Information Brochure pertaining to Recruitment of Enrolled Persons in Indian Coast Guard

1. Indian Coast Guard is an Armed Force of the Union under Ministry of Defence. ICG is a multi - mission force, conducting round-the-year operations for the protection of our national maritime boundaries. The recruitment of Enrolled Persons in the ICG is conducted through Coast Guard Enrolled Persons Test (CGEPT) to following posts: -

1.1. Navik (General Duty)
1.2. Navik (Domestic Branch)
1.3. Hygienist-I
1.4. Yantrik (Electrical)
1.5. Yantrik (Mechanical)
1.6. Yantrik (Electronics)

2. The current recruitment procedure is divided into various stages and elaborate activities take place in each stage. The brief outline of each stage is enumerated in the succeeding paragraphs.

2.1. Stage-I Computer Based Examination at various cities across the country.

2.2. Stage-II Stage-II is conducted at designated ICG premises only. Currently, there are nine recruitment centres which are Gandhinagar, Chennai, Visakhapatnam, Goa, Kochi, Mangalore, Kolkata, Bhubaneswar and Noida. It is only qualifying in nature and comprises following major activities which are common for all irrespective of cadre or caste category of candidates: -

2.2.1. A Basic Identity Check.

2.2.2. Physical Fitness Test (PFT). A physical fitness test with standards mentioned at para 6 below.

2.2.3. Basic written examination/ Assessment & Adaptability Test.

2.2.4. Document Verification

2.2.5. Recruitment Medical Examination.

2.3. Stage-III (Induction and Enrolment process) The procedures conducted during Stage-III at INS Chilka are mentioned below.

2.3.1. Aadhar based verification
2.3.2. Biometric Verification of candidates
2.3.3. Document Verification of all original documents

2.3.4. Pre-Enrolment Medical. Candidate are examined for final medicals.

2.4. Enrolment. On completion of all the above formalities the candidates are enrolled into ICG and their training commence at INS Chilka.

3. **Eligibility Conditions.** MALE and FEMALE INDIAN CITIZENS possessing educational qualifications and age as prescribed below are eligible to apply.

3.1. Post Wise Educational Qualification.

3.1.1. Navik (General Duty). Class 12th passed with Maths and Physics from an education board recognized by Council of Boards for School Education (COBSE).

3.1.2. Navik (Domestic Branch). Class 10th passed from an education board recognized by Council of Boards for School Education (COBSE).

3.1.3. Hygienist-I. Matriculation OR Industrial Training Institute (ITI) OR equivalent from Board of Education recognised by the Central/ State Government.

3.1.4. Yantrik. Class 10th passed from an education board recognized by Council of Boards for School Education (COBSE) **AND** Diploma in Electrical/ Mechanical / Electronics/ Telecommunication (Radio/Power) Engineering of duration 03 or 04 years approved by All India Council of Technical Education (AICTE).

OR

Class 10th & Class 12th passed from an education board recognized by Council of Boards for School Education (COBSE) **AND** Diploma in Electrical/ Mechanical / Electronics/ Telecommunication (Radio/Power) Engineering of duration 02 or 03 years approved by All India Council of Technical Education (AICTE).

Note: - List of equivalent diploma for recruitment in Yantrik cadre in Electrical, Mechanical and Electronics & Telecommunication (Radio/Power) Engineering (Engg) branch as mentioned below: -

Electrical Engineering (Diploma)	**Mechanical Engineering (Diploma)**	**Electronics / Telecommunication (Radio/ Power) Engineering (Diploma)**

Electrical and Electronics (Power System)	Marine Engg/ Marine Engg and Systems	Advanced Electronics and Communication Engg
Electrical and Electronics Engg	Mechanical Engg	Electronic Instrumentation and Control Engg
Electrical and Instrumentation Engg	Mechanical Engg (Production)	Electronics Engg
Electrical and Mechanical Engg	Mechanical Engg (Automobile)	Electronics (Fibre Optics)
Electrical Engg	Mechanical Engg (Refrigeration and Air Conditioning)	Electronics and Communication Engg
Electrical Engg (Electronics and Power)	Mechanical Engg (Repair & Maintenance)	Electronics and Electrical Engg
Electrical Engg (Industrial Control)	Production Engg	Electronics and Telecommunication Engg
Electrical Engg (Instrumentation and control)	Ship building Engg	
Electrical Power System Engg		

3.2. Post wise age Relaxation Minimum 18 years and maximum 22 years. Further, applicable age relaxations are as follows: -

Ser.	Category	Relaxation
1.	OBC	03 years
2.	SC/ST	05 years

4. Question Paper format and syllabus for conduct of Computer Based Examination (The format is tentative in nature and SSC/ICG may vary as per requirements)

4.1. Format of Question Paper

Ser. No.	**Subject**	**Navik(DB) /Hygienist-I**	**Navik (GD)**	**Yantriks**
1.	10th standard Maths	25	00	00
2.	10th standard English	25	15	15

ICG

3.	10th standard Science	15	00	00
4.	General Knowledge	10	10	10
5.	General Reasoning	25	15	15
6.	12th standard Maths	--	30	--
7.	12th standard Physics	--	30	--
8.	Diploma level Electrical/ Mechanical/ Electronics Engineering syllabus	--	--	60

Note: - The passing marks criteria for all posts for respective categories are as follows: -

Ser. No.	Category	Passing marks
1.	UR/EWS/OBC	40
2.	SC/ST	35

4.2. Syllabus pertaining to each subject is as follows: -

4.2.1. Syllabus pertaining to 10th standard Mathematics for preparation of question paper of **Navik(DB)/ Hygienist-I**: -

