

Indian Institute of Technology Goa
School of Mechanical Sciences
PhD Admissions – Autumn 2022

Instructions to the candidates (Regular) appearing for the written test/Interview

There will be two rounds in the selection process, (i) written test and (ii) interview. The candidates shortlisted based on the performance in the written test will be invited for the interview. The written test will be on 9th June (10.00 AM) and the interview will start post lunch (around 2 PM).

1. Please report to the Admin at IIT Goa, Farmagudi by 9.30 AM, 9th June.
2. Please bring a presentation (maximum 5 slides and/or maximum 7 minutes) to present your Masters (Candidates with Master degree) /Bachelor (Candidates with Bachelor degree) thesis work during the interview.

The written test will cover Mathematics and the domain topics. Thus, a candidate of a particular domain will have to appear in the written test on Mathematics and his/her domain topics as below.

Mathematics:

Linear Algebra, Calculus, Differential equations, Probability and Statistics, Numerical methods.
The contents are as per the latest gate syllabus

Domain: Solid Mechanics and Design

Engineering Mechanics: Free-body diagrams and equilibrium; friction and its applications including rolling friction, belt-pulley, brakes, clutches, screw jack, wedge, vehicles, etc.; trusses and frames; virtual work; kinematics and dynamics of rigid bodies in plane motion; impulse and momentum (linear and angular) and energy formulations; Lagrange's equation.

Mechanics of Materials: Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; thin cylinders; shear force and bending moment diagrams; bending and shear stresses; concept of shear centre; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.

Vibrations: Free and forced vibration of single degree of freedom systems, effect of damping; vibration isolation; resonance; critical speeds of shafts.

Domain: Thermo-fluid Science

Fluid mechanics: definition of a fluid, Newton's law of viscosity, Hydrostatic law, Buoyancy, Material derivative, continuity equation, Bernoulli's equation, Flow through pipes, Dimensional analysis, boundary layer, and Navier Stokes equation.

Thermodynamics: Thermodynamic systems and processes; properties of pure substances, behavior of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability, and irreversibility; thermodynamic relations, vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles. Refrigeration and air-conditioning: Vapour and gas refrigeration and heat pump cycles; properties of moist air, psychrometric chart, basic psychrometric processes

Heat transfer: Conduction: 1-D conduction, fins, Unsteady conduction, 2-D conduction; Convection: forced convection, governing equations, boundary layer over a flat plate (hydrodynamic and thermal consideration), flow and heat transfer through a tube, flow across a cylinder, natural convection: single-phase natural convection, vertical flat plate, horizontal cylinders, horizontal plates; Radiation: Basic laws, properties of surfaces, heat transfer between bodies, view factors.

Domain: Industrial Engineering

Industrial Engineering, Productivity, Work Study --- Method Study and Work Measurement, Operations Management, Forecasting, Plant Location, Plant Layout, Sequencing, Scheduling, Inventory Control, Project Management --- CPM and PERT, Operations Research, Linear Programming, Graphical Method, Simplex Method, Big-M Method, Two Phase Method, Primal-Dual Theory, Transportation Model, Assignment Model, Dynamic Programming, Queueing Theory, Non-Linear Optimization Methods, Advanced/ Recent Optimization Methods, System Simulation, Quality Engineering, Reliability Engineering

Instructions to the candidates (Part-time) appearing for the Interview

Please report to the Admin at IIT Goa, Farmagudi by 10.00 AM, 11th June.

The decision of the selection committee would be final regarding the selection process. For any queries, you may write to pg-admissions-mech@iitgoa.ac.in. Please use subject line "PhD_application number" for all your communications.