

Revised Curriculum
Bachelor of Arts Degree Programme
Center for Distance and Continuing Education 2021

Subject: Social Statistics

Year of Study	Semester	Course Code	Course Title	Compulsory/ Optional	Credits
1	1 & 2	SOST 18214	Basic Mathematics	Compulsory	4
		SOST 18224	Basic Statistics	Compulsory	4
2	3 & 4	SOST 28214	Probability Distribution and Sampling Methods	Compulsory	4
		SOST 28224	Statistical Inference and Nonparametric Techniques	Compulsory	4
3	5 & 6	SOST 38214	Correlation and Regression	Compulsory	4
		SOST 38224	Operational Research	Compulsory	4

Course Code:	SOST 18214
Compulsory/ Optional:	Compulsory
Course Name:	Basic Mathematics
Intended Learning Outcomes:	<ul style="list-style-type: none"> ➤ Identify the relevant calculation to given numerical or algebra expression ➤ Identify required values using graphs when linear or non-linear equation solve and simply a given equation ➤ Recognize derivatives of a given function and solve mathematical operations with vectors and matrices.
Course Content	<p>Algebra Operation</p> <ul style="list-style-type: none"> • Define Algebra, variables, numerical expressions and algebraic expressions. • Identify algebraic expression using the correct order of operations. • Define algebraic expression (by adding, subtracting, dividing, multiplication). <p>4.Transform factorize algebraic form into its factors, Factorization and Fractions.</p> <p>Index Numbers and Logarithms</p> <ul style="list-style-type: none"> • Describe the meaning of index numbers. • Recognize the laws of index numbers and their applications. • Describe logarithms and identify the laws of logarithms <p>Function and Graphs</p> <ul style="list-style-type: none"> • Identify the intercept and the slope of a graph. • Recognize the absolute maximum/ minimum of a function using the equation and the graph. • Define linear equations, and to find X, Y, intercept and slope for given simple linear equation <p>Solving Equations</p> <ul style="list-style-type: none"> • Identify and solve formulas and Simple Linear Equations for a specific variable. • Identify and solve quadratic equations using quadratic formulas and factors • Recognize simultaneous equations and define them in algebraic and graphical methods <p>Basic Calculus</p> <ul style="list-style-type: none"> • Identify derivative in terms of a tangent line to the graph of the function.

	<ul style="list-style-type: none"> Describe limit of the function using limit laws (Derivative at a point as a limit). Define the derivative function using limits. Identify basic rules of differentiation and use them to find derivatives of products and quotients <p>Vector and Matrix</p> <ul style="list-style-type: none"> Define the terminology of Vector and Matrix. Describe geometric and algebraic properties of vectors to compute vector additions, subtractions and multiplication. Identify and find the determinant of a square matrix (2×2) by using the definition and by using the properties of determinants Identify and compute the inverse of a square matrix by using the definition and by using the properties of inverse. Identify the transpose of the matrix, Solve simultaneous equations using matrices (2×2).
Teaching /Learning Activities:	Lectures, Discussions, Assignments, Workshop All should be presented by using LMS (As PowerPoint presentation), Using web search and self-studies methods.
Assessment Strategy:	Written exam (100 marks) or written exam (80 marks) + assignments (20marks) at end of the academic year.
Recommended Reading:	<ul style="list-style-type: none"> Bradely, T. & Patlon, P. (1998). <i>Essential Mathematics for Economics and Business</i>. Jhone Wiley publication: New York Freund, J. (2001). <i>Mathematics for Statistics</i>. Prentice Hall of India Strauss, M. J., Bradley, G. L. & Smith, K. J. (2002). <i>Calculus</i>. Prentice Hall of India

Course Code:	SOST 18224
Compulsory/ Optional:	Compulsory
Course Name:	Basic Statistics
Intended Learning Outcomes:	<ol style="list-style-type: none"> Identify the scale and type of the data and basic concepts of the statistics Define the process of a research and select appropriate data collection method in a given situation Recognize and interpret measures of central tendency, dispersion, skewness, and kurtosis
Course Content	<p>Introduction</p> <ul style="list-style-type: none"> Describe the meaning, importance and scope of Statistics. Identify the nature of Statistics problem and examples. Define descriptive and inferential statistics

	<p>Population and Sample</p> <ul style="list-style-type: none"> • Define population, census, finite and infinite population, Sample. • Describe the process of selecting a random sample. • Recognize the differences between parameters and statistics <p>Classification of Data</p> <ul style="list-style-type: none"> • Describe the purpose of classification of data, Advantages of classification of data. • Recognize types of data classification: Primary and Secondary, Internal and External, Qualitative and Quantitative, Continuous and Discrete. <p>Scales of Measurement</p> <ul style="list-style-type: none"> • Identify nominal, ordinal, interval and ratio measurements. <p>Survey and Experiment</p> <ul style="list-style-type: none"> • Recognize the deference between survey and experiment. • Describe the steps to be taken to conduct a research. <p>Data Collection Methods</p> <ul style="list-style-type: none"> • Describe primary and secondary data collection methods. • Define advantages and disadvantages of each data collections methods. • Recognize suitable data collection method in a given scenario. • Describe the procedure of each data collection methods <p>Organization of Data</p> <ul style="list-style-type: none"> • Define the concept of classification and tabulation. • Identify methods of constructing the frequency distribution. • Describe basic principles of tabulation. <p>Presentation of Data</p> <ul style="list-style-type: none"> • Identify different types of data presentation methods (bar charts, pie charts, line graphs and etc.) <p>Frequency Distribution</p> <ul style="list-style-type: none"> • Define different types of frequency distribution: cumulative and relative, grouped and ungrouped. • Recognize graphical representation of frequency distribution : histogram, frequency polygon, Less than ogive or More Ogive, Lawrence Curve <p>Measures of Central Tendency</p> <ul style="list-style-type: none"> • Recognize the uses of Central Tendency Measures • Define, find and interpret the various measures of central tendency (Mean, Median, Mode), • Describe merits and demerits of each type of measures
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	<p>Measures of Relative Location</p> <ul style="list-style-type: none"> Describe various measures of relative location: Quartiles, Deciles, Percentiles <p>Measures of Dispersion</p> <ul style="list-style-type: none"> Define the importance of measuring dispersion Recognize the measures of dispersion: Range, Mean deviation, Quartile Range, Variance, Standard deviation. Recognize absolute and relative measures of dispersion. Describe merits and demerits of each type of measures <p>Measures of Skewness and Kurtosis</p> <ul style="list-style-type: none"> Define symmetric and asymmetric distributions Recognize skewness of distributions and interpret the nature of skewness, Recognize kurtosis of distributions and interpret the types of kurtosis, Calculate Skewness and Kurtosis <p>Indices</p> <ul style="list-style-type: none"> Describe and construct price, quantity, and value indices (Simple Relative Indices, Simple Aggregate Indices, Aggregate Indices, Laspeyre's Index, Paasche's Index, Marshall Addedge Index, Fisher's Index). Define the practical use of indices.
Teaching /Learning Activities:	<p>Lectures, Discussions, Assignments, Workshop</p> <p>All should be presented by using LMS (As PowerPoint presentation), Using web search and self-studies methods.</p>
Assessment Strategy:	<p>Written exam (100 marks) or written exam (80 marks) + assignments (20marks) at end of the academic year.</p>
Recommended Reading:	<ul style="list-style-type: none"> Arora, P.N., Arora, S., Arora, S. & Arora, A. (2007). <i>Comprehensive Statistical Methods</i>. S. Chand & Company Ltd: India Pillai, R.S.N. & Bagavathi. (2018). <i>Statistics: Theory and Practice</i>. S. Chand & Company Ltd, India

