



**ST. THOMAS COLLEGE (AUTONOMOUS)**  
THRISSUR, KERALA - 680 001

College with Potential for Excellence  
NIRF INDIA Ranking 2021 : 64<sup>th</sup>

[www.stthomas.ac.in](http://www.stthomas.ac.in)

**PROGRAMME OUTCOMES**  
**PROGRAMME SPECIFIC OUTCOMES**  
**COURSE OUTCOMES**

**M.Sc Statistics**

## Outcomes

At the end of Post Graduate Program at St. Thomas College (Autonomous), a student will have obtained:

PO1	Attained profound Expertise in Discipline
PO2	Acquired Ability to function in multidisciplinary domains
PO3	Attained ability to exercise Research Intelligence in investigations and Innovations
PO4	Learnt Ethical Principles and be committed to Professional Ethics
PO5	Incorporated Self-directed and Life-long Learning
PO6	Obtained Ability to maneuver in diverse contexts with Global Perspective
PO7	Attained Maturity to respond to one's calling

## **Program Specific Outcomes**

At the end of M.Sc. Statistics at St. Thomas College (Autonomous), Thrissur, a student will have developed:

PSO1	Understand and apply mathematical fundamentals of statistical techniques for data analysis.
PSO2	Understand and implement the techniques involved in probability and statistical distributions in real life situations.
PSO3	Understand and implement statistical sampling and inference techniques in real situations
PSO4	Carry out stochastic modelling of real life problems
PSO5	Explain and apply the techniques of design of experiments, statistical quality control and life time data analysis in real life situations
PSO6	Implement the statistical techniques using R and Python softwares

## Course Outcomes

### M.Sc. Statistics

#### MST1C01: Analytical Tools For Statistics – I

At the end of this course, a student will have developed ability to:

CO1	Understand and apply the functional properties of Multivariable functions and its applications in statistics
CO2	Understand and examine the analyticity of a complex function.
CO3	Understand and apply theorems on complex integral.
CO4	Examine types of Singularities and residues
CO5	Understand Laplace and Fourier transform and associated results.
CO6	Apply Laplace transform to solve differential equations.

## M.Sc. Statistics

### MST1C02: Analytical Tools For Statistics – II

At the end of this course, a student will have developed ability to:

CO1	Understand the basics of linear algebra and examine the linear independence of vectors.
CO2	Understand and apply operations on matrices and its properties.
CO3	Discuss matrices with special structures and their properties.
CO4	Determine the rank and generalized inverse of a matrix.
CO5	Understand and execute the decomposition of a matrix.
CO6	To understand the solution of homogeneous equations and their application in real situations, use of g inverse and classification of quadratic forms

## M.Sc. Statistics

### MST1C03: Distribution Theory

At the end of this course, a student will have developed ability to:

CO1	Understand the behavior of various discrete probability distributions and discuss the characterization properties of it.
CO2	Understand the behavior of various continuous probability distributions and discuss the characterisation properties of it.
CO3	Illustrate the origin of the distributions based on the family concepts.
CO4	Understand and apply the terminologies of joint, marginal and conditional distributions.
CO5	Understand the fundamentals of sampling distribution.
CO6	Explain and derive Chi square, t, F distributions and their properties

## M.Sc. Statistics

### MST1C04: Probability Theory

At the end of this course, a student will have developed ability to:

CO1	Understanding the idea of sets, random variables and its properties
CO2	Understand fundamentals of distribution function and properties of expectation.
CO3	Explain the properties of characteristic function, independence of random variables and derive the associated results.
CO4	Explain the convergence of random variables and the related results.
CO5	State and prove the inequalities and properties related to law of large numbers
CO6	Explain the proof and applications of central limit theorems.

## M.Sc. Statistics

### MST1C05: STATISTICAL COMPUTING-I

At the end of this course, a student will have developed ability to:

CO1	To expertise the students with the basics of R package
CO2	To develop problem solving skills of linear algebra and distribution theory



## M.Sc. Statistics

### MST2C06: Design And Analysis Of Experiments

At the end of this course, a student will have developed ability to:

CO1	Understand the basic principles of experimentation and apply complete block designs.
CO2	Discuss analysis of covariance and analysis of experiments with missing observations
CO3	Explain the concepts and applications of incomplete block designs
CO4	Understand and apply factorial and fractional factorial designs to take decisions in real scenario.
CO5	Understand the concepts of split plot design and strip plot design.
CO6	Understand the fundamentals of Response surface designs, orthogonality and rotatability.