Number & Arithmetic: Number System, Percentage, Ratio, Average, Profit & Loss, SI/CI. **Algebra**: Polynomials, Linear Equations, Quadratic Equations, AP, Algebraic Expressions. **Geometry & Mensuration**: Triangles, Circles, Areas, Surface Areas & Volumes. **Trigonometry & Coordinate Geometry**: Trigonometry, Heights & Distances, Coordinate Geometry. **Data Handling**: Statistics, Probability, Tables and Graph. **Applied Mathematical Reasoning**: Time & Work, Speed & Distance, Measurement, Mathematical Problem Solving

4.2.2. Syllabus pertaining to 10th standard **English** for preparation of question paper of **Navik(DB)/ Navik(GD)/Hygienist-I/Yantriks**: -

Reading Comprehension: Unseen passages, inference, main idea, vocabulary in context. **Grammar:** Tenses, SVA, articles, prepositions, conjunctions, modals, voice, narration. **Vocabulary:** Synonyms, antonyms, spelling, idioms, one-word substitution, word formation. **Sentence & Language Usage:** Error detection, sentence correction, completion, transformation. **Functional English:** Cloze test, dialogue, rearrangement, communication. **Basic Literature Awareness:** Theme, literary devices, prescribed-level understanding

4.2.3. Syllabus pertaining to 10th standard **Science** for preparation of question paper of **Navik(DB)/ Hygienist-I**: -

Physics: Light, Human Eye, Electricity, Magnetism, Energy. **Chemistry:** Reactions, Acids/Bases/Salts, Metals, Carbon, Periodic Classification. **Biology:** Life Processes, Control & Coordination, Reproduction, Heredity & Evolution. **Environment & Ecology:** Ecosystem, Food Chain, Pollution, Natural Resources, Sustainability. **Everyday Science:** Scientific applications in daily life. **Scientific Measurement & Reasoning:** Units, measurement, experiments, data interpretation, safety

4.2.4. Syllabus pertaining to **General Knowledge** for preparation of question paper of **Navik(DB)/ Navik(GD)/ Hygienist-I/ Yantriks**: -

Indian History & National Movement: Ancient, Medieval, Modern India, Freedom Movement. **Indian Polity & Constitution:** Constitution, Rights, Duties, Parliament, Judiciary, Local Government. **Geography:** India, World Geography, Resources, Agriculture, Climate. **Economy & Development:** Basic economics, Banking, Agriculture, Development. **General Science & Technology:** Everyday science, scientific developments, space, digital awareness. **Environment & Ecology:** Biodiversity, pollution, climate, conservation. **Art, Culture & Heritage:** Dance, music, literature, monuments, festivals. **Sports, Awards, Books & Important Days. National & International Organisations:** Indian/international institutions and world affairs. **Current Affairs:** National, international, economy, science, sports, environment.

4.2.5. Syllabus pertaining to **General Reasoning** for preparation of question paper of **Navik(DB)/ Navik(GD)/ Hygienist-I/Yantriks**: -

Verbal & Logical Reasoning: Analogy, Classification, Series, Coding-Decoding, Blood Relations, Direction, Ranking. **Analytical Reasoning:** Syllogism, Statement-Conclusion, Assumption, Cause-Effect, Assertion-Reason, Decision Making. **Arrangement & Problem Solving:** Puzzles, Seating Arrangement, Scheduling, Logical Sequence, Rule-Based Problem. **Non-Verbal Reasoning:** Figure Series, Analogy, Classification, Embedded Figures, Figure Completion, Counting Figures. **Spatial Reasoning:** Mirror/Water Images, Paper Folding, Cube/Dice, Spatial Visualization. **Basic Critical Reasoning:** Data Sufficiency, Inference, Logical Consistency, Relevant/Irrelevant Information.

4.2.6. Syllabus pertaining to **12th standard Physics** for preparation of question paper of **Navik (GD)**: -

Electrostatics

Electric charges, Conservation of charge, Coulomb's law-force between two- point charges, forces between multiple charges; superposition principle and continuous charge distribution, electric dipole.

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

Electric field, electric field lines electric field due to a point charge, electric field due to a dipole, torque on a dipole in an uniform electric field.

Electric flux, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.

Current Electricity

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law, V-I characteristics (linear and nonlinear), electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance, Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel.

Kirchhoff's rules, Wheatstone bridge.

Magnetic Effects of Current and Magnetism

Concept of magnetic field, Oersted's experiment. Biot - Savart law and its application to the current carrying circular loop.

Ampere's law and its applications to infinitely long straight wire. The solenoid, force on a moving charge in uniform magnetic and electric fields.

Force on a current-carrying conductor in a uniform magnetic field, force between two parallel current-carrying conductors-definition of ampere, current loop as a magnetic dipole and its magnetic dipole moment, torque experienced by a current loop in uniform magnetic field.

Moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter.

Bar magnet, bar magnet as an equivalent solenoid, magnetic field lines, magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, torque on a magnetic dipole (bar magnet) in a uniform magnetic field.

Magnetic properties of materials- Para-, Dia- and Ferro – magnetic substances with examples, Magnetization of materials, effect of temperature on magnetic properties.

Electromagnetic Induction and Alternating Currents

Electromagnetic induction; Faraday's laws, induced emf and current; Lenz's Law, Self and mutual induction.

Alternating currents, peak and rms value of alternating current/voltage; reactance and impedance; LCR series circuit, phasors, resonance, power in AC circuits, power factor, wattless current.

AC generator, Transformer.

Electromagnetic Waves

Concept of displacement current.

Electromagnetic waves, their characteristics, and their transverse nature.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, and gamma rays) including elementary facts about their uses.

Optics

Reflection of light, spherical mirrors, mirror formula, refraction of light, total internal reflection and optical fibers, refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, magnification, power of a lens, combination of thin lenses in contact, refraction and dispersion of light through a prism.

Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

Wave front and Huygen's principle, reflection and refraction of plane waves at a plane surface using wave fronts.

Proof of laws of reflection and refraction using Huygen's principle.

