



सी. एस. आई. आर. - राष्ट्रीय अंतर्विषयी विज्ञान तथा प्रौद्योगिकी संस्थान
CSIR-NATIONAL INSTITUTE FOR INTERDISCIPLINARY SCIENCE AND TECHNOLOGY,
तिरुवनंतपुरम / Thiruvananthapuram-19

अधिसूचना/NOTIFICATION

RECRUITMENT TO THE POST OF TECHNICAL ASSISTANT(TA2502) VIDE
ADVT.NO.01/2025

Name of the Post : Technical Assistant
Post Code : TA2502
Area : Mechanical Engineering
Category : EWS

The syllabus for the post of Technical Assistant (**Post Code: TA2502**) advertised vide **Advertisement No. 01/2025** is attached herewith for the information and guidance of the candidates.

Candidates are advised to go through the syllabus carefully while preparing for the examination.

प्रशासन नियंत्रक/Controller of Administration

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Syllabus for the post TA-2502

Engineering Drawing: convention of lines, scales, Dimensioning, Geometrical constructions, first angle & third angle projections and their symbols, Projection of points, projection of lines, orthographic projection, isometric projection, 2D/3D models, Thread profiles, nuts, bolts, studs, washer, locking arrangements

Materials for Engineering: Classification of Engineering Material, Properties of metals-Physical-mechanical-Thermal properties, Types of cast iron-White-grey-Nodular malleable, Broad classification of steels, BIS- ASME coding of plain, alloy steel and cast iron, Copper, Aluminium, Nickel and their alloys, Chemical composition & Properties, Bearing materials, Polymeric materials, Ceramics, Composite materials, Bio material, Nano material, smart material, Iron-carbon equilibrium diagram, Heat treatment processes, annealing, normalizing, tempering, hardening and case hardening, surface treatment

Mechanics of materials: Types of Forces, Resolution of forces, Types of loads (Tensile, Compression, Shear, Impact, Young's modulus, stress strain diagram, Beams, shear force and bending moment diagrams, finite element method introduction

Fundamentals of Electrical and Electronics engineering: Electrical symbol and electrical safety, Electrical earthing, Electrical current, voltage, emf, potential difference, resistance, SI units, AC, DC supply systems, AC Sinewave, meters used to measure different electrical quantities, open circuit, closed circuit, short circuit, single phase and three phase supply, fuses, relay, types of wires, cables, transformer, induction motor, DOL, Star delta starters, battery, UPS, Conductors, insulators, semiconductors, resistor color code, diode, rectifier, transistor, sensors, actuators

Machine tool technology: Safety signs in machine shop, types of fire extinguishers, Lubrication and Lubricant, Traditional & Non Traditional material removal process, cutting tool types and specifications, grinding-abrasives, Surface Texture roughness symbols, Jigs and fixtures, Lathe, Lathe Operations: Facing, Plain Turning, Step Turning, Taper Turning, Knurling, Thread cutting, chamfering, radius turning, Milling, milling cutters and nomenclature, up milling and down milling, plain milling, key way and v- slot operation, Gear cutting, indexing method, Drilling, Drill bit, reamer, die and taps, Drill bit nomenclature, Transmission of power, cams, mechanical vibrations, governors, bearings, types of drives-belt, chain, rope, velocity ratio, gears and gear trains, Power tools, Power plane, Circular saw, Sander, Chain saw, Angle grinder Drilling machine

CNC Programming and machining: Introduction to CNC machines, Construction features of CNC machine- Machine Structure, bed, spindle motor and drive, axes motor and ball screws, Guide ways, LM guides, console, control switches, coolant system, hydraulic system, Cutting tool materials, cutting tool geometry, index able inserts, tool length, tool nose radius and tool wear compensation, programming sequence and format-absolute and incremental system, G codes and M codes, Linear interpolation and circular interpolation, metal cutting parameters, part program for facing, turning, step turning and taper turning, CNC milling and drilling programs, mirroring and subroutines, introduction to CAM

Product design and development: stages of product development, need and feasibility study, material selection and process, prototype and product life cycle, Aesthetic and Ergonomic design, torsion of shaft, springs classification and design of helical spring, muff coupling, flange coupling, knuckle joint, 3D printing, fused deposition modelling machine, elements of costs, depreciation, indirect expenses, machining time estimation, welding and fabrication time estimation