## M.Sc. Statistics

### MST2C07: Estimation Theory

At the end of this course, a student will have developed ability to:

CO1	Understand sufficiency of estimators and related results.
CO2	Describe Exponential and Pitman family of distributions.
CO3	Understand unbiasedness of estimators and related results.
CO4	Understand consistency of estimators and related results.
CO5	Explain and apply methods of estimation.
CO6	Understand the concepts of interval estimation and classify confidence intervals.

## M.Sc. Statistics

### MST2C08: Sampling Theory

At the end of this course, a student will have developed ability to:

CO1	Recollecting and expanding the knowledge about the census and sampling procedures
CO2	Understand and apply Simple random sampling, Stratified sampling, Systematic sampling and cluster sampling methods.
CO3	Carry out the estimation of population mean, population total and their variances using Simple random sampling, Stratified sampling, Systematic sampling and cluster sampling methods
CO4	Apply and compare Ratio method and Regression method for estimating population total and mean.
CO5	Estimate the population total, population mean and their variances using probability proportions to size sampling with and without replacement
CO6	Understand and apply multi stage and multiphase sampling methods

## M.Sc. Statistics

### MST2C09: Testing Of Statistical Hypotheses

At the end of this course, a student will have developed ability to:

CO1	Recall the fundamentals of testing of hypotheses and understand most powerful tests.
CO2	Understand UMP unbiased test for multi parameter case and explain the construction of $\alpha$ -similar tests with Neyman structure.
CO3	Understand the concept of locally most powerful tests, Likelihood ratio tests and Bayesian tests.
CO4	Understand and apply single sample non parametric tests.
CO5	Understand and apply two sample non parametric tests.
CO6	Understand the fundamentals of sequential probability ratio test, Operating characteristics and Average sample number.

## M.Sc. Statistics

### MST3C10: STATISTICAL COMPUTING-II

At the end of this course, a student will have developed ability to:

CO1	To expertise the students with the basics of R & Python
CO2	To develop problem solving skills of Design and Analysis of Experiments, Estimation Theory, Sampling Theory and Testing of Statistical Hypotheses

## M.Sc. Statistics

### MST3C11: Applied Regression Analysis

At the end of this course, a student will have developed ability to:

CO1	Illustrate the concept of linear regression model.
CO2	Estimation and testing the significance of regression parameters and explain properties estimators.
CO3	Check the model adequacy of regression models using residual analysis.
CO4	Discuss polynomial, step- wise and non-parametric regression models.
CO5	Explain logistic and Poisson regression models for binary and count data and estimate their parameters.
CO6	Discuss generalized linear models and estimation of its parameters.

## M.Sc. Statistics

### MST3C12: Stochastic Processes

At the end of this course, a student will have developed ability to:

CO1	Recollecting the basic concepts of random variables and conditional probabilities.
CO2	Understand the fundamentals of Markov process and classification of states.
CO3	Explore inter arrival time and waiting time distributions and their properties
CO4	Understand generalized Poisson process and their properties
CO5	Understand the concept and applications of renewal process
CO6	Understand the basic characteristics of queues and the properties of Brownian motion

## M.Sc. Statistics

### MST4C13: STATISTICAL COMPUTING-III

At the end of this course, a student will have developed ability to:

CO1	To expertise the students with the basics of R & Python
CO2	To develop problem solving skills of Applied Regression Analysis, Statistical Quality Control, Lifetime Data Analysis and Stochastic Processes



## M.Sc. Statistics

### MST4C14: Multivariate Analysis

At the end of this course, a student will have developed ability to:

CO1	Understand the probability functions and their properties of multivariate random variable
CO2	Understand the independence and probability distributions of quadratic and linear forms.
CO3	Compute the MLE estimates of the parameters of multivariate normal distribution and determine their sampling distributions.
CO4	Discuss Wishart's distribution and its properties
CO5	Describe the testing problems in connection with multivariate normal distribution.
CO6	Illustrate and apply the techniques of Classification, principal component analysis and factor analysis.

