



# K L UNIVERSITY

K L University, 29-36-38, Museum Road, Governorpet  
VIJAYAWADA - 500 002,  
Phone Number 08662577715, [http:// www.kluniversity.in](http://www.kluniversity.in)

## Syllabus for Entrance Test for PhD Admissions Department of Mathematics

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### Analysis:

Matrices spaces, open sets ,closed sets, compact sets in the Euclidean space  $\mathbb{R}^n$ , Complete metric space, diameter of a set in metric space, convergence of a sequence in a metric space, sequences and series of a number .

Continuity of a function, Continuity and compactness, Continuity and connectedness, intermediate value theorem , discontinuous of real valued functions on a subset of  $\mathbb{R}$  , monotone functions, infinite limits and limits at infinity.

Differentiation –mean value theorems, higher derivatives, Taylors theorem, continuity of derivatives, L’Hospital’s rule, differentiation of vector valued functions.

Riemann Stilye’s integral-definition and existence, integration and differentiation, rectifiable curves , uniform convergence of sequences and series of function-Continuity , derivative and integration.

Topology:

Metric Spaces: Open sets, closed sets, convergence, Continuity, Baires theorem, spaces of Continuous functions, Euclidean and unitary spaces.

Topological spaces: Elementary concepts, bases and subbases, weak topologies, compactness, product spaces, Tychonoff theorem, Ascoli’s theorem, connectedness, components.

Separation: T1 spaces, Hausdraff spaces,regular spaces, normal spaces, completely regular spaces, Uryson’s lemma,Uryson’s embedding lemma and Tietje extension , extension theorems.

### Algebra:

Groups: Automorphisms, conjugacy, cosets, normal series, sylow theorems, solvability, cyclic decomposition, simplicity of  $A_n$ . Direct products, finitely generated abelian groups , Invariance of a finite abelian group, groups of order  $p^n$  and pq.



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Rings: Ideals and homomorphisms, sum and direct sum of ideal, prime ideals , maximal ideal, nilpotent and nil ideals. Unique factorization domain, principal ideal domain, Euclidean domain, polynomial ring over UFD, rings of fractions.

Complex Analysis:

Analytical functions : Cauchy – Riemann equations, conformal mapping- Bilinear mapping-power series. Complex integration – Cauchy’s theorem – Integral Formula Morera’s theorem- Laurent series – Maximum modulus theorem – Liouville’s theorem.

Classification of singularities – Calculus of residues , number of zeros and poles – Rouché’s theorem. Evaluation of integral using calculus of residues.

## **Applied Mathematics:**

Fourier series, even and odd functions, Parseval’s inequality, complex form of Fourier series, Harmonic analysis, Applications to engineering situations.

Fourier Transforms, Fourier integral theorem, Fourier sine and cosine transforms, finite Fourier transforms, Transforms for derivatives, Applications for solving partial differential equations.

Ordinary differential equations, Methods of Solutions, Physical applications, partial differential equations, methods of solutions, Physical applications.

Laplace Transforms, properties, Inverse Laplace Transforms, convolution theorem, Applications to solve ODE and PDE.

Numerical solutions of algebraic and transcendental equations, solutions of simultaneous equations, numerical solutions of Ordinary differential equations by Picard’s, Euler’s, modified Euler’s and Runge – Kutta methods, Numerical solutions of Laplace and Poisson equations, numerical integration by trapezoidal, Simpson’s methods.

## **Probability:**

Basic concepts of theory of probability , Baye’s theorem, probability distributions, Binomial distributions, Poisson distributions, Maueut generating functions, Poisson process, continuous uniform distributions, Normal distribution, Exponential distributions, Gamma distribution, weibull distributions and their basic properties.