Probability & Statistics

The Following is the list of all kind of Probability & Statistics courses that TMS can offer either online or home tutoring

Introduction to Probability
Probability axioms and their consequences. Conditional probability and independence. Random variables, distributions and densities, moments, sampling distributions. Weak law of large numbers, sums of independent random variables, moment generating functions, convergence concepts, the central limit theorem.

Note: This course is intended for those students whose majors might be Mathematics, Statistics, Physics, Engineering, and some other interdisciplinaries.

Introduction to Statistics
Theory of statistical inference; point and interval estimation, tests of hypotheses. Inferences about normal models. Introduction to nonparametric methods.

Note: This course is intended for Statistics and some other interdisciplinary students.

Probability and Statistics for Engineers
A concise survey of: combinatorial analysis; probability and random variables; discrete and continuous densities and distribution functions; expectation and variance; normal (Gaussian), binomial and Poisson distributions; statistical estimation and hypothesis testing; method of least squares, correlation and regression. The emphasis is on statistics and quality control methods for engineers.

Note: This course is intended for Engineering students.

Foundations of Probability
An overview of probability from a non-measure theoretic point of view. Random vectors; independence, conditional expectation and probability, consequences. Various types of convergence leading to proofs of the major theorems in classical probability theory. An introduction to simple stochastic processes such as Poisson and branching processes.

Note: This course is intended for Pure Mathematics and Statistics students. Applied Mathematics and Engineering students are alsp welcome.

Elementary Probability & Statistics
Probability And Statistics are two important concepts. Probability is all about chance. Whereas statistics is more about how we handle various data using different techniques. It helps to represent complicated data in a very easy and understandable way. The introduction of these fundamentals is given in this course.

Note: This course is intended for those students who only needs to learn a critical approach to reading statistical analyses reported in the media, and how to correctly interpret the outputs of common statistical routines for fitting models to data and testing hypotheses.

Introduction to Time Series Analysis
Time domain methods: detrending, autoregressive moving average (ARMA) models, non stationarity and seasonality, state space methodology. Frequency domain methods: lagged regression, deterministic input and random coefficient models. Examples of financial time series. Time series data will be analyzed using software packages.

Note: This course is intended for Statistics students and many other Interdiciplinary Programs that concern data Analysis.

Applied Probability

An introduction to stochastic processes, with emphasis on Markov processes. Review of basic probability, limit theorems and conditioning. The Poisson process. Limit theorems for regenerative processes. Discrete-time and continuous-time Markov processes. Hidden Markov processes on finite state spaces. Applications chosen from signal processing, queuing theory, economics, finance and actuarial sciences.

Note: This course is intended for Statistics graduate students. Pure Mathematics and Applied graduate students are also welcome.

Basic Probability and Stochastic Processes with Engineering Applications

Calculus of random variables and their distributions with applications. Review of limit theorems of probability and their application to statistical estimation and basic Monte Carlo methods. Introduction to Markov chains, random walks, Brownian motion and basic stochastic differential equations with emphasis on applications from economics, physics and engineering, such as filtering and control.

Stochastic Methods in Engineering

The basic limit theorems of probability theory and their application to maximum likelihood estimation. Basic Monte Carlo methods and importance sampling. Markov chains and processes, random walks, basic ergodic theory and its application to parameter estimation. Discrete time stochastic control and Bayesian filtering. Diffusion approximations, Brownian motion and an introduction to stochastic differential equations. Examples and problems from various applied areas. Prerequisites: exposure to probability and background in analysis.

Statistics for Engineering and Sciences

Statistics for Science is an introductory course for junior or senior level students. It is an introduction to the statistical analysis of data that arise from experiments, sample surveys, or other observational studies. It focuses on topics that are frequently used by scientists and engineers, particularly the topics of regression, design of experiments, and statistical process control.

Probability and its applications

The real-life applications of probability are many in various fields like medicines, business, and other industries also. In this course, we will provide detailed information on applications of probability and will cover the following topics:
This course provides an elementary introduction to probability with its applications. Topics includes basic combinatorics, random variables, probability distributions, Bayesian inference, hypothesis testing, confidence intervals, and linear regression. The application of probability is illustrated in many examples related to course contents.