Coherent sources and interference of light, Young's double slit experiment and expression for fringe width.

Diffraction due to a single slit, width of central maxima.

Dual Nature of Matter and Radiation

Matter waves-wave nature of particles, de-Broglie relation.

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light. Experimental study of photoelectric effect.

Atoms and Nuclei

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model of hydrogen atom, Expression for radius of an orbit, velocity and energy of electron in an orbit, hydrogen line spectra (qualitative treatment only).

Composition and size of nucleus, atomic number, atomic mass number, isotopes, isobars and isotones, nuclear force, Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear fusion.

Electronic Devices

Energy bands in conductors, semiconductors and insulators (qualitative ideas only).

Intrinsic and extrinsic semiconductors, p-type and n-type, p-n junction Semiconductor diode its I-V characteristics in forward and reverse bias.
Application of junction diode -diode as a rectifier.

4.2.7. Syllabus pertaining to **12th standard Mathematics** for preparation of question paper of **Navik(GD)**: -

Sets and Logic Set: Representing sets in different ways. Subsets. Different types of sets e.g. universal set, finite or infinite sets, intervals in real line. Various operations on sets. Properties of various operations on sets. Venn diagram. Ordered pairs. Cartesian products.
Relations & functions: Type of relations. Equivalence relation. Functions. Types of functions. Composition of functions, inverse of a function. Real valued functions: algebraic operations of real valued functions, different types of real valued functions (e.g. polynomial, rational, modules, signum, etc), graphical representation of real valued function
Basic counting techniques Permutations and Combinations: Fundamental principles of counting. Factorial n. Permutations and combinations- derivation of formulae and their connections. Applications.
Binomial Theorem: Binomial theorem for positive integral indices. Pascal's triangle. General and middle term in binomial expansion. Applications.
Complex numbers, linear and quadratic equations
Complex Numbers:
Motivation for complex numbers. Representation of complex numbers in the plane as a pair of real numbers and their representation of the form a+ib. Polar representation and the Argand plane. Algebra of complex numbers. Modulus and conjugate of a complex number. Statement of the Fundamental Theorem of Algebra.
Quadratic Equations: Quadratic equations and their solutions. Relation between roots and the coefficients of quadratic equations.
Linear Inequalities: Inequalities, Algebraic solution of linear inequalities in one variable and their graphical representation.
Trigonometric functions:
Measures of angles and their conversions. Trigonometric functions, identities, and their geometric interpretations. Applications of trigonometric equations. Inverse trigonometric functions and properties. Graphs of trigonometric functions.
Vectors
Vectors and scalars. Magnitude and direction of a vector. Direction cosines/ ratios. Types of vectors. Position vector. Negative and components of a vector. Addition of vectors. Multiplication of a vector by a scalar. Position vector of a point dividing a line segment in the given ratio. Dot and cross products of vectors. Projection of a vector on another vector/ line.

Matrices & determinants

Matrices:

Concept, notation, order, equality, transpose of a matrix, types of matrices, simple properties of addition, multiplication, scalar multiplication, and multiplication of matrices. Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists. Applications of matrices.

Determinants: Determinant of a square matrix (up to 3 X 3 matrices), properties of determinants, minors, cofactors, and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Applications of determinants**.**

Coordinate geometry

Cartesian system of rectangular coordinates in a plane. Shifting of origin.

Straight Lines: Slope of a line and angle between two lines. Various forms of equations of a line. General equation of a line. Distance of a point from a line.

Conic Sections: Sections of a cone: Circles, ellipse, parabola, hyperbola, a point, a straight line, and a pair of intersecting lines as a degenerated case of a conic section. Standard equations and simple properties of parabola, ellipse, and hyperbola. Standard equation of a circle, the general form of the equation of a circle.

Three-dimensional geometry

Coordinate axes and planes. Distance between points. Section formula. Direction cosines and direction ratios of a line. Various forms of the equation of a line. Angle between two lines and two planes. Shortest distance between two lines in three-dimensional space. Coplanar and skew line. Cartesian and vector equation of a plane. Distance of a point from a plane.

Sequences & series

Arithmetic and Geometric progressions. Sums of finite and infinite geometric series. Sums of finite terms in arithmetic series. Arithmetic mean (A.M.) and geometric mean (G.M.). Relation between A.M and G.M. Sums of first n-terms of the special series, for example, ∑ n, ∑ n^2 and ∑ n^3.

Limit & continuity

Limits. Continuity. Algebraic properties of limits. Algebraic properties of continuous functions. Limits and continuity of real valued functions, polynomials, rational functions, trigonometric functions, exponential functions, and inverse functions.

Differentiation

Differentiation: Definition of derivative and relating it to slope of tangent of the curve. Derivative of sum, difference, product, and quotient of functions. Derivative of some standard functions e.g. polynomial, trigonometric, inverse trigonometric, exponential, and logarithmic functions. Derivative of composite functions via chain rule.

Derivative of implicit functions and functions in parametric forms. Logarithmic derivative. Second order derivatives.

Application of Derivatives: Rate of change, increasing/decreasing functions, tangents and normals maxima and minima.

Integration

Integration: Integration as inverse process of differentiation. Integrals involving algebraic, trigonometric, exponential, and logarithmic functions. Integration of a variety of functions by substitution, by partial fractions, by parts and using trigonometric identities. Evaluation of integrals of some standard types. Fundamental theorem of calculus. Basic properties and evaluation of definite integrals. Applications of Integration: Finding the area of region under simple curves. Finding the area of the region between two simple curves.

Differential equations

Definition, order, degree. Formation of a differential equation. Solution by separation of variables. Homogeneous differential equation of first order and degree. Solution of the equations dy/dx +P y=Q where P and Q are functions of x or constant and similarly for dx/dy +P x=Q where P and Q are functions of y or constant

Statistics, Probability & Linear Programming

Statistics: Measure of dispersion; mean deviation, variance, and standard deviation of ungrouped/grouped data.

