Technical Syllabus for the post of Junior Engineer (Civil) based on MSBTE
(Diploma Level)

Sr. No.	Topics
1.	**Building Construction & Materials:** Properties of wet and hardened concrete, tests on concrete, factors affecting strength of concrete, water-cement ratio, aggregate-cement ratio, mix design, additives, design of form work, types of formwork. Stones, bricks, cements, lime, mortar, timber, plastic, concrete, steel, paints and varnishes. Principles of building planning and design, integrated approach, building byelaws, building services such as vertical transportation, water supply sanitation, thermal ventilation, lighting, acoustics, fire protection, electrical fittings. Foundations, stones, brick and block masonry, steel and reinforced cement concrete structures, floors, doors and windows, roofs, finishing works, water proofing.
2.	Engineering Mechanics : Simple Machines, Force System, Computation of Forces, Equilibrium, Friction, Centroid & Centre of Gravity
3.	**Strength of materials:** stresses, strains, bending moments, shear forces and torsion theory, bending theory of beam, deflection of beam, theories of buckling of columns.
4.	**Theory of structures:** Analysis of beams, frames and trusses, slope deflection method, moment distribution method.
5.	**Steel structures:** Design of bolted and welded connections, columns, footings, trusses, steel beams.
6.	**Design of reinforced concrete structures** (limit state): Design of slab, beam, columns, footing, retaining walls, tanks, building frames, staircases.
7.	**Construction planning and Management:** Elements of scientific management, elements of material management, safety engineering, network analysis, construction equipment, site layout, quality control.
8.	**Surveying:** Classification of surveys, measurement of distances-direct and indirect methods, optical and eletronic devices, prismatic compass, local attraction; plane table surveying, levelling, calculations of volumes, contours, theodolite, theodolite traversing, omitted measurements, trigonometric levelling, tacheometry, curves, photogrammetry, geodetic surveying, hydrographic surveying.
9.	**Estimating, costing and Valuation:** Specification, estimation, costing, tenders

	and contracts, rate analysis, valuation.
10.	**Geo-technical Engineering**: Geotechnical properties, stresses in soil, shear resistance, compaction, consolidation and earth pressure, stability of slopes, bearing capacity, settlements, shallow and deep foundations, cofferdams, ground water control.
11.	**Highway Engineering**: Planning of highway systems, alignment and geometric design, horizontal and vertical curves, grade separation, materials and different surfaces and maintenance, rigid and flexible pavement, traffic engineering.
12.	**Bridge Engineering**: Selection of site, types of bridges, discharge, waterway, spans, afflux, scour, standards, specifications, loads and forces, erection of superstructure, strengthening.
13.	**Environmental Engineering**
a.	**Water Supply Engineering**: Sources of supply, design of intakes, estimation of demand, water quality standards, primary and secondary treatment, maintenance of treatment units, conveyance and distribution of treated water, rural water supply.
b.	**Waste water Engineering & Pollution control**: Quantity, collection and conveyance and quality, disposal, design of sewer and sewerage systems, pumping, characteristics of sewage and its treatment, rural sanitation, sources and affects of air and noise pollution, monitoring, standards.
c.	**Solid Waste Management**: Sources, classification, collection and disposal.

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Technical Syllabus for the post of Junior Engineer (M&E) based on MSBTE
(Diploma Level)

Sr. No.	Topics
1.	**Basics of Mechanical Engineering** – Concept of mechanical technology – Milling, planning, shaping, drilling, reaming, grinding, riveting, welding and joining process – types, defects. Super finishing processes – Honing, lapping, buffing, Casting, forging, rolling, drawing, forming processes Classification, Selection and application of Machine Tools, Cutting tool material. Coolants, Design of cutting tools or Tool design.
2.	**Theory of Machines** – Fundamentals and type of Mechanism, Simple machines, Belt Drives, Gear Drives, Joints and Coupling, single and multi cylinder engines and v engines, belt and chain drives, degree of freedom.
3.	**Machine Design Concepts** – Torson, Spring, Joints, Bearing – types and Design, Theory of Failure, Factor of Safety, Combined stresses, Threaded and welded joints, design of screw and bolts, Design of Shafts and Springs, Keys, Basics of CNC machines
4.	**Environmental Studies** – Natural resources and associated problems, Environmental pollution, Environment and Social issues, Renewable energy sources, Concepts of Solar energy, Energy audit, Environmental protection Act
5.	**Strength of material** – Properties of Liquids, Properties of Solids, Thermal properties of Matter, Basic of Electrochemistry, Metals ans alloys, Basic of Non metallic Engineering materials, Thermocouple, Basic of fuels, lubricants etc. Simple stresses and strains, Direct and Bending stresses etc., Torsion, Trusses and Trough, Shear Stress, Torsion, bending moment and shear force concept
6.	**Fluid Mechanics** – Pumps, Types and Selection, Efficiency, Characteristics etc., Compressible fluid flow, Fluid properties, pressure, Thrust, Buoyancy, Viscosity, Bernoulli's theorem, Hydraulic jump, non-uniform flow, reynold's number, hydraulic gradient, water hammer.
7.	**Manufacturing planning and Control** – Manufacturing planning and control system, Forecasting, Planning Function, Planning for Material Requirements, project management, Industrial safety and Legislative acts
8.	**IC engines** – Volumetric and thermal efficiency, SI engines, CI engines,

