

Syllabus for candidates seeking admission to MS and Direct MS+PhD program

General Guidelines:

The interview will consist of questions based on fundamentals in your specific area of choice, followed by more advanced concepts. Additionally, you will need to have a basic understanding of mathematical concepts, language, and logical reasoning. The syllabus below is described in 2 parts: Part A lists the topics within Mathematics (which corresponds essentially to what you would have learnt in your UG curriculum) and Aptitude, while Part B lists topics within your chosen area of research.

PART A

Mathematics

Linear Algebra: Matrix algebra; Systems of linear equations; Eigen values and Eigen vectors.

Calculus: Functions of single variable; Limit, continuity and differentiability; Mean value theorems, local maxima and minima, Taylor and Maclaurin series; Evaluation of definite and indefinite integrals, application of definite integral to obtain area and volume; Partial derivatives; Total derivative; Gradient, Divergence and Curl, Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Ordinary Differential Equation (ODE): First order (linear and non-linear) equations; higher order linear equations with constant coefficients; Euler-Cauchy equations; Laplace transform and its application in solving linear ODEs; initial and boundary value problems.

Partial Differential Equation (PDE): Fourier series; separation of variables; solutions of one-dimensional diffusion equation; first and second order 1D wave equation and 2D Laplace equation.

Probability and Statistics: Definitions of probability and sampling theorems; Conditional probability; Discrete Random variables: Poisson and Binomial distributions; Continuous random variables: normal and exponential distributions; Descriptive statistics -Mean, median, mode and standard deviation; Hypothesis testing.

Numerical Methods: Accuracy and precision; error analysis. Numerical solutions of linear and non-linear algebraic equations; Least square approximation, Newton's and Lagrange polynomials, numerical differentiation, Integration by trapezoidal and Simpson's rule, single and multi-step methods for first order differential equations.

Aptitude

Verbal: Word completion, sentence completion, verbal analogies, word groups, instructions and verbal deduction, verbal reasoning, reading comprehension

Non-verbal: Critical reasoning, numerical computation, numerical estimation, non-verbal reasoning and data interpretation.

PART B

Division: Building Technology and Construction Management

Candidates can choose one of three streams of research

1. Building Sciences:

Climatology, Heat transfer and Thermal comfort, Lighting and daylighting, Energy and sustainability, Ventilation, air quality, Sensors and measurements of indoor environment quality

2. Construction Management:

Construction management; Construction planning and scheduling; Quantity take-off and costing; Productivity measurement; Risk management; Engineering Economics, Time Value of Money, Alternative Comparison, Cost Benefit Analysis

3. Construction Materials:

Mechanics of Materials: Tension, compression, shear; Axially loaded members; Torsion; Shear forces and Bending moments; Stresses in beams; Analysis of stress and strain; Stress and strain in two dimensions, principal stresses, stress transformation, Mohr's circle; Deflection of beams; Columns; Centroid and Moment of Inertia; Toughness

Construction Materials: Production of cement and concrete materials; Chemistry and hydration of cement and mineral admixtures; Chemical admixtures; Concrete Technology – fresh and hardened properties of various types of concretes (such as fiber reinforced concrete, self-compacting concrete, light-weight concrete, heavy-weight concrete); Basics of concrete mix design; Aggregates; Masonry systems; Basic properties of bituminous materials, wood and wood products, steel and other metallic materials used in construction; Basics of the mechanisms of deterioration of construction materials and systems