Probability: Random experiments: outcomes, sample spaces (set representation). Events: Occurrence of events, 'not', 'and' & 'or' events, exhaustive events, mutually exclusive events. Axiomatic (set theoretic) probability. Probability of an event, probability of 'not', 'and', & 'or' events. Multiplication theorem on probability. Conditional probability, independent events, total probability, Baye's theorem.

4.2.8. Syllabus pertaining to **Diploma level Mechanical Engg** for preparation of question paper of Yantrik(Mechanical): -

Ser.	Topic	Sub-topic
1.	Engineering Mechanics	Free Body Diagrams and Equilibrium Resultant of Forces Lami's Theorem Laws of Friction, Sliding and Rolling Friction Centroid of geometrical plane figures Centre of Gravity of Simple Solids
2.	Strength of Materials	Simple Stress and Strain Types of beams, Shear Force and Bending Moment Simple Bending and Deflection of Beam Torsion of Shafts Thin Cylindrical Shells
3.	Theory of Machines	Cams and Follower, Belt, Chain, Rope, Gear Drives, Gear Trains

		Flywheels and Governors, Balancing and Vibration Brakes, Dynamometers, Clutches, Bearings
4.	Machine Design	Types of Loads and Stresses, Creep and fatigue, Theories of Failure Design of Cotter Joint, Knuckle joint, Lever and Crank, Design of Screw fasteners, Bolted Joints and Welded Joints Design of Sunk key, Shaft, Couplings, Spur Gear, Power Screw Springs, Antifriction Bearing
5.	Material Science and Engineering	Crystal Structure and bonds, Iron Carbon Phase Diagram Heat Treatment of Steel, Types of Cast Iron and Steels, Major Non-Ferrous Alloys e.g. Aluminum alloys, Nickel Copper Alloys and Bearing Alloys Material properties and testing, Non-Destructive Testing Corrosion
6.	Thermal Engineering - I	Sources of Energy, Laws of Thermodynamics, Heat Pump, Heat Engine and Refrigerator Thermal Power Plant, Steam Generators, Steam Turbine-Impulse and Reaction Turbine, Cooling Tower Internal Combustion Engines-Auto, Diesel and Dual Cycles with P-V and T-s Diagrams, Types of IC Engines Air Compressor, Refrigeration and Airconditioning
7.	Thermal Engineering - II	Gas Turbine and Jet Propulsion Properties of Steam, Steam Generators, Steam Nozzle, Steam Turbine Heat Transfer - Conduction, Convection and Radiation, Heat Exchanger
8.	Fluid Mechanics and Hydraulic Machinery	Properties of Fluid, Fluid Flow, Fluid Flow through pipes, Continuity Equation Impact of Jets on plate and curved vanes Hydraulic Turbine and Power Plant Centrifugal and Reciprocating Pumps
9.	Industrial Engineering	Site Selection and Plant Layout; Work study and Work Measurement Production Planning and Control, Statistical Quality Control, Inventory Control
10.	Manufacturing Engineering	Pattern making, Molding, Casting Metal Forming, Welding-Gas, Arc and Resistance Welding, Press Working Types of lathe and Lathe Operations, Broaching Machine, Drilling, Milling Gear Making, Grinding and Finishing
11.	Metrology and Measurement	Precision, Accuracy, Sensitivity, Repeatability, Range, Calibration Linear and Angular Measurement, Comparators, Form and Surface Finish Measurement, CMM Limit, Fits and Tolerances, Interchangeability

12.	Advance Manufacturing Processes	Jigs and Fixture, Special Purpose Machine CNC Milling Machine and Machining Centre, PLC Non Traditional Machining Processes like EDM, ECM, AJM, LBM and EBM Fundamentals of CAD/CAM, Industrial Robot Configurations and FMS

4.2.9. Syllabus pertaining to **Diploma level Electronics and Telecommunication Engineering** for preparation of question paper of Yantrik (Electronics): -

Ser.	Topic	Sub-topic
1.	Engineering Mathematics	Linear Algebra: Vector space, basis, linear dependence and independence, matrix algebra, eigen values and eigen vectors, rank, null space, solution of linear equations - existence and uniqueness, least squares solution. Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series. Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems. Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stokes' theorems. Complex Analysis: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, sequences, series, convergence tests, Taylor and Laurent series, residue theorem. Probability and Statistics: Random variable (continuous and discrete), Mean, median, mode, standard deviation, combinatorial probability, probability distributions, binomial distribution, Poisson distribution, uniform distribution, exponential distribution, normal distribution; probability density function, cumulative density

		function, probability mass function, probability distribution function and their properties, joint and conditional probability.
2.	Network Analysis	Circuit Analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, Tellegen's theorem. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer theorem. Transient Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform. Linear 2-port network parameters: Z, Y, h and ABCD parameters, reciprocity and symmetry conditions, interconnections of two-port parameters (cascade, series, parallel), wye-delta transformation.
3.	Signals and Systems	Continuous-time Signals: Fourier series, Fourier transform, Laplace transform and their properties, sampling theorem, convolution and applications. Inverse transforms. Transformation of signals. Discrete-time Signals: DTFT, DFT, z-transform and their properties and inverse transform, discrete-time processing of continuous-time signals. LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response, group delay, phase delay, LTI systems in term of differential and difference equations. LTI system properties in terms of transforms
4.	Electronic Devices	Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors. Carrier Transport: Diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations. P-N junction, Zener diode, BJT, MOS capacitor, MOSFET and their circuit configurations; LED, photo diode and solar cell.
5.	Analog Circuits	Diode Circuits: Clipping, clamping and rectifiers. BJT and MOSFET Amplifiers: Biasing, AC coupling, small signal analysis, frequency response. Current mirrors and differential amplifiers. Op-amp Circuits: Amplifiers, summers,