	Combustion, Knocking, Supercharging, cooling lubrication and ignition system
9.	**Refrigeration and Air Conditioning** – Thermal Engineering – Ton of refrigeration, concept of latent heat, evaporation concept, Heat transfer Thermodynamics – Law of thermodynamics, Ideal Gasses, Various Refrigeration Cycles Design of Refrigeration system – Compressor, Expansion unit, Accumulator, Evaporator, Condenser, Basic of Duct design, Vapour Absorption and Compression Refrigeration system Design of Air Conditioning system – Types of system– Window, split, centralised., Cooling tower etc. Latest refrigeration and their examples.
10.	**Parts of Vehicles** – Engine, Chassis, Transmission, drive assembly, alternator, axle, body, wheels, brakes, steering, suspension etc., Components of Transmission system and their functions, Recent trends in Auto mobiles
11.	**Concept of SI and CI Engines** – Carnot cycle, Reverse Carnot cycle, Otto cycle, Diesel cycle, SI Vs CI Engine
12.	**Efficiency** – Thermal, Volumetric, Mechanical, Electrical system etc.
13.	**Electrical Fundamentals** – Supply voltage, AC and DC Supply, voltage, current, inductance, resistance, capacitance, 3 phase and 1 phase supply system, electrical power, electrical energy, hv/ Iv supply, active and reactive power transfer and distribution, Reactive power consumption, Basics of Nanotechnology, Power factor improvement, Energy conservation methods
14.	**Electrical power transmission & distribution** – Substation & receiving station, earthling, substation equipment, Bus Bar, CT, PT, Protection relay numerical / digital, circuit breaker, on load isolator, offload isolator, Surge arrestor, system grounding, equipment grounding, lightening protection etc. IS 3043, Single line diagram, control circuit, Various types of power plants
15	**Insulating material** – Classification, dielectric strength, test & section (Bakelite, FRP, Teflon, PVC, HDPE, Mica, SF6, Vacuum, Oil etc).
16	**Electrical systems** – Electrification of residential installation, Electrification of Commercial installation, Electrification of Industrial installation
17	**Measurement and Control** – Basics of Measurement of Pressure, Temperature, Flow displacement etc.
18	**Electric Motors (Induction Motors)** – Principle of working, 3 phase, 1 phase

	motors, motor starting methods, selection rating, cooling and enclosures, HV/LV motors, Motor protection relay, Motor control circuits, IS325, speed control methods-V/F control, slip recovery scheme, pole changing, construction of induction motors and their applications for pump, compressor, crane, actuator, tools, Maintenance & testing.
19	**Cables and wires** – Types, construction, HV/LV cables, testing, fault finding, cable rating and selection, cable jointing, termination.
20	**Statutory requirement of electric installation** – safety precautions, safety equipment and test instrument, Indian Electricity Rules 1956 – provisions, IEEE, IEC, ESSA, Factory act, Workman compensation act, Minimum wages act
21	**Illumination (Light)** – Types of light, solar lighting, LED, CLF, HPSV, Mercury lamp, tube light etc.
22	**Principles of Digital Instruments** – Working principles of digital Voltmeter, Ammeter, Frequency meter, multimeters, Measurement of Resistance Megger Earth Test Potentiometer.
23	**Power Electronics** – SCR MOSFET, FET devices, rectifiers and inverter, SMPS, PWM convertor, application, Power amplifier
24	Batteries and UPS
25	**Electrical protection** – MCCB, ELCB etc.
26	Provision of National Building Codes on Building services & ventilation, electrical & allied installation, air conditioning, ventilation, acoustic, sound insulation and noise control, installation of lifts and escalators.
27	**Concepts of Electronics** – Diode, Triode, Semiconductor, Forward bias, Reverse bias, Transistor – NPN, PNP. Analog circuits, Digital circuits
28	**Digital Electronics** – Logic Gates, De'Morgans Theorem, Boolean Logic, Counter, Adder, Flip flops and types
29	**PLC concepts** – Basic of Ladder logic, Programming, architecture, Concept of Nano PLC
30	**SCADA** – Concept, Hardware, Software etc.
31	**Automation** – Timer, Sequencing, Logic
32	**Network Design** – Lan, MAN, WAN, Topology – Ring, Star, Bus.
33	**Data Transmission** – Single, Half duplex, Full duplex, Fibre optic concept
34	Computer Integrated Manufacturing and Technology Driven practices

35	Enterprise Resource Planning
36	Computers in Industrial Engineering
37	Internet vs Intranet

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