## M.Sc. Statistics

### **MST4C15: PROJECT/DISSERTATION AND COMPREHENSIVE VIVA-VOCE**

At the end of this course, a student will have developed ability to:

CO1	To expertise the students in the Discipline
CO2	To exercise Research Intelligence in investigations and Innovations.
CO3	To learn ethical principles and self-directed learning

## M.Sc. Statistics

### MST4C16: STATISTICAL COMPUTING-IV

At the end of this course, a student will have developed ability to:

CO1	To expertise the students with the basics of R & Python
CO2	To develop problem solving skills of Multivariate Analysis and Time Series Analysis

## M.Sc. Statistics

### E01: Operations Research-I

At the end of this course, a student will have developed ability to:

CO1	Discuss the concept of Operations Research.
CO2	Understand and apply linear programming problem to solve real life problems.
CO3	Understand and apply the transportation and assignment problems to solve real life problems.
CO4	Discuss sensitivity analysis and parametric programming.
CO5	Understand integer programming problems.
CO6	Explain game theory and apply it in real life problems.

## M.Sc. Statistics

### E02: Time Series Analysis

At the end of this course, a student will have developed ability to:

CO1	Discuss the fundamentals and components of time series.
CO2	Describe applications and methods of smoothing.
CO3	Discuss time series models and determine suitable models.
CO4	Estimate the parameters of ARMA models and apply these models for forecasting.
CO5	Apply time series models using statistical packages.
CO6	Explain spectral analysis of weakly stationary process describe non-linear time Series models.

## M.Sc. Statistics

### E03: Operations Research-II

At the end of this course, a student will have developed ability to:

CO1	Discuss the Non linear programming problems and methods to solve the problems.
CO2	Understand and solve Quadratic programming problem.
CO3	Explain Dynamic and Geometric programming.
CO4	Discuss inventory management, deterministic and probability models.
CO5	Understand Replacement models.
CO6	Understand simulation modeling and random number generation

## M.Sc. Statistics

### E04: Queueing Theory

At the end of this course, a student will have developed ability to:

CO1	Understanding basic concepts of queueing theory
CO2	Analyze behaviours of queueing models
CO3	Study on queueing networks
CO4	Apply queueing models
CO5	Evaluate performance measures
CO6	Create significance and applications of queueing theory

## M.Sc. Statistics

### E05: Lifetime Data Analysis

At the end of this course, a student will have developed ability to:

CO1	Discuss life time distributions and important parametric models.
CO2	Explain censoring and estimation of parameters using censored data.
CO3	Understand and estimate the survival probabilities using product – limit and Nelson-Aalen methods.
CO4	Describe inference under exponential model and discuss the comparison of distributions.
CO5	Explain important hazard models and apply Rank test, Log-rank test and Generalized Wilcoxon test
CO6	Discuss multivariate lifetime models and data



## M.Sc. Statistics

### E06: Advanced Distribution Theory

At the end of this course, a student will have developed ability to:

CO1	Discuss stopped sum distributions.
CO2	Describe the bivariate discrete distributions and its properties.
CO3	Explain bivariate continuous models and distributions with specified conditionals.
CO4	Discuss bivariate Pareto family and multivariate Liouville distributions.
CO5	Understand record values and its properties.
CO6	Illustrate the moments relationships and characterizations of record values from exponential, Weibull and logistic models.

## M.Sc. Statistics

### E07: Statistical Decision Theory

At the end of this course, a student will have developed ability to:

CO1	Understand the statistical decision problems and Interpret the decision rules and loss randomized decision rules.
CO2	Interpret the utility and classify the loss functions, standard loss functions and vector valued loss functions
CO3	Discuss the effort of prior information in the decision rules and Compare the informative and non- informative priors
CO4	Describe posterior distribution, Bayesian inference
CO5	Understand the Bayesian robustness Admissibility of Bayes Rule.

## M.Sc. Statistics

### E08: Reliability Modelling

At the end of this course, a student will have developed ability to:

CO1	Understand basic concepts of structural reliability
CO2	Analyze system reliability
CO3	Study on ageing properties of a system
CO4	Apply reliability theory to shock models and stress- strength models
CO5	Study on maintenance and replacement models
CO6	Create significance and applications of reliability theory

## M.Sc. Statistics

### E09: Actuarial Statistics

At the end of this course, a student will have developed ability to:

CO1	Understand and apply the elements of interest.
CO2	Discuss regular pattern of cash flows and related topics.
CO3	Illustrate and apply individual and collective risk models for a short period.
CO4	Discuss survival distributions and derive survival functions.
CO5	Explain and apply life insurance models.
CO6	Discuss and apply annuity models.

## M.Sc. Statistics

### E10: Statistical Quality Control

At the end of this course, a student will have developed ability to:

CO1	Understand the concepts quality, quality assurance and acceptance sampling.
CO2	Explain and compare the Methods of acceptance sampling for attributes.
CO3	Explain acceptance sampling by variables and continuous sampling plans.
CO4	Describe and apply the control chart for attributes.
CO5	Explain and implement control chart for variables.
CO6	Understand process capability analysis and Explain CUSUM and EWMA control charts.

## M.Sc. Statistics

### E11: Advanced Probability Theory

At the end of this course, a student will have developed ability to:

CO1	Introduce the basic concepts of Probability, Mathematical expectation and Lebesgue - Stieltjes integrals
CO2	Study on Weak and Complete convergence of random variables.
CO3	Illustrate the Infinitely divisible distributions then connect it with Stable distribution then discuss its convergence.
CO4	Describe the basic theorems based on Decomposition of normal distribution
CO5	Discuss the relevance's of Conditional expectations in Martingales and Random- Nikodym theorem

## M.Sc. Statistics

### E12: Official Statistics

At the end of this course, a student will have developed ability to:

CO1	Understand Indian and International Statistical systems, its role, functions and activities
CO2	Discuss the scope and contents of population census of India.
CO3	Understand the population growth in developed and developing countries and evaluate the performance of family welfare programmes
CO4	Identify Statistics related to industries, foreign trade, balance of payment, cost of living inflation, educational and social statistics
CO5	Understand economic development and national income estimation using product approach, income approach and expenditure approach
CO6	Discuss the measures of inequality in income and measures of incidence and intensity.

## M.Sc. Statistics

### E13: Biostatistics

At the end of this course, a student will have developed ability to:

CO1	Discuss types of Biological data and Principles of Biostatistical design of medical studies.
CO2	Understand the concepts of survival time functions of important parametric models and comparing two survival distributions using L.R test and Cox's F-test.
CO3	Explain censoring and estimation of parameters using censored data.
CO4	Understand and estimate the non-parametric methods for estimating survival function and variance of the estimator using actuarial and Kaplan–Meier methods.
CO5	Describe competing risk theory and estimate the probabilities of death by ML method.
CO6	Discuss the Basic biological concepts in genetics and clinical trials.



## M.Sc. Statistics

### E14: Econometric Models

At the end of this course, a student will have developed ability to:

CO1	Understand basic concepts of Economics.
CO2	Discuss the optimization problems with more than one choice variable in Economics.
CO3	Explain the optimization problems with equality constraints and discuss Domar growth model, Solow growth model and Cobweb model.
CO4	Explain the meaning and methodology of Econometrics and understand the concept of regression and autocorrelation
CO5	Discuss the dynamic econometric models
CO6	Discuss the inconsistency of OLS estimators and understand the basic concepts of stochastic process

## M.Sc. Statistics

### E15: Demographic Techniques

At the end of this course, a student will have developed ability to:

CO1	Understand the sources of demographic Statistics and explain basic demographic measures.
CO2	Understand life tables and construct a lifetable.
CO3	Explain the measures of fertility.
CO4	Understand the point estimates and population projections based on mortality, fertility and migration basis.
CO5	Discuss the ageing of the population
CO6	Estimate the demographic measures from incomplete data

## M.Sc. Statistics

### E16: Stochastic Finance

At the end of this course, a student will have developed ability to:

CO1	Understand the basic concepts of financial markets and market lines
CO2	Learn the usage of Statistical models in modeling Financial data.
CO3	Interpret and apply the black Scholes theorem and its properties.
CO4	Describe the pricing of European and American options by monte-Carlo and finite difference methods.
CO5	Discuss on the modelling security market and price process models
CO6	Learn the special features of the financial time series and their models and its estimation.

## M.Sc. Statistics

### E17: Longitudinal Data Analysis

At the end of this course, a student will have developed ability to:

CO1	Study the basic concepts of Linear Model in longitudinal data analysis
CO2	Analyze numerical methods to solve the problems in Linear Model
CO3	Study on basic concepts of Generalized Linear Model
CO4	Illustrate and study on missing data mechanism in longitudinal data analysis
CO5	Study on Multivariate and Time-dependent covariates in longitudinal data analysis

## M.Sc. Statistics

### E18: Data Mining Techniques

At the end of this course, a student will have developed ability to:

CO1	Understand and apply classification techniques and concept of decision trees.
CO2	Discuss clustering techniques in statistical and data mining viewpoints.
CO3	Explain and apply unsupervised and supervised learning and data reduction techniques.
CO4	Explain and apply artificial neural networks and extensions of regression models.
CO5	Discuss data warehousing and online analytical data processing.
CO6	Explain and apply the techniques of association rules and prediction.

