BHARATHIARUNIVERSITY: COIMBATORE-641 046
CERTIFICATE IN DECK CADET
(For the CCII students admitted from the academic year 2016-17 onwards)

COURSE OBJECTIVES

1. To impart the knowledge on Meteorology, Navigation with help of heavenly bodies and Terrestrial objects.
2. Fixing up position, making voyage plans on different types of charts and its usage, usage of Bridge equipment's and technics of collision avoidance.
3. Handling different types of cargoes.
4. Naval Architect Ship stability and maintenance and Repair Function.

Duration : 6 Months (Fully Residential Course)

Eligibility : A Pass in SSLC Examination

SCHEME OF EXAMINATIONS :

S.No	Course Title	EXAMINATION	
		Duration Hours	Total Marks
1	**Theory 1** : Competency Meteorology	3	100
2	**Theory 2** : Competency Navigation	3	100
3	**Theory 3** : Competency Chart Work	3	100
4	**Theory 4** : Competency Bridge Equipment & Watchkeeping	3	100
5	**Theory 5** : Cargo Handling and Stowage Function	3	100
6	**Theory 6** : Practical Seamanship	3	100
7	**Theory 7** : Maintenance Repair & Function	3	100
Total			700

THEORY PAPER 1 : COMPETENCY METEOROLOGY

INTRODUCTION

Sea as a career in the Merchant Navy, scope and objectives of the course, parts of a ship using models or suitable video films, Basic types of merchant ships – General Cargo, Bulk Carrier, Container Ship and Oil Tanker, ship organization including the ranks and duties of all officers and crew on board, Introduce ship-shore related organizations & persons – ship owner, charterer, Company'ssuperintendent, Agent, Ship chandler, Stevedore, shipper, Consignee, pilot, Surveyor, Longshoreman,Repair workshop, etc.,

UNIT –I :

The Atmosphere : various layers of the atmosphere, atmospheric temperature adiabatic changes, DALR, SALR, diurnal variation of atmospheric temperature, atmospheric pressure semidiurnal variation, barometric tendency, Heat: conduction, convection, radiation, insolation, why cloudy nights are warmer than clear sky nights, green-house effect, the seasons, why Polar Regions are colder than equatorial regions, temperature zones of the world, Water vapor in the atmosphere: humidity, absolute humidity, relative humidity, saturation, dew point, meteorological application to hold ventilation, Fohn wind effect, The hydrological cycle: evaporation, condensation, precipitation, general idea of the hydrological cycle, condensation near the ground – dew, hoar frost, glazed frost, rime, types of precipitation – drizzle, rain, freezing rain / drizzle, snowflakes, snow pellets, sleet, ice pellets, hail.

UNIT –II :

Visibility : Visibility, mist, fog, haze, spray and their differences, judging and reporting visibility, types of fog – radiation fog, advection fog, smog, arctic sea smoke, orographic fog, Clouds: classification & description of the ten basic types of clouds, formation due toturbulence, orographic lifting, convection currents & frontal lifting, use International cloud Atlas and identify various types of clouds, Pressure gradient, wind and waves : isobars, pressure gradient, Coriolis force (Geostrophicforce), sea, swell, gust, squall, veering, backing, Buys Ballot's Law, Beaufort wind scale and Beaufortweather notation, descriptive terms to use to describe sea and swell, true and apparent wind theirmeaning and difference.

UNIT –III :

1. Judging wind: Explain the methods of estimating direction and force of wind at sea by the appearance of the sea and the use of the 'State of sea card'.
2. True and Apparent wind : Explain difference between true & apparent wind
3. Conduct exercises on problems involving true and apparent wind

UNIT –IV :

Pressure measuring instruments: principle, construction, corrections, errors, maintenance and precautions when using the aneroid barometer, the precision aneroid barometer and the open scale barograph, Conduct practical exercises on reading the aneroid barometer, the precision aneroid barometer and the open scale barograph, Other meteorological instruments: principle, construction, corrections, errors, maintenance and precautions when using the thermometer, the wet and dry bulb hygrometer, the Stevenson screen the whirling psychrometer.

UNIT –V :

Conduct practical exercises on reading the thermometer, the wet and dry bulb hygrometer and the whirling psychrometer, The 'Ship's Weather code': Decoding of Ship's Weather code, Conduct exercises in coding and decoding of ship's weather reports.

REFERENCES:

Marine Meteorology – Capt. Subramanian

THEORY PAPER 2 : COMPETENCY NAVIGATION

UNIT – I :
Shape of the Earth, the meaning of the terms Axis of Rotation, pole, Equator, Parallel of Latitude, Latitude, Meridian & Longitude, terms D'lat&D'long, meaning of 'Nautical Mile', term Departure an derive the relationship between Departure, D'long& Latitude.

