



# Central University of Himachal Pradesh

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PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA - 176215, HIMACHAL PRADESH

Website: [www.cuhimachal.ac.in](http://www.cuhimachal.ac.in)

## **Department of Mathematics, Central University of Himachal Pradesh Syllabus for the PhD Screening/ Entrance Test Section A (Mathematics): 50 Marks**

The syllabus for this section is same as of CSIR-UGC National Eligibility Test (NET) for Junior Research Fellowship and Lecturer-ship Examination excluding: Probability, Statistics and Operations Research. The details of which are available at:

[http://csirhrdg.res.in/mcs\\_ma\\_sylys.pdf](http://csirhrdg.res.in/mcs_ma_sylys.pdf)

### **Section B (Research Methodology): 50Marks**

Sample space, discrete probability, independent events, Bayes theorem. Random variables and distribution functions (univariate and multivariate); expectation and moments. Independent random variables, marginal and conditional distributions.

Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs. Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs. Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

Variation of a functional, Euler-Lagrange equation, Necessary and sufficient conditions for extrema. Variational methods for boundary value problems in ordinary and partial differential equations. Linear integral equation of the first and second kind of Fredholm and Volterra type, Solutions with separable kernels. Characteristic numbers and eigenfunctions, resolvent kernel.

Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, Finite differences, Lagrange, Hermite and spline interpolation, Numerical differentiation and integration, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods.