stratified random sampling:** Stratified random sampling, proportional, optimum and Neyman allocation, comparison with simple random sampling for fixed sample size. Stratified sampling for proportions, Covariance and Variance Function. Gain in precision due of stratification. Estimation of sample size with proportions, Effects of deviations from the optimum allocation, effects of errors in the stratum sizes, the problem of allocation with more than one item and its various methods, two-way stratification with small samples, controlled selection, construction of strata, number of strata, post-stratification, estimation of variance with one unit per stratum, estimating totals and means over subpopulations. Sampling from two frames.

REFERENCES:

1. Cochran, W. G. (1977). Sampling Techniques. India: Wiley. ISBN: 9788126515240, 8126515244
2. Madow, W. G., Hansen, M. H., Hurwitz, W. N. (1953). Sample survey methods and theory. United Kingdom: Wiley. ISBN: 9780471006282, 0471006289.
3. Kish, L. (1965). Survey Sampling. United Kingdom: Wiley. ISBN: 9780471489009, 047148900X
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8. Yates, F. (1960). Sampling Methods for Censuses and Surveys. United Kingdom: Hafner Publishing Company. ISBN: 9780852640067, 0852640064.
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11. Rao, P. S. (2017). Sampling Methodologies with Applications. United Kingdom: CRC Press. ISBN: 9781138462557, 1138462551
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17. Daniel, J. (2011). Sampling Essentials: Practical Guidelines for Making Sampling Choices. Italy: SAGE Publications. ISBN: 9781412952217, 1412952212.

Elective III
Course 1043: Official Statistics

Unit I
• Official statistics: Meaning, Need, Uses, Users, Reliability, Relevance, Limitations, Transparency, its visibility, Compilation, Collection, Processing, Analysis and Dissemination, Agencies Involved, Methods. • Introduction to National and International official statistical system. Role, function and activities of Central and State statistical organisations. Nodal Ministry of India: MOSPI. • National Statistical Organization: Vision and Mission, NSSO and CSO; roles and responsibilities; Important activities, Publications etc. • National Statistical Commission: Need, Constitution, its role, functions etc; Legal Acts/ Provisions/ Support for Official Statistics; Important Acts
Unit II
• Index Numbers: Different Types, Need, Data Collection Mechanism, Periodicity, Agencies Involved, Uses. • Sector Wise Statistics: Agriculture, Health, Education, and prices, Labour, Industry, Women and Child etc. Important Surveys related them, Indicators, principal publications, Agencies and Usages etc.
Unit III
• National Income – Measures of national income - Income, expenditure and production approaches - Applications in various sectors in India. Measurement of income inequality: Lorenz curves, Application of Pareto and Lognormal as income distribution. • National Accounts of India: Definition, Basic Concepts; issues; the Strategy, Collection of Data and Release.
Unit IV
• Population Census: Need, Data Collected, Periodicity, Methods of data collection, dissemination, Agencies involved. • Socio Economic Indicators, Gender Awareness/Statistics, Other Important Surveys and census. Organization of large scale sample surveys. General and special data dissemination systems.

REFERENCES:

1. https://unstats.un.org : Historical Perspective of Official Statistics in India
2. https://www.mospi.gov.in : Official statistical System in India, Reports, publications and surveys, NSO and its divisions, NSC.
3. https://censusindia.gov.in : Population census in India
4. Goon A. M., Gupta M. K., and Dasgupta. B. (2001), Fundamentals of Statistics, Vol. 2, World Press, India.
5. Mukhopadhyay P. (2011). Applied Statistics, Second Edition, Books & Allied Ltd, India
6. United Nations. "Economic and development statistics" http://www.un.org/esa/progareas/stats
7. Fundamental Principles of Official Statistics http://www.unece.org

Skill based Elective Course
Course 106: Statistical Computing with Excel and JAMOVI

Unit I

1.1 WINDOWS

- 1.1.1. Typing, Editing, Proofing & Reviewing
- 1.1.2. Formatting Text & Paragraphs, Automatic Formatting and Styles
- 1.1.3. Working with Tables, Graphics and Frames
- 1.1.4. Mail Merge

1.2 POWERPOINTPRESENTATION

- 1.2.1 Preparation of Slides, Inserting Elements into Slides
- 1.2.2 Inserting Animation
- 1.2.3 Preparing Slideshows

Unit II

2.1 EXCEL

- 2.1.1. Working & Editing in Worksheets
- 2.1.2. Creating Formats & Links
- 2.1.3. Formatting a Worksheet & Creating Graphic Objects
- 2.1.4. Creating Charts(Graphs), formatting and analyzing data
- 2.1.5. Organizing Data in a List(Data Management)
- 2.1.6. Sharing & Importing Data
- 2.1.7. Printing

Unit III

3. JAMOVI

- 3.1 Introduction to Jamovi
- 3.2 Data management in Jamovi
- 3.3 Functions in Jamovi
- 3.4 One-way ANOVA
- 3.5 Two-way ANOVA
- 3.6 Correlation and linear regression

Unit IV

4.1.Introduction to Internet

- 4.1.1. Internet Protocols: HTTP, FTP,TCP/IP, etc.
- 4.1.2. Internet Utilities: e-mail, chat, searching, etc.

4.2.Web Browsers and Web Server

4.3.HTML

- 4.3.1. Introduction to
- 4.3.2. HTML Tags

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