		differentiators, integrators, active filters, Schmitt triggers and oscillators.
6.	Digital Circuits	Number Representations: Binary, integer and floating-point- numbers. Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, demultiplexers, decoders, encoders, half adder, full adder, look-ahead carry adder, multiplier, comparator Sequential Circuits: Latches and flip-flops, counters, shift-registers, finite state machines, propagation delay, setup and hold time, critical path delay. Conversion of flip flops Data Converters: Sample and hold circuits, ADCs and DACs. Semiconductor Memories: ROM, SRAM, DRAM. Computer Organization: Machine instructions and addressing modes, ALU, data-path and control unit, instruction pipelining.
7.	Control Systems	Basic control system components; Feedback and feedforward principle; Transfer function and Laplace transform; Block diagram representation and reduction principle; Signal flow graph and Mason gain formula. Transient and steady-state analysis of LTI systems, Static error coefficients, and generalized error coefficients; Frequency response; Routh-Hurwitz criterion, and Nyquist stability criteria; Bode plots, gain margin and phase margin, and root locus plots; Lag, lead and lag-lead compensation, minimum phase system; State variable model and solution of state equation of LTI systems, controllability and observability.
8.	Analog Communications	Random Processes: Auto correlation and power spectral density and their properties, wide and strict sense stationary, ergodicity, filtering of random signals through LTI systems, low pass equivalent of band pass signals. Noise: properties of white noise, thermal noise, shot noise, noise figure, noise equivalent bandwidth. Analog Communications: Amplitude modulation and demodulation, envelope detector, angle modulation and demodulation,

		efficiency of AM, spectra of AM, DSB-SC modulation and demodulation, Costas receiver, SSB-SC modulation and demodulation, FM modulation and demodulation, NBFM and WBFM, Carson's rule of bandwidth, Frequency discriminator, Phase locked loop, Noise analysis for DSB-SC and SSB-SC modulation; super heterodyne receivers.
9.	Digital Communications	Information Theory: Entropy, condition entropy, entropy rate, mutual information, capacity of binary symmetric channel and binary erasure channel, Huffman coding, Shannon Fano coding, Kraft inequality, Shannon source coding theorem, Shannon channel coding theorem. Digital Communications: PCM, DPCM, Delta modulation, Linear prediction filter, Line coding (NRZ-unipolar, RZ-unipolar, NRZ-polar, RZ-polar, Manchester) and their PSD with bandwidth. Digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth efficiency, average energy per bit, orthogonal basis representations, minimum distance. Inter-symbol interference, eye patterns, Nyquist pulse criteria, Raised cosine pulse, RRC pulse, MAP, ML detection, matched filter receiver, SNR, Cauchy Schwarz inequality, Grahm Schmidt Orthogonalization, Correlation receiver, and BER of digital modulation schemes. Fundamentals of error correction codes, block codes, Hamming codes, CRC, convolution codes.
10.	Electromagnetics	Cartesian, Cylindrical, and Spherical coordinates and their transformation; Electrostatics: Electric field and potential due to point charge, line charge, surface charge, Electric flux density and capacitance. Magnetostatics: Magnetic induction, Faraday's law, Magnetic flux density and strength, Ampere law, Gauss law, Permeability, Energy stored in magnetic field, Magnetic vector potential. Maxwell's Equations: Differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector. Plane Waves and Properties: Reflection and refraction, polarization, phase and group velocity,

		propagation through various media, skin depth. Transmission Lines: Equations, characteristic impedance, reflection coefficient, VSWR, impedance matching, impedance transformation, S-parameters, Smith chart. Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays

4.2.10. Syllabus pertaining to **Diploma level Electrical Engineering** for preparation of question paper of Yantrik (Electrical): -

Ser.	Topic	Sub-topic
1.	Fundamentals Electrical Engineering	Concepts of Electrical Circuit Elements - Resistors, Capacitors, Inductors, Batteries and the factors affecting their values and performance. Concept of Voltage, current, power, energy, flux etc. and their units. Network Soultion Methods : KCL, KVL, Node and Mesh Analysis Network Theorems: Thevenin's, Nortan's Superposition and Maximum Power Transfer Theorem
2.	Magnetic Circuits	Concepts of Flux, Reluctance, Self & Mutual Inductance, Magnetomotive force, Magnetic Circuits.
3.	A.C. Fundamentals	RMS and Average Values of Alternating Waves. Simple series and parallel A.C. Circuits, Resonance, balanced three phase circuits, Star-Delta transformation, Complex power and Power Factor in AC circuits
4.	Measurement and Measuring Instruments	Measurement of Voltage, Current, Power and Power Factor. Classification of Instruments, types of errors Galvanometer, Ammeter, Voltmeter, Wattmeter, Wheatstone Bridge, Kelvin's double bridge, Energy Meter, Megger. Constructional features and Calibration of single-phase electronic energy meter CT, PT and their uses
5.	Electrical Machines	Single Phase and Three Phase Transformers DC Machines, their types, characteristics, Losses, efficiency, applications AC Machines: Single Phase and Three Phase Induction Motors, tarting, Speed Control methods, electrical Braking and Torque-Speed characteristics

6.	Special Electric Machines and Synchronous Generators	Fractional Motors, Servomotors Armature Reaction, Parallel Operation of Generators, Synchronization
7.	Generation, Transmission and Distribution	Types of Power Stations, Load Factor, Demand Factor, and Diversity Factor Power Factor and its improvement Types of Transmission and Distribution lines, Transmission line parameters, Corona Effect and Ferranti Effect Circuit Breakers, Protection of Generators and Transformers Coaxial Cables, their ratings, efficiency
8.	Estimation & Costing	Estimation of lighting schemes Electric installation of machines and relevant IE Rules Earthing Practices and IE Rules
9.	Utilization of Electrical Energy	Illumination, Electric Heating, Electric Welding, Electroplating, Electric Traction and Drives.
10.	Basic Electronics	P N Junction Diodes, Rectifiers and Wave-Shapers, lipping, lamping BJT and FET Transistors, their characteristics, Amplifiers, Oscillators
11.	Power Electronics	Static V-I characteristics of Thyristor Firing/Gating circuits for Thyristor DC to DC conversion: Buck, Boost and Buck-Boost Converters Single phase half controlled, full controlled and midpoint-controlled rectifier

Note: - The syllabus given above is indicative and not exhaustive in nature. The same is subjected to change as per the administrative requirement of ICG.