Course Code:	SOST 28214
Compulsory/ Optional:	Compulsory

Course Name:	Probability Distribution and Sampling Methods
Intended Learning Outcomes:	<ol style="list-style-type: none"> 1. Explain probability theory and probability distributions in decision making. 2. Solve calculation for the probability values of a given events. 3. Explain the sampling techniques in field of Social Sciences and discuss the basic principles and methods underlying sample surveys.
Course Content	<p>Set theory</p> <ul style="list-style-type: none"> • Discuss terminology of set theory, Union, Intersection and complement. • Explain Venn diagrams representing events, Union and intersection of events, mutually exclusive events and independent events <p>Introduction to Probability</p> <ul style="list-style-type: none"> • Explain terminology of probability • Discuss basic rules of probability, random events, Permutation and Combination • Illustrate Venn Diagrams representing events and their probabilities, Union and intersection of events, Mutually exclusive events and independent events, • Construct conditional probability of a given event and Bayes' Theorem <p>Random variables</p> <ul style="list-style-type: none"> • Differentiate random variables: Discrete and continuous random variables. • Solve expected value and Variance of discrete random variable and continuous random variable <p>Discrete Probability distribution</p> <ul style="list-style-type: none"> • Interpret and solve discrete probability distribution, Probability mass function, Uniform distribution, Binomial distribution, Poisson distribution, Hyper geometric distribution. <p>Continuous Probability distribution</p> <ul style="list-style-type: none"> • Interpret and solve continuous probability distribution, Probability density function, Uniform distribution, Normal distribution, Exponential distribution <p>Introduction to Sampling Methods</p> <ul style="list-style-type: none"> • Explain terminology, sampling survey, and methods of sampling <p>Probability Sampling Techniques</p>

	<ul style="list-style-type: none"> Differentiate simple Random Sampling, Stratified Random Sampling, Systematic Sampling and Cluster Sampling. <p>Non-probability Sampling Techniques</p> <ul style="list-style-type: none"> Differentiate quota sampling, convenience sampling, judgmental sampling, purposive sampling, snowball sampling. <p>Applications</p> <ul style="list-style-type: none"> Differentiate practical applications of the sampling methods
Teaching /Learning Activities:	Lectures, Discussions, Assignments, Workshop All should be presented by using LMS (As PowerPoint presentation), Using web search and self-studies methods.
Assessment Strategy:	Written exam (100 marks) or written exam (80 marks) + assignments (20marks) at end of the academic year.
Recommended Reading:	<ul style="list-style-type: none"> ජයතිස්ස, ඩබ්. ඒ. (1991). <i>මූලික සංඛ්‍යාන විද්‍යාව 2 - සම්භාවිතාව සහ ව්‍යාප්ති න්‍යාය</i>. කර්තෘ ප්‍රකාශන: නුගේගොඩ ජයතිස්ස, ඩබ්. ඒ. (1991). <i>මූලික සංඛ්‍යාන විද්‍යාව 3 - අනුමිතික සංඛ්‍යාන</i>. කර්තෘ ප්‍රකාශන: නුගේගොඩ Ardilly, P. and Tille, Y. (2006). <i>Sampling Methods: Exercise and Solutions</i>. Springer: Verlag, New York Kandasamy, P., Thilagavathi, K. & Gunavathi, K. (2005). <i>Probability Statistics and Queueing Theory</i>. S. Chand & Company Ltd, India. Ross, S. (2019). <i>A First Course in Probability</i>. (10th Edition). Pearson Education Thompson, S.K. (2002). <i>Sampling</i>. Wiley Series in Probability and Statistics

Course Code:	SOST 28224
Compulsory/ Optional:	Compulsory
Course Name:	Statistical Inference and Nonparametric Techniques
Intended Learning Outcomes:	<ul style="list-style-type: none"> ➤ Discuss basic concepts of the statistical inference procedure and various methods of point estimators and their characteristics ➤ Construct interval estimates, confidence intervals and confidence limits ➤ Discuss the situations where non parametric tests are used and to construct appropriate Non-Parametric Tests.
Course Content	<p>Statistical Inference Procedure</p> <ul style="list-style-type: none"> Explain type of estimation (point estimation, interval estimation).

