



**Probability Theory
for Data Science**
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The WHY: Learning Objectives

- Probability Theory for Datascience is a course aimed to build the basics of classical probability, random variables and stochastic processes proceeding to apply the intuition developed in a varying set of problems.
- The course will strengthen the concepts of probability spaces and distributions to understand better the models used in Datascience.
- The course is tailored to suit students of diverse background and solidify the grasp of students on the topics by examples and numerous exercises alongside the theory.

The WHO and WHEN:

Instructors

Archi De



Completed
B.Stat from
ISI Kolkata.
Currently

pursuing M.Stat at
ISI Kolkata and will
be joining Goldman
Sachs as an Analyst
next year.

Diganta



Completed
B.Stat from
ISI Kolkata.
Currently

pursuing M.Stat at
ISI Kolkata and will
be joining Morgan
Stanley as an
Associate next year.

Somak Laha



Completed
B.Stat from
ISI Kolkata.
Currently

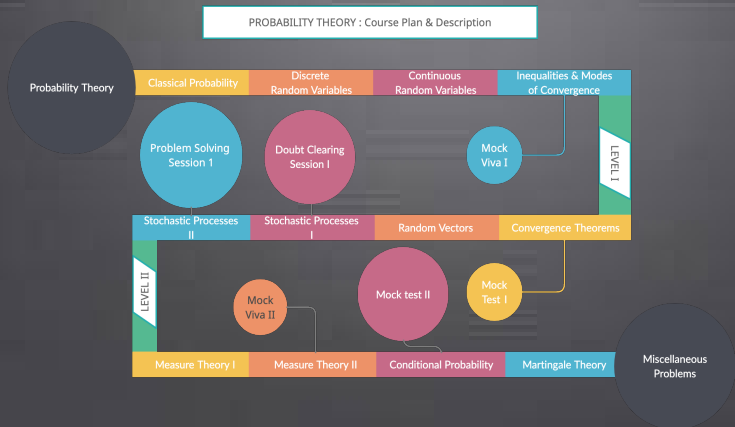
pursuing M.Stat at
ISI Kolkata and will
be joining Capital
One as an Analyst
next year.

Class schedule

Tuesday: 9pm-11pm

Sunday: 9pm-11pm

The WHAT: Syllabus Schematics



Lecture-Wise Syllabus

Lectures (1-4)

- Introduction to The Classical Approach.
- Discrete Continuous Random Variables.
- Probability Inequalities and Modes of Convergence.
- Theorems of Convergence.

Lectures (5-8)

- Random Vectors.
- Stochastic Processes I & II.
- Measure Theory & Radon-Nikodym Derivative.
- Miscellaneous Topics in Probability.

Brain Teasers and FAQ's

- Identically distributed random numbers (Real Numbers) are generated one by one till the sequence obtained by listing these numbers are in increasing order. What is the Expected Length of this list?
- There are n unstable molecules in a row, m_1, m_2, \dots, m_n . One of the $n - 1$ pairs of neighbours, chosen at random, combines to form a stable dimer; this process continues until there remain U_n isolated molecules no two of which are adjacent.
 1. What is the probability that m_1 remains isolated?
 2. Deduce that $\lim_{n \rightarrow \infty} \frac{1}{n} \mathbb{E} U_n = \frac{1}{e^2}$.

Brain Teasers and FAQ's [continued]

- A number n of spaceships land independently and uniformly at random on the surface of planet Mongo. Each ship controls the hemisphere of which it is the centre. What is the probability that every point on Mongo is controlled by at least one ship?

[Hint: n great circles almost surely partition the surface of the sphere into $n^2 - n + 2$ disjoint regions.]