5. TattooPolicy The policy regarding acceptability of permanent body tattoos of candidates aspiring to join the Indian Coast Guard is amplified in the succeeding paragraphs: -

5.1. **Location of Tattoo(s).** Permanent body tattoos are only permitted on inner face of forearms i.e. from inside of elbow to the wrist and on the reverse side of palm/ back (dorsal) side of hand. Permanent body tattoo on any other part of the body is not acceptable and candidate will be barred from recruitment.

5.2. **Size of Tattoo(s).** Only small innocuous tattoos that are not prejudicial to good order and military discipline are permitted e.g. religious symbols or names of near and dear ones.

5.3. **Nature of Tattoo(s).** A tattoo must not have any lewd or offensive indelible marks or figure on any part of the body. Tattoos that are indecent (grossly offensive to modesty, decency, or propriety), sexist (demean a person based on gender) or racist (degrade or demean a person based on race ethnicity or region and religion).

5.4. **Exception of Tattoo(s) on Candidates From Tribal Communities.** Candidates from tribal communities/ from tribal areas as declared by the Government of India Scheduled Tribes Orders/ Act/ Lists (amended and modified from time to time), are permitted to have permanent body tattoos on any part of the body as per existing customs and traditions of the said tribe to which a candidate belongs.

6. **Physical Fitness Standard** PFT standards applicable for both Male and Female candidates are as follows: -

Ser. No.	**Gender**	**Timings for 1.6 Km run**	**Squats (Uthak-Baithak)**	**Push-ups**	**Bent Knee Sit-ups**
	a.	b.	c.	d.	e.
1.	Male	06 min 30 sec	20	15	15
2.	Female	08 min	15	10	10

7. The candidates shortlisted for induction process will be called at INS chilka for induction process. The activities pertaining to induction process is mentioned at para 2.3. above. The candidates after qualifying the induction process will be subjected to training. The details of training for respective posts are provided below: -

7.1. The basic training will be conducted at INS Chilka followed by sea training and professional training in the allotted trade. Branch/ trade will be allocated as per the requirement of service and performance during basic training.

7.2. Basic training at INS Chilka will cover the following Subjects:

7.2.1. Academic and service subjects.
7.2.2. Sports activities
7.2.3. Outdoor training such as Parade Training, Sailing, Boat Pulling, Swimming, Trekking, Cross- Country, Firing etc.
7.2.4. Service oriented activities including maintenance of equipment, living spaces and training areas etc.

Note 1. On completion of basic training at INS Chilka, the trainee will undergo professional and sea training for a period of 06 months to 2 years or as decided by ICG.

2. Trainees are liable to be discharged as UNSUITABLE if their progress (including academic) or conduct is unsatisfactory at any time

during training. Trainees are also liable to be discharged at any stage of training if their online application or the documents are found to be falsified at any stage of recruitment.

8. **Job profile** The Enrolled Persons in ICG are the operational backbone of the service. They are responsible for sustaining sea-going operations, maintaining complex naval systems, coordinating logistics support, and safeguarding national maritime boundaries. The post wise details of day-to-day functions pertaining to various posts are as follows: -

8.1. **Navik(GD)**: - Navik (General Duty) serves onboard ships and ashore for various duties, as an Enrolled Personnel. Navik (GD) candidates are allotted specialization trade on completion of basic training at INS Chilka. The trade/ specialization (i.e. Quarter Arms, Radar Plotter, Radio Operator, Mechanical Engineer, Electrical, Store, Writer) is allotted on the performance of the candidate in the training and the requirement of the service. The trades include.

8.2. **Navik(DB)**: - The Navik (Domestic Branch) provide logistics support to the Ships Company onboard ship and ashore as Cook & Steward as mentioned below:

8.2.1. Cook: The would be required to prepare food as per menu (both vegetarian and non/vegetarian including handling of meat products) and accounting of ration. In addition, they will also be allotted other duties for efficient running of the organisation.

8.2.2. Steward: They would be required to serve food in the Officer's mess as waiters, housekeeping, maintenance and accounting of funds, wine and store handling, preparation of menu etc. In addition, they will also be allotted other duties for efficient running of the organisation.

8.3. **Hygienist-I**: - Hygienist-I post is of Sweeper/Safaiwala and duties includes maintaining hygiene, Cleaning of WCs of toilets onboard ICG ship/shore, maintenance of septic tank/sewer lines/Bathrooms onboard Indian Coast Guard Ships, Shore establishment premises. Also, the post is transferrable anywhere in India (mainland/islands) subject to the exigencies of the service. Any other duties as and when assigned by the concerned Officials.

8.4. **Yantriks**: - Yantriks serves on-board ships and aircraft as per the branch allocated to them {Mechanical, Electrical, Electronics} at INS Chilka. They are responsible to maintain all types of machinery/equipment fitted on-board Ships/ Aircraft/ Station. They are also required to maintain the adequate level of spares and accounting of spares. In addition, they will also be allotted other duties for efficient running of the organisation.

