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# <World of Discrete>

#An Online course on foundations of Computer Science



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**Course Name:** World of Discrete

**Tagline:** An Online course on foundations of Computer Science

**Target audience:** Typically the course is for undergraduate students but the course is also recommended for students who are in high school and higher secondary and quite advanced in Mathematics.

## **What is Discrete Mathematics?**

Discrete Mathematics is the study of discrete objects, rather than a continuum. It sets up the language needed to take a dive in computer science. Typically taught in the second year in an undergrad computer science course, the course includes probability, counting, proofs and graph theory. These tools are used across fields in today's data driven world. The course is also aimed at introducing the students to the art of algorithmic thinking.

## **About the course:**

Before taking a deep dive into any stream, one must know a few basic tools to set up a platform to take the plunge from. This course aims to supply the participants with such tools needed for computer science. As a bonus, the course aims at inculcating an ability to think in a logical fashion. We cover basic proof techniques students of any mathematical science must know, before working magic in the world of combinatorics. We will also take a stroll with probability and graph theory. These tools are a must have for a wide variety of fields. The debates and discussions from class aim in assisting students to prepare themselves to find their way in this data driven world.

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## Topics covered:

- Boolean Algebra
- Methods of Proofs: Mathematical Induction, Contradiction, Contrapositive, Pigeon Hole Principle, Deduction
- Combinatorics
- Probability
- Graph Theory

## How do I know if this course will interest me?

If the below questions interest you, then this course may be of interest to you.

1. Do there exist 100 consecutive natural numbers with exactly 7 primes in them?
2. In the Parliament of Sikinia, each member has at most three enemies (enmity is mutual). Prove that the house can be separated into two houses, so that each member has at most one enemy in his own house.
3. Suppose the positive integer  $n$  is odd. First Pichai writes the numbers  $1, 2, \dots, 2n$  on the blackboard. He then picks any two numbers  $a, b$ , erases them, and writes  $|a - b|$  instead. He repeats this process until only one number remains on the board. Prove that an odd number will remain at the end.

## Who should do this course?

Undergraduate students who wish to get a deeper foundation in discrete mathematics and high school students who are advanced in Mathematics and would like to get an insight into mathematical foundations in computer science can consider doing this course.

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## Faculty Profile:



Aadityan Ganesh completed BSc (Hons) in Math and Computer Science from Chennai Mathematical Institute. An avid Math and Computer Science lover, Aadityan brings different aspects of both into his classrooms. Having seen Math in a decompartmentalised way, he connects Math and auctions, Economics and Theoretical CS, Game Theory and Mathematical Thinking and makes his sessions one of its kind. His interest in sciences was tickled with the history of Indian Mathematics, which later changed to physics, grew deeper through Computer Science and Economics, and got rooted in Algorithmic Game Theory.

At the age of 16, he was invited to Princeton University to attend a UG level summer course on Randomised Algorithms. He has been part of several prestigious Math and Computer Science courses in India and abroad. He mentors many high school students who are passionate about Math and Computer Science. He has been a faculty at Raising A Mathematician Training Program, Epsilon India camp, etc. and has been invited as a guest speaker at programs like Program for Algorithmic and Combinatorial Thinking (USA).

Aadityan is currently working as a research assistant with some eminent professors from the US and aspires to be a full-fledged researcher soon. Apart from academics, he loves watching and analysing cricket and chess, and enjoys juggling. With all this, Aadityan has the melody of music in his soul and is a great Mridangam and Ghatam player. He aspires to inspire young Math enthusiasts and help them find their area of love in Mathematics.

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## Course duration and mode:

This is a semester-long course that will be offered Live from August 6th to December 18th (approximately)\* in an ONLINE mode.

## Timings:

Saturdays 6:30 to 9:00 pm IST

## Course fee:

INR 21,000/- for Indian residents.

Fee includes teaching, material, assignments and grading of assignments.

Number of participants: 20-25

**Scholarships:** We offer limited need-based scholarships for students who cannot afford to pay partial or full tuition fee.

**Write to us:** [contact@vicharvatika.org](mailto:contact@vicharvatika.org)

\*Course end date is subject to change in the duration of the course