

## NPTel Video Lecture Topic List - Created by LinuXpert Systems, Chennai

NPTel Video Course - Mathematics - An Introduction to Riemann Surfaces and Algebraic Curves:  
Complex 1-Tori and Elliptic Curves

Subject Co-ordinator - Dr. T.E. Venkata Balaji

Co-ordinating Institute - IIT - Madras

Sub-Titles - Available / Unavailable | MP3 Audio Lectures - Available / Unavailable

- Lecture 1 - The Idea of a Riemann Surface
- Lecture 2 - Simple Examples of Riemann Surfaces
- Lecture 3 - Maximal Atlases and Holomorphic Maps of Riemann Surfaces
- Lecture 4 - A Riemann Surface Structure on a Cylinder
- Lecture 5 - A Riemann Surface Structure on a Torus
- Lecture 6 - Riemann Surface Structures on Cylinders and Tori via Covering Spaces
- Lecture 7 - Moebius Transformations Make up Fundamental Groups of Riemann Surfaces
- Lecture 8 - Homotopy and the First Fundamental Group
- Lecture 9 - A First Classification of Riemann Surfaces
- Lecture 10 - The Importance of the Path-lifting Property
- Lecture 11 - Fundamental groups as Fibres of the Universal covering Space
- Lecture 12 - The Monodromy Action
- Lecture 13 - The Universal covering as a Hausdorff Topological Space
- Lecture 14 - The Construction of the Universal Covering Map
- Lecture 15 - Completion of the Construction of the Universal Covering
- Lecture 16 - Completion of the Construction of the Universal Covering
- Lecture 17 - The Riemann Surface Structure on the Topological Covering of a Riemann Surface
- Lecture 18 - Riemann Surfaces with Universal Covering the Plane or the Sphere
- Lecture 19 - Classifying Complex Cylinders
- Lecture 20 - Characterizing Moebius Transformations with a Single Fixed Point
- Lecture 21 - Characterizing Moebius Transformations with Two Fixed Points
- Lecture 22 - Torsion-freeness of the Fundamental Group of a Riemann Surface
- Lecture 23 - Characterizing Riemann Surface Structures on Quotients of the Upper Half-Plane with Abelian Fundamental Groups
- Lecture 24 - Classifying Annuli up to Holomorphic Isomorphism
- Lecture 25 - Orbits of the Integral Unimodular Group in the Upper Half-Plane
- Lecture 26 - Galois Coverings are precisely Quotients by Properly Discontinuous Free Actions
- Lecture 27 - Local Actions at the Region of Discontinuity of a Kleinian Subgroup of Moebius Transformations

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- Lecture 28 - Quotients by Kleinian Subgroups give rise to Riemann Surfaces
- Lecture 29 - The Unimodular Group is Kleinian
- Lecture 30 - The Necessity of Elliptic Functions for the Classification of Complex Tori
- Lecture 31 - The Uniqueness Property of the Weierstrass Phe-function associated to a Lattice in the Plane
- Lecture 32 - The First Order Degree Two Cubic Ordinary Differential Equation satisfied by the Weierstrass Phe-function
- Lecture 33 - The Values of the Weierstrass Phe-function at the Zeros of its Derivative are nonvanishing Analytic Functions on the Upper Half-Plane
- Lecture 34 - The Construction of a Modular Form of Weight Two on the Upper Half-Plane
- Lecture 35 - The Fundamental Functional Equations satisfied by the Modular Form of Weight Two on the Upper Half-Plane
- Lecture 36 - The Weight Two Modular Form assumes Real Values on the Imaginary Axis in the Upper Half-plane
- Lecture 37 - The Weight Two Modular Form Vanishes at Infinity
- Lecture 38 - The Weight Two Modular Form Decays Exponentially in a Neighbourhood of Infinity
- Lecture 39 - A Suitable Restriction of the Weight Two Modular Form is a Holomorphic Conformal Isomorphism onto the Upper Half-Plane
- Lecture 40 - The J-Invariant of a Complex Torus (or) of an Algebraic Elliptic Curve
- Lecture 41 - A Fundamental Region in the Upper Half-Plane for the Elliptic Modular J-Invariant
- Lecture 42 - The Fundamental Region in the Upper Half-Plane for the Unimodular Group
- Lecture 43 - A Region in the Upper Half-Plane Meeting Each Unimodular Orbit Exactly Once
- Lecture 44 - Moduli of Elliptic Curves
- Lecture 45 - Punctured Complex Tori are Elliptic Algebraic Affine Plane Cubic Curves in Complex 2-Space
- Lecture 46 - The Natural Riemann Surface Structure on an Algebraic Affine Nonsingular Plane Curve
- Lecture 47 - Complex Projective 2-Space as a Compact Complex Manifold of Dimension Two
- Lecture 48 - Complex Tori are the same as Elliptic Algebraic Projective Curves