	<ul style="list-style-type: none"> • Discuss properties of good point estimation. <p>Point Estimation</p> <ul style="list-style-type: none"> • Interpret population mean, population proportion, population variance and standard deviation <p>Interval Estimation</p> <ul style="list-style-type: none"> • Interpret confidence interval: population mean, population proportions, population variance, population standard deviation and difference between each parameters • Construct problems in determination of sample size <p>Hypothesis Testing</p> <ul style="list-style-type: none"> • Explain procedure for hypothesis testing. • Differentiate type I and II errors, one tailed and two tailed test • Construct hypothesis test for large sample (Population Mean, Difference between two population mean, Population Proportion, Difference between two population Proportion, Population Variance, Difference between two populations variance) and hypothesis tests for small sample, Paired Sample t test <p>Introduction to Non-Parametric Tests</p> <ul style="list-style-type: none"> • Discuss advantages and disadvantages of Non-Parametric Methods, • Explain the uses of Non-Parametric Methods <p>Types of Non-Parametric Methods</p> <ul style="list-style-type: none"> • Explain Sign test for paired data, one sample sign test, rank sum test, Mann-Whitney U test, Kruskal-Wallis test (H test), one sample runs test, median test for randomness (runs above and below the median), Spearman's rank correlation test, testing hypothesis about rank correlation, Kolmogorov-Smirnov test, Kendall test of concordance, median test for two independent samples, Wilcoxon's signed rank test, the matched pairs sign test. • Solve problems using chi-square test. • Discuss conditions for applying chi-square test and yate's corrections • Construct chi-square test: independence, goodness of fit, homogeneity, misuses of chi-square test
Teaching /Learning Activities:	<p>Lectures, Discussions, Assignments, Workshop</p> <p>All should be presented by using LMS (As PowerPoint presentation), Using web search and self-studies methods.</p>
Assessment Strategy:	<p>Written exam (100 marks) or written exam (80 marks) + assignments (20marks) at end of the academic year.</p>

Recommended Reading:	<ul style="list-style-type: none"> • Arora, P.N., Arora, S., Arora, S. & Arora, A. (2007). <i>Comprehensive Statistical Methods</i>. S. Chand & Company Ltd: India • ජයතිස්ස, ඩබ්. ඒ. (1991). <i>මූලික සංඛ්‍යාන විද්‍යාව 3 - අනුමිතික සංඛ්‍යාන</i>. කර්තෘ ප්‍රකාශන: නුගේගොඩ • Anderson, D. R., Sweeney, D. J., Williams, T. A., Camm, J. D., Fry, M. J., Cochran, J. J. & Ohlmann, J. W. (2014). <i>Statistics for Business and Economics</i>. Cengage Learning India Private Limited:Delhi, India • Levin, R. I., Rubin, D. S., Siddiqui, M. H. & Rastogi, S. (2017). <i>Statistics for Management</i>. (8th Edition). Pearson India Education Service Pvt Ltd: India
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Course Code:	SOST 38214
Compulsory/ Optional:	Compulsory
Course Name:	Correlation and Regression
Intended Learning Outcomes:	<ul style="list-style-type: none"> ➤ Clarify dependent and independent variables and the pattern of raw data. ➤ Calculate correlation between dependent variable and one or more independent variables and to compute the regression model ➤ Use Statistical software to do statistical analysis
Course Content	<p>Correlation</p> <ul style="list-style-type: none"> • Clarify dependent variable and the independent variable. • Apply scatter plot and identify the patterns and outliers from the scatter plot. • Compute and interpret correlation coefficients (Pearson correlation, Partial correlation, Spearman correlation, Correlation coefficient by Two-way tables). • Demonstrate merits and demerits of different types of Correlation Coefficients. • Use practical applications of the correlation coefficient <p>Simple Linear Regression Analysis</p> <ul style="list-style-type: none"> • Clarify assumptions of the linear regression. • Calculate and interpret regression coefficients using OLS method, • Apply tests for the significance of the parameters and the overall significance of the model • Construct and interpret a confidence interval for the parameters <p>Multiple linear Regression analysis</p> <ul style="list-style-type: none"> • Clarify the relationship between two or more independent variables with dependent variable.

