



Indian Coast Guard Navik GD / Navik DB / Yantrik Syllabus 2021

➤ COAST GUARD NAVIK / YANTRIK ELIGIBILITY

Navik General Duty	10+2 Passed with Maths and Physics.
Navik Domestic Branch	10th Class Pass
Yantrik	10th Class Pass with Diploma in Electrical / Mechanical / Electronics and Telecommunication (Radio / Power) Engineering.

➤ COAST GUARD NAVIK / YANTRIK SELECTION PROCESS:

The selection of recruits is based on an all India order of merit on their performance in Stage-I, II, III & IV.

- ★ Stage I : Written Exam
- ★ Stage II : PFT and DV
- ★ Stage III : Medical
- ★ Stage IV : Original Document Verification

➤ Section Wise : Written Exam

Exam	Exam Details	Subject
Section I	60 Q. : 60 Marks in 45 Min	Math – 20, Science – 15, English – 15, Reasoning – 10, GK – 5
Section II	50 Q. : 50 Marks in 30 Min.	Math – 25, Physics – 25
Section III	50 Q. : 50 Marks in 30 Min.	Electrical Engg. – 50
Section IV	50 Q. : 50 Marks in 30 Min.	Electronics Engg – 50
Section V	50 Q. : 50 Marks in 30 Min.	Mechanical Engg – 50



➤ **Stage I : Written Exam**

- ★ The question paper for section I, II, III, IV & V will be objective type with four options.
- ★ There is no negative marking in the written examination test.

Post Name	Written Test
Navik DB	Section I
Navik GD	Section I + II
Yantrik (Mechanical)	Section I + III
Yantrik (Electrical)	Section I + IV
Yantrik (Electronics)	Section I + V

➤ **Stage II : Physical Fitness Test**

- ★ 1.6 Km run to be completed in 7 minutes.
- ★ 20 Squat ups (Uthak Baithak).
- ★ 10 Push-up.
- ★ Height : 157 CMS Minimum



Navik GD/ DB & Yantrik Syllabus : Section I:

➤ **Science :**

- Nature of Matter, Universe (Planets / Earth / Satellites / Sun), Electricity and its application.
- Force and Gravitation, Newton's Laws Of Motion, Work, Energy and Power.
- Heat, Temperature, Metals and Non-Metals, Carbon and its Compounds, Measurements in Science, Sound & Wave Motion, Atomic Structure.

➤ **Mathematics:**

- Mathematical Simplification, Ratio and Proportion, Algebraic Identities, Linear Equations and Polynomials, Simultaneous Equations, Basic Trigonometry.
- Simple Mensuration, Geometry, Measures of Central Tendency (Average, Median and Mode).
- Interest, Profit, Loss and Percentage, Work, Time, Speed and Distance.

➤ **English:**

- Passage, Preposition, Correction of sentences, Change active to passive/passive to active voice.
- Change direct to indirect/indirect to direct, Verbs/Tense/Non Finites, Punctuation.
- Substituting phrasal verbs for expression, Synonyms and Antonyms, Meanings of difficult words.
- Use of adjectives, Compound preposition, Use of pronouns.

➤ **General Awareness:**

- Geography: Soil, Rivers, Mountains, Ports, Inland, Harbours.
- Culture and Religion, Freedom Movement, Important National Facts about India, Heritage, Arts and Dance.
- History, Defence, Wars and neighbours, Awards and Authors, Discoveries, Diseases and Nutrition.
- Current Affairs, Languages, Capitals and Currencies, Common Names, Full Forms and Abbreviations.
- Eminent Personalities, National Bird / Animal / Sport / Flower / Anthem / Song/ Flag / Mountains.
- Sports: Championships / Winners /Terms / Number of Players.

➤ **Reasoning:**

- Spatial, Numerical Reasoning & Associative Ability, Sequences, Spellings Unscrambling, Coding and Decoding



Navik GD Syllabus : Section II:

➤ **Physics :**

- Physical world and measurement, Kinematics, Laws of Motion, Work, Energy and Power. Newtons laws and applications, circular motion.
- Motion of System of particles and rigid body, gravitation, Property of Bulk Matter, thermodynamics, behavior of perfect gas and kinetic theory, Oscillation and Waves.
- Electrostatics, Current Electricity, Magnetic Effects of current and magnetism, Electromagnetic Induction and alternating currents, Electromagnetic Waves.
- Optics, Dual Nature of matter and radiation, Atom and Nuclei.
- Electronic devices, Communicating systems.

➤ **Mathematics :**

• **Sets, Relations and Functions**

Set, Relations and Functions trigonometric functions.

• **Algebra**

Principle of Mathematical induction, complex numbers and quadratic equations, linear inequalities, permutation and combinations, binomial theory, sequence and series, Matrices, determinants.

• **Vector And Three Dimensional**

• **Geometry**

Vectors, and three dimensional geometry

• **Liner Programming**

• **Coordinate Geometry** –

Straight lines, conic section, introduction to three-dimensional geometry.

