NOC:An invitation to mathematics - Video course

COURSE OUTLINE

This course is an introduction to the ideas and methods of mathematics.The only prerequisite is some familiarity with topics in a typical high school mathematics curriculum. We will revisit many of these from a more conceptual viewpoint and through numerous examples. Special emphasis will be laid on the interconnections between seemingly disjoint topics. This course seeks to go beyond the “procedures-to-solve-routine-problems” approach of a typical school curriculum to offer a glimpse of what mathematics is really about. It should be suitable for high school students, lower undergraduates, teachers at various levels, or others with a keen interest in mathematics.

COURSE ABSTRACT

- **Polynomials:** Interpolation, Taylor's formula, Polynomials with integer values, Polynomials in several variables, Counting monomials.
- **Counting Principles:** Basic methods, the Pigeonhole principle, the Binomial theorem, Permutations, Graphs, Recurrence relations, Bijective proofs.
- **Functions:** Continuous functions, the Intermediate value property and its applications, Fixed points, Linear transformations of the plane, the Derivative and dilations, Higher order derivatives and the binomial theorem, Polynomial approximation to functions.
- **Matrices:** Matrices and transformations, Multiplication vs composition, Determinants as dilation factors, Polynomials applied to matrices, Matrices in probability theory. Matrices in Polynomial interpolation, the Vandermonde determinant.
- **Conservation laws:** Invariants of transformations, Discrete transformations, and applications, Transformations in Euclidean Geometry- circle inversions.
- **Elementary number theory:** Modular arithmetic, Divisibility, Prime numbers.
- **Exploratory project suggestions.**

NP-TEL

NPTEL

http://nptel.ac.in

Mathematics

Coordinators:

Prof. Sankaran Vishwanath
ProfessorDepartment of MathematicsInstitute of Mathematical Sciences