UNIT – II :
Exercises in determining Departure, D'long&D'lat between two points on the earth'ssurface, terms Mean Latitude & Mid-Latitude. Explain plane sailing formulae & conductexercises on their use, Using Travers tables calculate the course & Distance between two points on the earth's surface, meaning of the Ship's log, Log distance, Dead Reckoned and Estimated positions, Exercises on Day's work

UNIT – III :
Mercator & Gnomonic projections. Explain the meaning Meridional Parts & DMP, Mercator Sailing Formulae and conduct exercises on their use**,** contents and use of the Nautical Almanac, concept of Time and its relationship with Longitude on the earth's surface.

UNIT – IV :
GMT, Zone time, Standard Time & Apparent time, Rational Horizon, Visible Horizon & Sensible Horizon. Explain with the aid of diagrams, aid of diagrams, Zenith, Nadir, Vertical circles, prime Vertical, True Altitude, Zenithdistance, Declination, Polar Distance, Hour Angles, Aries& Azimuth. Exercises in drawingfigures,reasonably to scale, on the plane of rational horizon, aid of diagrams, correction of altitudes : Dip, Refraction, SD

UNIT – V :
Latitude by Meridian Altitude, Conduct practical training in observing the sun at meridianpassage, Conduct exercises on the above**,** meaning of Amplitude & Azimuth. Conduct exercises on obtaining Compass Error usingthe above nautical tables. Explain method of obtaining times of Twilight, Rising, Setting &Meridian**,** Passage from the Nautical Almanac. Conduct exercises on the above, stargazing – the identification of stars with reference to the main constellations.

REFERENCES :
1. Practical Navigation – Capt.H.Subramanian
2. Principles of Navigation – Capt.T.K.Joseph&Capt.S.S.S.Revari

THEORY PAPER 3 : COMPETENCY CHART WORK

UNIT –I :
Meaning of compass, Magnetic & True Course and Bearing, Deviation, Variation & Deviation Card, variation at a place is obtained from the chart after applying change in variation, Satethat the latest chart should be consulted for this, Conduct exercises on the conversion of courses & Bearings between compass, magnetic &True.

UNIT – II :
Mercator char in detail – Latitude scale, Natural scale, Longitude scale. The relation between latitude & longitude scales. Practical determination of distance on a Mercator chart, chart reading, thorough knowledge of symbols& abbreviations used on British Admiralty & Indian charts. Thorough familiarisation with B.A. NP5011. The Compass Rose, plotting ship's position on a Mercator chart, the use of parallel ruler, set square, compass,divider, Stress the importance of neatness in chart work. State the appropriate pencil to use in chartwork, care & maintenance of charts.

UNIT – III :
Layout of the ship's chart outfit. Familiarization with the Admiralty Chart Catalogue & the Admiralty Chart folio system, transferring position lines and courses on Mercator charts, Admiralty List of lights, characteristics of lights.

UNIT – IV :
Buoyage System in use worldwide with special emphasis on the IALA system, Dead Reckoned and observed positions and the symbols used for indicating them on the chart, fixing vessel's position using terrestrial cross-bearings and bearing and range, course steered, course made good, engine speed, and speed made good, current, leeway,how to counteract current and leeway, estimated position (EP) and the symbol used to denote EP.

UNIT – V :
Use of Tide tables at Standard ports, Admiralty Sailing Directions and other publications, Conduct exercises in above chart work techniques.

REFERENCES :
1. Chart work – Capt.S.S.Chaudhari
2. Chart work for Mariners – Capt.S.Puri S.K
3. Mariner's Rules of the Road – Interpretations for collison avoidance – Capt. Errol Fernandes
4. IMO rule of the road – Capt.Bhandarkar

THEORYPAPER 4 : COMPETENCY BRIDGE EQUIPMENT AND WATCHKEEPING

UNIT –I :
Lights & shapes, Distress signals, steering & Sailing Rules to give a good working knowledge, various methods to call the Master to the bridge when in doubt during bridge watch, use of a Sextant for observing vertical & horizontal angles, correctable errors of a sextant and demonstrate their method of correction and allowance

UNIT – II :
Use & care of marine Chronometers (Winding & battery types). The importance ofmaintaining chronometer error log. Practical exercises on accumulated rates, arrangement and reading of a Wet card Magnetic compass, use of the Gyrocompass, Repeaters and course Recorder, Navigational aids equipment to be demonstrated during ship visits. DF, Decca, LORAN, GPS, etc.,Stress the importance of measuring depths below the ship, Echo Sounder and Depth recorder.