9. Pay and Allowances

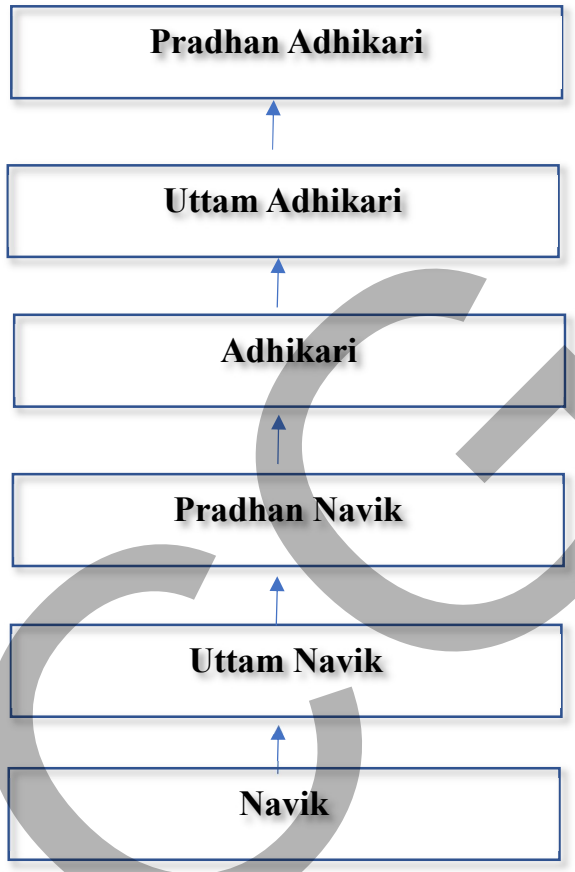
Ser.	Rank a.	Pay b.	Promotion and Perquisite c.
1.	Navik (General Duty)	On joining Indian Coast Guard, you will be placed in Basic pay of Rs. 21700/- (Pay Level-3) plus Dearness Allowance and other allowances based on nature of duty/place of posting as per the prevailing regulations.	Promotion prospects exist upto the rank of Pradhan Adhikari with pay scale Rs. 47600/- (Pay Level 8) with Dearness Allowance. Promotion to the Officer cadre is subject to suitability and performance.
2.	Navik (Domestic Branch).	Starting Basic Pay Scale for Navik (DB) is Rs. 21700/- (Pay Level-3) plus Dearness Allowance and other allowances based on nature of duty/place of posting as per the regulation enforced time-to-time.	Promotion prospects exist up to the rank of Pradhan Adhikari with pay scale Rs. 47600/- (Pay level 8) with Dearness Allowance.
3.	Hygienist-I	On joining Indian Coast Guard, you will be placed in Basic pay of Rs. 21700/- (Pay Level-3) plus Dearness Allowance and other allowances based on nature of duty/place of posting as per the prevailing regulations.	Promotion prospects exist upto the rank of Hygiene Supervisor with pay scale Rs. 35400/- (Pay Level 6) with Dearness Allowance. Promotion to the Officer cadre is subject to suitability and performance.
4.	Yantriks	On joining Indian Coast Guard, you will be placed in Basic pay Rs. 29200/- (Pay Level-5). In addition, you will be paid Yantrik pay @ Rs.6200/- plus Dearness Allowance and other allowances based on nature of duty/place of posting as per the regulation inforce time-to-time.	Promotion prospects exist upto the rank of Pradhan Sahayak Engineer with pay scale Rs. 47600/- plus Yantrik pay @ Rs. 6200/- with Dearness Allowance. Promotion to the Officer cadre is subject to suitability and performance.

10. Career Progression

10.1. **Navik (DB)/Navik(GD)** Enrolled Persons joining ICG as Navik(DB)/(GD) get optimum career progression opportunity for further

promotion to the higher ranks. The rank structures and required minimum time period for promotion to next higher rank is as follows: -

10.1.1. Rank Structure: -



10.1.2. Minimum time period in one rank

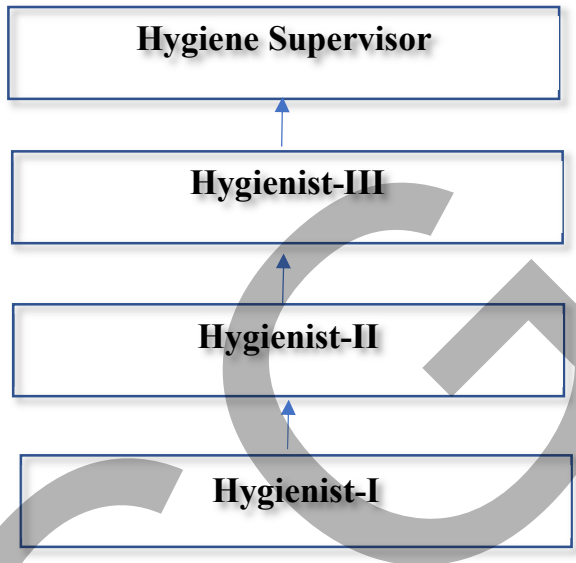
Ser	Rank a.	Minimum time period in one rank for promotion b.
1.	NAVIK – UTTAM NAVIK	5 Yrs
2.	UTTAM NAVIK – PRADHAN	4 Yrs
3.	PRADHAN NAVIK – ADHIKARI	3 Yrs
4.	ADHIKARI – UTTAM ADHIKARI	4 Yrs
5.	UTTAM ADHIKARI – PRADAHAN ADHIKARI	3 Yrs

10.1.3. **Promotion to Officer's Cadre:** The Enrolled Persons may also get opportunity for promotion to the Officer's Rank if fulfilling the requisite criteria promulgated by Indian Coast Guard from time to time.

Note: - Promotion rules are subject to change as per government regulations in vogue.

