



## **Basic Course Idea**

**fun-filled intuitive course dealing with serious topics in mathematics without dilution.**

- **Learn concepts in an intuitive way**
- **Make learning fun through illustrations, games, etc.**
- **Will include elementary Calculus, Equations and Graphs, Counting**
- **Art of Problem Solving – will discuss some classic problems and their solutions**
- **Will touch upon Fermi problems too.**
- **Material covered will be useful for competitive exams as well as interviews**
- **No formulae memorising – Calculator allowed – and ... all exams Open Book**

# Course Details and Syllabus

The students will be involved in learning concepts through simple illustrations that are both challenging and stimulating. The idea is to inculcate mathematical ways of thinking and at the same time cover topics that will be generally useful to liberal arts students. The emphasis is on making the course interesting and yet delivering the matter required without dilution. This course is a mixture of undergrad level topics with a fun-flavour added and the art of problem formulation and solving.

In general, no formulae will need to be memorised, they will all be available wherever required. Calculators will be allowed. There will be 36 lectures of 50 minutes each. Attendance requirement will be as per college guidelines.

The basic areas covered are

- Art of Problem Solving

Students will be encouraged to discuss various methods of formulating and solving fairly 'simple' school level problems. Some techniques will be discussed and illustrated through examples. Here we want to develop a thinking culture.

- The Art of Counting

This deals with the enumerative ways of counting the number of elements of a finite set. In daily lives, we often are curious or need to find out the number of outcomes of a series of events or possible number of arrangements of objects or number of ways of selection of objects. We will learn simple ways of dealing with permutations and combinations.

- Fermi Problems

It is a fashion nowadays to ask these problems in interviews – we will discuss a few

- Equations and Graphs

Solving quadratic equations by completing squares and using formula. Nature of roots. Plotting graphs of quadratic as well as certain cubic equations

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- Introduction to Calculus, formulating problems and methods used for solving problems

Covers the basic concepts of differentiation and integration of functions of one variable. Applications to maximisation/minimisation problems, areas and volumes.

- Derivatives
  - Concept as rate of change or slope of tangent
  - Able to find derivatives of simple expressions.
  - Application in maxima and minima problems
- Integration
  - Concept as area under the curve
  - Simple integrals
  - Use to calculate average function value, areas, volumes
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- Basics of Linear Algebra

- Evaluating simple 2 x 2 and 3 x 3 determinants
- Basics of matrices – expressing system of linear equations as  $AX = B$
- Solving system of linear equations

- Mathematics in Everyday Life

Examples of how mathematics is used practically in everyday life. Class assignment.