Industrial Automation: Need and benefits of industrial automation, types of automation system-relay and PLC logic, I/O Modules, Input devices-mechanical, proximity switches, photo electric sensors, temperature sensors, encoders, position and displacement sensors, strain gauge, pressure gauges, DC motors, synchronous motor, servo motor, stepper motor, PLC programming, logic gates, timer functions, counter functions, embedded systems, HMI Concept, SCADA

Manufacturing processes: Foundry, pattern and types, molding, molding sand, Core & Core prints- Gates-Runner-Riser, Defects in casting, metal forming process, hand forging and power forging, power hammer, sheet metal, standard gauges of sheet, sheet metal operations, Trammels, Wire gauge, Snips, Hammer, Stacks, Soldering, Soldering iron, Brazing, sheet metal developments, wood work joints: Bridle joint, Dovetail joint (halved), Cross joint (halved), Mortise and Tenon joint, Tee (halved) joint, Commonly used workshop tools, Bench vise, pipe vise, Hammers [Ball peen hammer, Cross & straight peen hammers, Double faced hammer, Soft hammer (mallet)], Flat chisel, Cross cut chisel, Diamond pointed chisel, Single cut & double cut files, Flat file, Square file, Triangular file, Round and half round file, Hand saw, Callipers (outside and inside), Hermaphrodite calliper, Dividers, Surface plate, Scriber, Punches, V-block, Angle plate, Try square, Bevel square, Combination set, Marking gauge, Mortise gauge, Planes (jack plane, metal plane), Ratchet brace, Wheel brace, Welding Electrode holder, Transformer, Electrode, Face and head shield, Goggle, Chipping hammer, Wire brush, Hand gloves, Types of welding joints (Lap, Butt, Corner, T-joint), Introduction to rolling, types of rolling mills, Introduction to extrusion and drawing process, basic concepts of measurements, precision, accuracy, linear and angular measurements, error in measurements, measurement of force, power and flow, measurement of geometrical dimensions of "V thread" using Vernier & thread gauge, measurement of diameter of wire using micrometer, measurement of angle of "V block" / taper shank of drill using bevel protractor

Advanced manufacturing technologies: Ultrasonic machining process, Electro chemical machining, types of electrolytes, chemical machining, etchants, electrical discharge machining (EDM), Dielectric fluid, metal removing rate, wire cut EDM, Electron beam machining (EBM), laser beam machining, Additive manufacturing (AM), additive manufacturing materials, Binding mechanism, Robots in Advanced Manufacturing, industrial robots, types of robots, Concepts of IIOT (Industry Internet of Things)

Fluid power engineering: Properties of fluids, Pascal law, equation of continuity, Bernoulli's equation, Venturi meter, Pitot tube, Orifice meter, Flow through Pipes-Major & minor losses, Chezy's and Darcy's formulae, classification of pumps, centrifugal and mono block pumps, submersible and reciprocating pump, Hydraulic Turbine-Impulse turbine, basic components of Fluid Power Systems with Symbols, accumulators, Actuators-single and double acting air cylinders, air motors

Heating ventilation and air conditioning (HVAC): Thermal Principles Concepts of Heat, Sensible Heat, Latent Heat Temperature, Temperature Scale Work, Power, Energy, Enthalpy, Entropy, Specific Heat, Internal energy, conduction, convection and radiation, Heat exchangers, Perfect Gas – Gas Laws- Charles law, Boyles law, Laws of Thermodynamics, P-V and T-S Diagram, Psychrometry, Dry Air, Moist Air, Saturated Air, Degree of Saturation, Dry Bulb, Temperature, Wet Bulb Temperature, Humidity, Relative Humidity, Humidity Ratio, Human comfort, indoor air quality, solar angles, thermal insulation, split AC, variable refrigerant flow, Centralized Air Conditioning System, Refrigeration cycle, components of refrigeration cycle, Properties of refrigerant, chilled water cycle, components of chilled water cycle, air distribution system, duct, air handling unit, Heating cycle, boiler, heat pump, Fan, Fan law, Duct material, shape of duct, Duct Designing method- Velocity Reduction method, Equal friction Method, Static Regain Method, Pressure in Ducts- Static, Pressure, Dynamic or Velocity, pressure, Total pressure, Distribution System Plans and Symbols- Positive pressure supply, Negative pressure return, green buildings

Environmental sustainability: Ecosystem, global warming, greenhouse effect, ozone depletion, air pollution, air pollutant and types, cyclone separator, electro static precipitator, noise pollution, noise pollution measurement, water and soil pollution, water conservation, rain water harvesting, Renewable sources of Energy, E-waste, ISO-14001 & Environmental management