

Syllabus for Junior Technical Assistant (Mechanical)

1.	Manufacturing Processes	(a) Casting (b) Forging (c) Rolling (d) Extrusion (e) Machining including surface finishing
2.	Welding	(a) Types of welding (b) welding defects (c) Testing of welds (d) Brazing and soldering
3.	Theory of Machines and Machine Design	(a) Fundamentals and types of machines (b) Common mechanisms (c) Cams and followers (d) Common transmissions (e) Flywheels and governors (f) Brakes, dynamometers, clutches and bearings (g) Balancing and vibration
4.	Thermal Engineering	Energy sources Fundamentals of thermodynamics Ideal gasses Steam turbines and condensers Heat Transfer
5.	Applied Mechanics	(a) Forces and moments (b) Friction (c) Centroid and Centre of Gravity (d) Simple machines, pulleys, blocks and wheels (e) Kinetics (f) Kinematics (g) Work, power, energy
6.	Metallurgy and Material Properties	(a) Physical, Mechanical, Thermal, Electrical, Magnetic Properties etc (b) Effect of heat treatment (c) Surface hardness and hardening (d) Corrosion (e) Testing of metals (f) Lubricants and their properties
7.	Strength of Materials	(a) Stress and strain (b) Bending and shear forces (c) Bending and shear stress (d) Moment of Inertia (e) Torsion
8.	Fluid Mechanics	(a) Properties of liquids (b) Fluid dynamics (c) Classification of fluids (d) Laws related with fluid flow and dynamics (e) Turbines
9.	Basic Computer Applications	(a) Hardware and software (b) Operating systems and applications (c) Internet

10.	Basics of Electrical Engineering and Power Generation	<ul style="list-style-type: none"> (a) Electrical power generation, transmission and distribution (b) AC fundamentals (c) Measuring instruments (d) DC motors (e) AC appliances (f) Utilisation of electrical energy (g) Electrical safety
11.	Industrial Management	<ul style="list-style-type: none"> (a) Management process (b) Organisational Management (c) Human resource management (d) Material Management
12.	Metrology and Instrumentation	<ul style="list-style-type: none"> (a) Classification of instruments - range and span, accuracy and precision, reliability, calibration, hysteresis and dead zone, drift, sensitivity, threshold and resolution, repeatability and reproducibility, linearity, speed of response, fidelity and dynamic errors, overshoot. (b) Measurement of error- classification of errors, environmental errors, signal transmission errors, observation errors, operational errors. (c) Transducers : Classification of transducers- active and passive, resistive, inductive, capacitive, piezo, resistive, thermo resistive (d) Specification, selection and application for pressure, temperature, flow, humidity, displacement, velocity, force, strain, sound. (e) Control Systems (f) Measurement of displacement, flow, temperature, strain, miscellaneous. (g) Limits, fits, tolerances and gauges (h) Screw thread measurement (i) Surface finish measurement
13.	Construction and functioning of various machines	<ul style="list-style-type: none"> (a) Pumps (b) Compressors (c) Boilers (d) Turbines (e) IC Engines (f) Purifiers and separators (g) Hydraulic machinery and lifting equipment etc
14.	Refrigeration and Air-conditioning	<ul style="list-style-type: none"> (a) Basics of refrigeration (b) Refrigeration cycles (c) Refrigerants (d) Components of a refrigeration system (e) Air conditioning (f) Air conditioning Systems (g) Air Distribution Systems

Syllabus for Junior Technical Assistant (Electrical)

1.	Basic electrical engineering	(a) Network theorems and laws (b) Magnetic circuits (c) AC fundamentals (d) RLC circuits
2.	Static and rotating AC&DC machines	(a) DC generators (b) DC motors (c) Transformers (d) Synchronous generators (e) Synchronous motors (f) Induction motors (g) Single phase motors
3.	Power system	(a) Generation of electrical power (b) Transmission and distribution (c) Circuit breakers (d) Cables
4.	Electrical measurements	(a) Moving coil instruments (b) Moving iron instruments (c) Measurement of current, voltage, frequency and energy (d) Bridge circuits
5.	Semiconductor Devices	(a) Semiconductors (b) Diodes and power supplies (c) Transistors
6.	Basic Computer Applications	(a) Hardware and software (b) Operating systems and applications (c) Internet

Syllabus for Senior Ship Draftsman (Mechanical)

Basic Mechanical Engineering:

- Importance of IC Engines – Classification, working, two stroke engines, four stroke engines, petrol & diesel engines.
- Various power plants: classification, working of Hydro and Thermal power plants

Engineering Graphics:

- Importance of engineering graphics – Development of Engineering graphics and CAD
- Drawing Standards: Drawing sheet size, types of lines
- Dimensioning: Dimensioning standards, notations used in engineering drawing
- Geometric construction – principles of Geometric construction
- Projections of Points, Lines and planes
- Orthographic projections – Principles of orthographic projections
- Sectional Views
- Pictorial views
- Development of surfaces