• **Calculus**

Limits and derivatives, Continuity and differentiability, Applications and derivatives, Integrals, applications of the integrals, differential equations.

• **Mathematical Reasoning Probability**

Statistics, Probability. Mathematical Simplification, Ratio and Proportion, Algebraic Identities, Linear Equations and Polynomials, Simultaneous Equations, Basic Trigonometry.

• **Relations And Functions**

Relations and Functions, inverse trigonometric functions. Simple Mensuration, Geometry, Measures of Central Tendency (Average, Median and Mode)



Yantrik Electrical Engineering : Section III:

➤ **Basic concepts**

- Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.

➤ **Circuit law**

- Kirchhoff's law, Simple Circuit solution using network theorems.

➤ **Magnetic Circuit**

- Concepts of flux, EMF, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.

➤ **AC Fundamentals**

- Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly Phase system – star and delta connection, 3 phase power, DC and sinusoidal response of R-L and R-C circuit.

➤ **Measurement and measuring instruments**

- Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving coil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.

➤ **Electrical Machines**

- (a) D.C. Machine – Construction, Basic Principles of D.C. motors generators and their characteristics, speed control and starting of D.C. Motors. Method of braking motor, Losses and efficiency of D.C. Machines.
- (b) 1 phase and 3 phase transformers – Construction, Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. Tests, Losses and efficiency. Effect of voltage, frequency and wave form on losses. Parallel operation of 1 phase / 3 phase transformers. Auto transformers.



- (c) 3 phase induction motors, rotating magnetic field, principle of operation, equivalent circuit, torquespeed characteristics, starting and speed control of 3 phase induction motors. Methods of braking, effect of voltage and frequency variation on torque speed characteristics, Fractional Kilowatt Motors and Single Phase Induction Motors: Characteristics and applications.
- **Synchronous Machines**
 - Generation of 3-phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power. Starting and applications of synchronous motors.
- **Generation, Transmission and Distribution**
 - Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, inter-connection of power stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults.
- **Switchgears and Protection**
 - Rating of circuit breakers, Principles of arc extinction by oil and air, H.R.C. Fuses, Protection against earth leakage / over current, etc. Buchholz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars. Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system. Cable – Different type of cables, cable rating and derating factor.
- **Estimation And Costing**
 - Estimation of lighting scheme, electric installation of machines and relevant IE rules. Earthing practices and IE Rules.
- **Utilization of Electrical Energy**
 - Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.
- **Basic Electronics**
 - Working of various electronic devices e.g. PN Junction diodes, Transistors (NPN and PNP type), BJT and JFET. Simple circuits using these devices.



Yantrik Electronics Engineering : Section IV.

➤ **Basic concepts**

- Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.

➤ **Electronic Components & Materials**

- Conductors, Semi conductor & Insulators; Magnetic materials; Jointing & Cleaning materials for U/G copper cable & OFC; Cells and Batteries (chargeable and non chargeable); Relays, Switches, MCB & Connectors.

➤ **Electronic Devices and Circuits**

- PN Junction diodes, thyristor; Diode and triode circuits; Junction Transistors; Amplifiers; Oscillator; Multivibrator, counters; Rectifiers; Inverter and UPS.

➤ **Digital Electronics**

- Number System & Binary codes; Boolean Algebra & Logic gates; Combinational & Sequential logic circuits; A/D & D/A converter, counters; Memories.

➤ **Linear Integrated Circuit**

- Introduction to operational Amplifier; Linear applications; Non Linear applications; Voltage regulators; Timers; Phase lock loop.

➤ **Microprocessor and Microcontroller**

- Introduction to microprocessor, 8085 microprocessor working; Assembly Language programming; Peripherals & other microprocessors; Microcontrollers.

➤ **Electronic Measurements**

- Measuring systems; Basic principles of measurement; Range Extension methods; Cathode ray oscilloscope, LCD, LED panel; Transducers.

➤ **Communication Engineering**

- Introduction to communication; Modulation techniques; Multiplexing Techniques; Wave Propagation, Transmission line characteristics, OFC; Fundamentals of Public Address systems, Electronic exchange, Radar, Cellular and Satellite Communication.



➤ **Data communication and Network**

- Introduction to data communication; Hardware and interface; Introduction to Networks and Networking devices; Local Area Network and Wide area network; Internet working.

➤ **Computer Programming**

- Programming concepts; Fundamentals of 'C' and C ++; Operators in 'C' and C ++; Control Statements; Functions, Array String & Pointers, File Structure; Data Structure and DBMS.

➤ **Basic Electrical Engineering**

- DC Circuits; AC fundamentals; Magnetic, Thermal and Chemical effects of Electric current; Earthing – Installation, Maintenance, Testing.

Yantrik Mechanical Engineering : Section V.