10.2. **Hygienist** Enrolled Persons joining ICG as Hygienist-I get optimum career progression opportunity for further promotion to the higher ranks. The rank structures and required minimum time period for promotion to next higher rank for Hygienist-I is as follows:

10.2.1. Rank Structure



10.2.2. Minimum time period in one rank

Ser	Rank a.	Minimum time period in one rank for promotion b.
1.	HYGIENIST-I – HYGIENIST-II	5 Yrs
2.	HYGIENIST-II – HYGIENIST-III	4 Yrs
3.	HYGIENIST-III – HYGIENE SUPERVISOR	3 Yrs

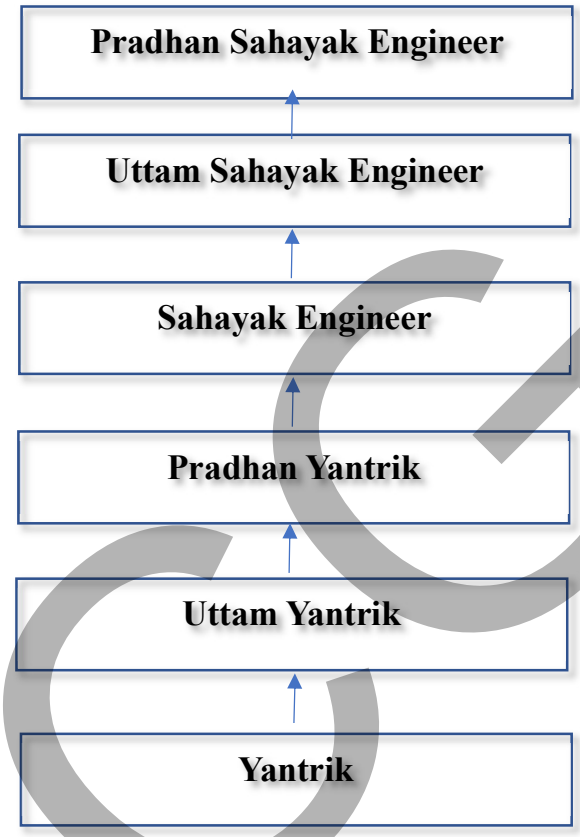
10.2.3. **Promotion to Officer's Cadre:** The Enrolled Persons may also get opportunity for promotion to the Officer's Rank if fulfilling the requisite criteria promulgated by Indian Coast Guard from time to time.

Note: - Promotion rules are subject to change as per government regulations in vogue.

10.3. **Yantrik (Mechanical, Electrical and Electronics)** Enrolled Persons joining ICG as Yantrik (Mechanical, Electrical and Electronics) get optimum career progression opportunity for further promotion to the higher ranks. The rank structures and required minimum time period for promotion to

next higher rank for Yantrik (Mechanical, Electrical and Electronics) is as follows: -

10.3.1. Rank Structure: -



10.3.2. Minimum time period in one rank

Ser	Rank a.	Minimum time period in one rank for promotion b.
1.	YANTRIK – UTTAM YANTRIK	2 Yrs
2.	UTTAM YANTRIK – PRADHAN YANTRIK	2 Yrs
3.	PRADHAN YANTRIK – SAHAYAK ENGINEER	3 Yrs
4.	SAHAYAK ENGINEER – UTTAM SAHAYAK ENGINEER	4 Yrs
5.	UTTAM SAHAYAK ENGINEER – PRADAHAN SAHAYAK ENGINEER	3 Yrs

10.3.3. **Promotion to Officer's Cadre:** The Enrolled Persons may also get opportunity for promotion to the Officer's Rank if fulfilling the requisite criteria promulgated by Indian Coast Guard from time to time.

Note: - Promotion rules are subject to change as per government regulations in vogue.

11. Facilities offered by ICG

<table>
<tr><td>
Medical</td><td>1 Serving Coast Guard Personnel and their families are entitled to free medical and dental facilities from Armed Forces Hospitals. There are also tie ups with Civil Hospitals for treatment of specialised cases, if required.

2. Post retirement, the facilities of Ex-servicemen Contributory Scheme (ECHS) is extended to ICG Personnel and their dependents at minimum one time contribution. ECHS provide cashless treatment for self & family for life at ECHS Polyclinics and empanelled premium super specialty group hospitals.</td></tr>
<tr><td>
Accommodation</td><td>Government accommodation for self & family on nominal license fee. In case if government accommodation is not provided then HRA is provided as per government rules</td></tr>
<tr><td>Clothing</td><td>Enrolled Persons are granted uniform allowance annually as per existing government rules. In addition, all enrolled Persons are also issued with certain uniforms free of cost.</td></tr>
<tr><td>
Insurance</td><td>The Coast Guard provides all Enrolled Persons with following life insurance coverage at a very minimal monthly premium.

<table><tr><th>Ser</th><th>Category</th><th>Insurance Cover</th><th>Monthly Contribution</th></tr><tr><td>1</td><td>Enrolled Persons</td><td>75 Lakh</td><td>7,5000/-</td></tr></table></td></tr>
</table>

 **Loan**	To alleviate financial hardship amongst the serving ICG Personnel various types of financial assistance in terms of loans are provided from Coast Guard Benevolent Association (CGBA) and NGIS (Naval Group Insurance Scheme) at minimal interest rate.
 **Ration**	All Enrolled Persons are entitled to free ration. Coast Guard Personnel can also seek money in lieu of ration while staying with their families as pe the existing rules.
 **CSD facilities**	Canteen facilities are provided to all serving and retired Enrolled Persons. CSD provides consumer goods of high quality to troops wherever they are, at a price cheaper than the prevailing market retail price.
 **Pension**	National Pension System (NPS) and Unified Pension Scheme (UPS) options are there for all new entrants. Other benefits on Retirement: 1. Retirement Gratuity 2. Leave Encashment 3. Survival benefits from NGIS
 **Leave**	45 days Earned leave and 08 days Casual leave every year with Leave Travel Concession (LTC) for self, family and dependent parents as per Government rules

ICG