Machine Drawing:

- Fastening devices – Different types of Screw threads, Riveted joints, foundation bolts.
- Assembly and detailed drawing of coupling joints, bearing and machine parts
- Welded joints and piping layout

Production drawing:

- Limits fits and tolerance
- Surface roughness
- Interpretation of drawings - Shop floor drawings
- Process chart

Manufacturing Process:

- Properties, testing and inspection of engineering materials – Destructive testing, NDT, Fatigue & Creep test.
- Measuring instruments, gauges and comparators –
- Welding: types of welding, advantages and limitations of welding, welding joints, various types of electrodes and its coatings, gas welding, TIG, MIG, Welding defects, testing and inspection of weld joints, soldering and brazing.

Metallurgy and machine tools:

- Manufacturing of metals and alloys: ferrous and non-ferrous metals, types of cast iron, pig iron – blast furnace, cast iron – cupola furnace, chemical composition in steels, alloying elements.
- Heat Treatment process: Need of heat treatment, various heat treatment process
- Machine tools: Lathe, Drilling, Milling, Grinding etc.
- Press tools and their operations – Piercing, blanking etc.
- Importance of Jigs and fixtures
- Non-conventional machining
- Numerically controlled machines

Refrigeration & Air Conditioning

- Principles of refrigeration - Sensible heat, Latent heat, Dew point temp, DBT, WBT, Sp. Humidity, Relative humidity, COP, Carnot cycle
- Different type of heat exchangers
- Refrigerants
- Air conditioning system: Factors governing designing of room air conditioners

Strength of Materials

- Mechanical properties – Hardness, ductility, Malleability, toughness etc
- Heat treatment process – Annealing, hardening, tempering
- Stress, Strain
- Creep, Fatigue
- SFD & BMD
- Different types of beams and loadings
- Elongation due to Temperature difference
- Moment of Inertia for geometrical shapes
- Section modulus
- Relation with Torque and power
- Comparison with solid and hollow shaft transmitting same power
- Working load, Factor of safety
- Springs
- Gears – Module, Addendum, gear ratio etc.
- Pulleys, Flanges, Key joints, weld joints etc.
- Column & struts

Fluid Mechanics:

- Bernoulli's equation
- Reynolds number
- Hydraulic machines
- Venturimeter, orifice meter, pitot tube
- Co-efficient of Discharge
- Head loss due to frictions
- Different types of Flow
- Pipes sizes , material , nomenclature
- Different types of Pumps
- Velocity triangle
- Water hammer

Computer Aided Engineering Drawing

Introduction to Computer Aided Drawing : Standard menus/toolbars, navigational tools, Co-ordinate systems. Selection of drawing size and scale, creation of line using draw commands, co-ordinate points draw commands-line, ray, spline, arc, circle, ellipse, polygons, rectangle, polyline, text editing commands-erase, copy, move, offset, mirror, rotate, trim, extend, break, chamfer, fillet etc

Dimensioning systems

Method of dimensioning diameters, radii, chords, arc and angles, surface symbols.

Aligned and uni-directional system, Dimension-commands

(Standard drawings to be supplied, draw and dimension using various systems)

Orthographic Projections

Four quadrants, principal planes, projectors, objects, profile plane, designation of views, projection of a point in all quadrants, projection of straight lines and true lengths, projection of laminas like triangular, square, pentagonal, hexagonal and circular in different positions.

Isometric Projections

Isometric scale, isometric projection of regular objects like cube, prism, pyramids, cone, cylinders and sphere. Isometric projection of step block, v-block, cross, sphere above the frustum of a cone and built up solids.

Fasteners

Temporary fastenings - screw threads, bolts and nuts

Screw threads - conventional symbols for representation of internal and external threads- metric threads - left hand and right hand - multi starts threads

Syllabus for Junior Commercial Assistant

- Office procedures, office correspondence,
- Record keeping and maintenance of files, Act and Regulations,
- Use and application of computer in office, Data entry, computer network, computer devices, operating systems, Windows, MS Word, MS Excel,
- Computer maintenance,
- Office stationery, paperless office,
- ERP,
- Duties and responsibilities of Commercial Assistants,
- E-commerce,
- Environment,
- Communicative English,
- Business Communication,
- Accountancy,
- Desktop Publishing,
- Data storage,
- Cyber security

Syllabus for Welder Cum Fitter
(Welder, Fitter Structural, Fitter Pipe, Fitter Engineering, Fitter Maintenance)

Welder

Theoretical and application knowledge on

- Principle of welding
- Welding positions & WPS/PQR/WPQ
- Weld joint nomenclature and welding symbols
- Welding and cutting tools
- Welding techniques
- Welding defects and remedial actions
- Specification of Welding rods as per AWS
- Gouging methods
- Welding of Carbon steel/Al/Austenetic SS/High strength low alloys
- Pipe welding – Cu, Ni and SS material
- Modern welding procedures – SAW/ TIG/ CO2/ Electro gas welding
- FCAW process with ceramic backing
- One side welding for panel welding
- Testing of weld joints
- Safety procedures/First aid
- Types of material handling equipments