Introduction to Probability Theory

Any realistic model of a real-world phenomenon must take into account the possi-bility of randomness. That is, more often than not, the quantities we are interestedin will not be predictable in advance but, rather, will exhibit an inherent varia-tion that should be taken into account by the model. This is usually accomplishedby allowing the model to be probabilistic in nature. Such a model is, naturallyenough, referred to as a probability model.The majority of the sessions of this course will be concerned with different probability models of natural phenomena. Clearly, in order to master both the "model building" and the subsequent analysis of these models, we must have a certain knowledge of basic probability theory. Therefore, In this course the following topics will be included:

A proof oriented development of basic probability theory. Counting; axioms of probability; conditioning and independence; expectation and variance; discrete and continuous random variables and distributions; joint distributions and dependence; Central Limit Theorem and laws of large numbers.

Note: This course is intended for pure mathematics students. Senior undergraduate or graduate students of Engineering and other sciences are also welcome.

Time Series Analysis and its Applications

In mathematics, a time series is a series of data points indexed (or listed or graphed) in time order. Most commonly, a time series is a sequence taken at successive equally spaced points in time. Thus it is a sequence of discrete-time data. Examples of time series are heights of ocean tides, counts of sunspots, and the daily closing value of the Dow Jones Industrial Average. Time series are used in statistics, signal processing, pattern recognition, econometrics, mathematical finance, weather forecasting, earthquake prediction, electroencephalography, control engineering, astronomy, communications engineering, and largely in any domain of applied science and engineering which involves temporal measurements.

Time series analysis comprises methods for analyzing time series data in order to extract meaningful statistics and other characteristics of the data. Time series forecasting is the use of a model to predict future values based on previously observed values.

This course includes the following topics as a tool of analizing a time series:

What time series is and why it is important; How to decompose trend, seasonality, and residuals; What additive, multiplicative, and pseudo-additive models are; The application of time series forecasting with Python; The definition of stationarity and its relevance; Transformation methods such as differencing, detrending, and logarithms; How to differentiate nonstationarity and stationarity data with Python; Why data smoothing is essential for data analysis; Data smoothing technique from simple average to triple exponential smoothing; How to smooth time series data with Python; What autocorrelation and partial autocorrelation functions are and how they work; The variations of models such as autoregressive and moving average models; How to use Python to build autocorrelation models; How ARMA, ARIMA, and SARIMA models work and how to build them; How to implement these models with Python; How to use control charts for anomaly detection; An introduction and use case for Kalman filters; Why signal transformations are useful for time series analysis; Techniques such as Fourier transformations, filters, and window functions;An explanation of Recurrent Neural Network (RNN) and Long Short Term Memory (LSTM) architectures; How to use Python to implement deep learning models for time series forecasting.

Theory of Probability I

Mathematical tools: sigma algebras, measure theory, connections between coin tossing and Lebesgue measure, basic convergence theorems. Probability: independence, Borel-Cantelli lemmas, almost sure and Lp convergence, weak and strong laws of large numbers. Large deviations. Weak convergence; central limit theorems; Poisson convergence; Stein's method.

Theory of Probability II

Conditional expectations, discrete time martingales, stopping times, uniform integrability, applications to 0-1 laws, Radon-Nikodym Theorem, ruin problems, etc. Other topics as time allows selected from (i) local limit theorems, (ii) renewal theory, (iii) discrete time Markov chains, (iv) random walk theory, (v) ergodic theory.

Theory of Probability III

Continuous time stochastic processes: martingales, Brownian motion, stationary independent increments, Markov jump processes and Gaussian processes. Invariance principle, random walks, LIL and functional CLT. Markov and strong Markov property. Infinitely divisible laws. Some ergodic theory.

Introduction To Stochastic Processes

Multivariate distributions, in particular the multivariate normal distribution. Conditioning and conditional expectation. The moment generating function. Stochastic processes: basic properties and examples. Expectation function, autocovariance function, cross covariance function. The Poisson process and the Wiener process. Martingales in discrete time. Stationary and wide sense stationary processes. Gaussian processes. Mean square convergence and the mean square integral. Linear time invariant filtering. Spectral densities. ARMA processes. Prediction. Markov chains in discrete and continuous time.