➤ **Engineering Mechanics**

- Resolution of forces, Equilibrium and Equilibrant, parallelogram law of forces, triangle law of forces, polygon law of forces and Lami's theorem, couple and moment of a couple, condition for equilibrium of rigid body subjected to number of coplanar non-concurrent forces, definition of static friction, dynamic friction, derivation of limiting angle of friction and angle of repose, resolution of forces considering friction when a body moves on horizontal plane and inclined plane, calculation of moment of inertia and radius of gyration of :
 - (a) I-Section (b) channel section (c) T-Section (d) L-Section (Equal & unequal lengths) (e) Z-Section
 - (f) Built up sections (simple cases only), Newton's laws of motion (without derivation), motion of projectile, D'Alembert's principle, definition law of conservation of energy, law of conservation of momentum.

➤ **Material Science**

- Mechanical properties of engineering materials – tensile strength, compressive strength, ductility, malleability, hardness, toughness, brittleness, impact strength, fatigue, creep resistance. Classification of steels, mild steel and alloy steels. Importance of heat treatment. Heat treatment processes – annealing, normalizing, hardening, tempering, carburizing, nitriding and cyaniding



➤ **Strength of Materials**

- Stress, strain, stress strain diagram, factor of safety, thermal stresses, strain energy, proof resilience and modulus of resilience. Shear force and bending moment diagram – cantilever beam, simply supported beam, continuous beam, fixed beam. Torsion in shafts and springs, thin cylinder shells.

➤ **Machining**

- Working principle of lathe. Types of lathes – Engine lathe – construction details and specifications. Nomenclature of single point cutting tool, geometry, tool signature, functions of tool angles. General and special operations – (Turning, facing, taper turning, thread cutting, knurling, forming, drilling, boring, reaming, keyway cutting), cutting fluids, coolants and lubricants. Introduction to shaper, slotter, planer, broaching, milling and manufacture of gears, heat treatment process applied to gears.

➤ **Welding**

- Welding – Introduction, classification of welding processes, advantages and limitations of welding, principles of arc welding, arc welding equipment, choice of electrodes for different metals, principle of gas (oxy-acetylene) welding, equipment of gas welding, welding procedures (arc & gas), soldering and brazing techniques, types and applications of solders and fluxes, various flame cutting processes, advantages and limitations of flame cutting, defects in welding, testing and inspection modern welding methods, (submerged, CO₂, atomic – hydrogen, ultrasonic welding), brief description of MIG & TIG welding.

➤ **Grinding & Finishing Process**

- Principles of metal removal by grinding, abrasives, natural and artificial, bonds and binding processes, vitrified, silicate, shellac rubber, grinding machines, classification: cylindrical, surface, tool & cutter grinding machine, construction details, relative merits, principles of centreless grinding, advantages & limitations of centreless grinding work, holding devices, wheel maintenance, balancing of wheels, coolants used, finishing by grinding, honing, lapping, super finishing, electroplating, basic principles – plating metals, applications, hot dipping, galvanizing tin coating, parkerising, anodizing, metal spraying, wire process, powder process and applications, organic coatings, oil base paint, lacquer base enamels, bituminous paints, rubber base coating.



➤ **Metrology**

- Linear measurement – Slip gauges and dial indicators, angle measurements, bevel protractor, sine bar, angle slip gauges, comparators (a) mechanical (b) electrical (c) optical (d) pneumatic. Measurement of surface roughness; methods of measurements by comparison, tracer instruments and by interferometry, collimators, measuring microscope, interferometer, inspection of machine parts using the concepts of shadow projection and profile projection.

➤ **Fluid Mechanics & Hydraulic Machinery**

- Properties of fluid, density, specific weight, specific gravity, viscosity, surface tension, compressibility capillarity, Pascal's law, measurement of pressures, concept of buoyancy. Concept of Reynold's number, pressure, potential and kinetic energy of liquids, total energy, laws of conservation, mass, energy and momentum, velocity of liquids and discharge, Bernoulli's equation and assumptions, venturimeters, pitottube, current meters. Working principle & constructional details of centrifugal pump, efficiencies – manometric efficiency, volumetric efficiency, mechanical efficiency and overall efficiency, cavitation and its effect, working principle of jet & submersible pumps with line diagrams.

➤ **Industrial Management**

- Job analysis, motivation, different theories, satisfaction, performance reward systems, production, planning and control, relation with other departments, routing, scheduling, dispatching, PERT and CPM, simple problems. Materials in industry, inventory control model, ABC Analysis, Safety stock, re-order, level, economic ordering quantity, break even analysis, stores layout, stores equipment, stores records, purchasing procedures, purchase records, Bin card, Cardex, Material handling, Manual lifting, hoist, cranes, conveyors, trucks, fork trucks.

➤ **Thermal Engineering**

- Laws of thermo dynamics, conversion of heat into work vice versa , laws of perfect gases, thermo dynamic processes – isochoric, isobaric, isothermal hyperbolic, isentropic, polytrophic and throttling, modes of heat transfer, thermal conductivity, convective heat transfer coefficient, Stefan Boltzman law by radiation and overall heat transfer coefficient. Air standards cycles – Carnot cycle, Otto cycle, Diesel cycle, construction and working of internal combustion engines, comparison of diesel engine and petrol engine. Systems of internal combustion engine, performance of internal combustion engines. Air compressors their cycles refrigeration cycles, principle of a refrigeration plant.