	<ul style="list-style-type: none"> • Compute and interpret the multiple regression coefficients, R square • Determine the significance of regression coefficients, Overall significance of the model • Demonstrate the violation of Assumptions of the Basic Model: Multicollinearity (Identification, Effect and Treatments), Autocorrelation (Identification, Effect and Treatments), Heteroscedasticity (Identification, Effect and Treatments) <p>Statistical software</p> <ul style="list-style-type: none"> • Practice the Statistical software for data analysis.
Teaching /Learning Activities:	Lectures, Discussions, Assignments, Workshop All should be presented by using LMS (As PowerPoint presentation), Using web search and self-studies methods.
Assessment Strategy:	Written exam (100 marks) or written exam (80 marks) + assignments (20marks) at end of the academic year.
Recommended Reading:	<ul style="list-style-type: none"> • Gujarati, D. N. (2004). <i>Basic Econometrics</i>. (4th Edition). Tata McGraw-Hill Publishing Company Limited: New-Delhi, India • Maddala, G. S. (2005). <i>Introduction to Econometrics</i>. (3rd Edition). John Wiley & Sons Ltd. New York • සේමසිංහ, W. M. (2015). <i>ආර්ථිකමිතිය න්‍යාය හා භාවිතය</i>. සරසවි ප්‍රකාශකයෝ: නුගේගොඩ

Course Code:	SOST 38224
Compulsory/ Optional:	Compulsory
Course Name:	Operational Research
Intended Learning Outcomes:	<ul style="list-style-type: none"> ➤ Clarify the background of Operational Research ➤ Compute linear programming problems in different methods ➤ Use Transportation problems and assignment problems in different methods ➤ Apply methodologies for analyzing networks of different ways
Course Content	<p>Introduction to Operational Research</p> <ul style="list-style-type: none"> • Demonstrate the historical development of operational research. • Demonstrate the operational research techniques, limitations of applications of operational research.

	<ul style="list-style-type: none"> • Clarify the methodology of operational research <p>Linear programming</p> <ul style="list-style-type: none"> • Formulate linear programming problems, General statement of linear programming problems • Apply the assumptions of linear programming. • Determine the solutions using graphical method, Special cases in graphical method (multiple optimal solutions, infeasibility and unboundedness) • Calculate using simplex method, Solutions using simplex methods, Big-M method, Two-phase method, Special cases in simplex method (multiple optimal solutions, infeasibility unboundedness and degeneracy problem) • Practice the duality in linear programming, Dual Simplex method, Sensitivity analysis in linear programming <p>Transportation Problems</p> <ul style="list-style-type: none"> • Determine the types of transportation problems. • Compute the basic feasible solution (North-West corner method, Least Cost method, Vogel's approximation method) • Solve the optimal feasible solution (Stepping Stone method, Modified distribution method), • Practice Special cases in transportation problem (Unbalanced transportation problem, Multiple Solutions transportation problems, Degeneracy problem, maximization problem, restrictions of routes). • Solve the transportation problems using linear programming, Sensitivity analysis in transportation problem <p>Assignment Problem</p> <ul style="list-style-type: none"> • Solve Assignment problem using Hungarian Assignment method, using linear programming • Practice Special cases in Assignment problem (Unbalanced Assignment problems, Constrained Assignment problems, Multiple Optimal Solutions, Maximization Case) <p>Network Analysis</p> <ul style="list-style-type: none"> • Practice Critical Path Method (CPM), Network Analysis (Scheduling the activities, Earliest and Latest time, Determining the critical path, Calculation of Floats), • Practice the Resource analysis and allocation (Crashing, Resource Levelling), Programme Evaluation and Review Technique (PERT), • Differentiate between PERT and CPM, • Practice Shortest route problem, Maximum flow problem, Minimum Spanning Tree Problem
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Teaching /Learning Activities:	Lectures, Discussions, Assignments, Workshop All should be presented by using LMS (As PowerPoint presentation), Using web search and self-studies methods.
Assessment Strategy:	Written exam (100 marks) or written exam (80 marks) + assignments (20marks) at end of the academic year.
Recommended Reading:	<ul style="list-style-type: none"> • Taha, H. A. (2013). <i>Operations research: an introduction</i>. Pearson Education India • Hira, D. S. & Gupta, P. K. (2005). <i>Operations Research</i>. S. Chand & Company Ltd, New Delhi. • Wagner, H. M. (1975). <i>Principles of operations research: with applications to managerial decisions</i> (No. 04; T56. 7, W3 1975.). Englewood Cliffs, NJ: Prentice-Hall.