Fitter Structural

Theoretical and application knowledge on

- Sheet metal terms like folding/bending/seaming etc
- Steel plates and its grades
- Welding- types of welding - distortion and remedies
- Line heating
- Metals and alloys- Characteristics
- SM methods/tools/ usage
- Types of Sheet Metal joints and specific usage
- Methods of laying out pattern/Development
- Alignment and fit up of plates/blocks using plates of various thicknesses
- Oxy acetylene / plasma cutting
- Plate/pipe weld joint configuration
- Safety procedures/First aid
- Types of material handling equipments

Fitter Pipe

Theoretical and application knowledge on

- Tools -Marking /Fitting / Fastening
- Marking and developing
- Method of joining - Welding/Soldering/Brazing
- Pipe fittings/joints and their usage

- Pipe Classes and Grades
- Properties of Steel/Alloys
- Numerical ability - Mass/Volume/Density/unit conversion/unit system/ Ratio/ Proportion/ Mensuration
- Material estimation for the piping layout
- Piping symbols
- Template and their preparation
- Hydrostatic/hydraulic testing of Piping systems
- Erection of piping systems and valves
- Pipe fastening methods and bending of pipes
- Safety procedures /First aid
- Types of material handling equipments

Fitter Engineering

Theoretical and application knowledge on

- Tools - Bench wise/Files etc
- Marking and measuring tools
- Limits/Fits/Tolerance
- Numerical ability – Mass/Volume/Density/unit conversion/unit system
- Shaft alignment
- Erection & commissioning of equipments
- Valve timing/Tappet clearance
- Decarbonising
- Fasteners and torque tightening
- Engine systems
- Engine type and functions
- I/C Engines and its parts
- Types of bearings and its uses
- Safety procedures /First aid
- Types of material handling equipments

Fitter Maintenance

Theoretical and application knowledge on

- Tools Bench wise/Files etc
- Marking and measuring tools
- Limit/Fits/Tolerance
- Numerical ability – Mass/Volume/density/unit conversion/unit system
- Physical properties of metals and specific usage
- Methods for removing the broken nuts
- Drilling /reaming/horning/Counter sinking
- Types of nuts and locking devices
- Types of valves and maintenance
- Bearings and pulleys
- Overhauling of machineries
- Types of maintenance
- Shaft alignment and shaft sighting
- Bedding or Chocking of machinery foundations
- Safety procedures /First aid
- Types of material handling equipments

Syllabus for Fitter (Electrical)

Theoretical and application knowledge on

Fundamentals of electricity: various laws of electricity and its applications, Basic electrostatics & electro dynamics, primary and secondary cells, magnetic and capacitive circuits, power and power factor, polyphase system, measuring instruments, measurement of power and energy.

Electrical appliances and wiring:

- domestic appliances- lighting, various types of lamps, wiring circuits
- domestic and industrial, earthing, regulated power supply, maintenance of domestic appliances, IEE rules.

Electrical machines: D.C generators & DC motors- characteristics and applications, speed control and testing, transformers& autotransformers- losses and testing, alternators, single phase& 3 phase motors, starter and internal connection diagrams.

Basic electronics: active and passive electronic components, rectifier circuits, characteristics of transistors, amplifiers, OPAMP, oscillators, types and application of SCR,UJT, TRIAC, DIAC, microprocessor etc, digital electronics.

Winding of machines: fundamental terms used in windings, winding of transformers, motors, armature winding, material used, and method of connection.

Electrical Switchgear: principle, operation & application of Fuses, MCCB, Protective relays, ELCB.

- safety for handling electrical equipments/ wiring/ applications
- statutory requirements while handling electrical applications

Syllabus for Painter

Theoretical and application knowledge on

- Types of Surface Preparation and application methods for marine painting.
- General awareness of tools & equipment for surface preparation and painting.
- Corrosion.
- Types of Paints and paint systems
- HSE & PPE-Marine paints & Surface preparation.
- Coating defects – its rectification

Syllabus for Shipwright Wood

Theoretical and application knowledge on

Wood working terminologies – Wood working machineries (portable & stationary) – its application & routine maintenance. Various hand tools- measuring instruments for wood working and its relative advantages – Wood preservation & seasoning- Timber identification – Defects in timber – Understanding measurements & tolerances – Knowledge of various wood working joints, furniture fabrication appropriate application and their relative merits & demerits – Knowledge of laminate material, hardware items, & its relative merits – Application of adhesives & finishing agents – Knowledge of modern modular assembly & interior architects and model developments & docking including block setting in marine field (Both new building projects & repair).

• **Industrial Safety**

Awareness on Safety & PPEs - Importance of house keeping