UNIT – III :
Working principle of Marine Radar, watch keeping duties at anchor and at sea, duties associated with preparing a vessel to proceed to sea, procedure of testing controls, procedure of taking over watch at sea.

UNIT – IV :
Importance of recording all relevant information in Logbooks, duties prior to arrival port, procedure of embarking and disembarking a pilot, use of the Signaling Lamp, Conduct exercises on visual Morse code.

UNIT – V :
Exercises on the recognition and single letter meanings of International Code Flags, exercise on the use of International Code of Signals, proper procedure to use of walkie-talkie and a VHF set. The importance of minimal use of air time, concept of GMDSS.

REFERENCES :
1. Ship Borne Radar – Capt. H.Subramanian
2. International code of Signal – HMSO
3. The Theory and Practice of Seamanship – Graham Dantar
4. Seamanship – Capt.K.K.Bhandarkar
5. Bridge equipment chart & Publication Nutshell series – Capt.H.Subramanian
6. Bridge equipment &Wtchkeeping notes – EdrichFernandes
7. Modern Electronic Navigation Aids – Bhatia & Sinha

THEORY PAPER 5 : CARGO HANDLING AND STOWAGE FUNCTION

UNIT - I : COMPETENCY CARGO GEAR & CARGO WORK, NAVAL ARCHITECTURE, SHIP STABILITY
Use of derricks, cranes & types of pumps used on a ship, principal of the educator system, various types of dunnage used, role of longshoremen, stevedores, foreman, ship's agent, supervisor and the overall procedure of loading, stowing and discharging of general cargoes, procedure of preparing the hold for loading general cargo and bulk cargo, necessity, and the procedure, for segregation of various types of dry cargoes.

UNIT – II :
Methods of securing of various types of cargo, cargo sweat, ship sweat and atmospheric sweat, state the precautions against cargo damage try sweat, unitization of cargo by palletization and containerization, carriage of Refrigerated Cargo, meaning of Stowage Factor and Load Density, classification and Labelling of dangerous goods, practical exercises on the recognition of various classes of dangerous goods and their labels.

UNIT – III :COMPETENCY NAVAL ARCHITECTURE
General terms the basic types of ships, General cargo, Bulk carrier, container and oil tanker, principal dimensions of a ship – LOA, LBP, EB, MB, MD, GT, NT, Name and explain theprincipal parts of ship including Peak tanks, Double Bottom Tanks, Deep Tanks, Cargo Tanks, BallastTanks, etc.,ship plans : General Arrangement of ship, fire-fighting appliances, Life saving appliances, pumping & Piping arrangements.

UNIT – IV :
Parts : Beam, Frame, Bulkhead, Hatch, Tank, Coaming, Hatch covet, Rudder,Deck, Hull, Bilge, sounding Pipe, air Pipe and Ventilator, Show where these are to be found on a ship, Draft Marks & Load Lines, method of reading draft marks in feet and in metres, practical exercises on reading draft by use of a suitable model, causes and simple methods of prevention of corrosion in a ship's structure. Brief noteson paint technology & anti-corrosion techniques, term Dry Dock, and reasons for dry docking a vessel and give a general idea of the activitiesin a dry dock.

UNIT – V :SHIP STABILITY
Principle of flotation and the meaning of terms : Displacement, Deadweight, Form Coefficients, Reserve Buoyancy, Light ship, Draft, air Draft and Freeboard, TPC, effect of density on the draft of a vessel and meaning of the terms Fresh water, Allowance and dock Water Allowance, COG and KG of a ship, factors that affect KG, COB, factors that affect KB, practical exercises in calculations based on the above topics.

Reference Books :
1. Cargo work & Maintenance – Capt. Errol Fernandes
2. Cargo Work – Capt.L.G.Taylor
3. Cargo work for Maritime operation – David J. House
4. Notes on cargo work new edition – Kemp & young
5. Ship construction – D.J. Eyres
6. Ship construction sketches & notes – Kemp & Young
7. Ship stability I & II – Capt. H.Subramanian
8. M.V. Ship & oil tankers – Capt.T.K. Joseph &Capt.S.S.S.Rewari
9. M.V. Ship stability tables – Capt.T.K.Joseph&Capt.S.S.S.Rewari

THEORY PAPER 6 : PRACTICAL SEAMANSHIP

UNIT –I :
Various types of cordage, fibre and wire ropes usedon ships, Various types of whippings, various types of knots, Bends & Hitches, types of fibre and wire ropes, bulldog grips and bottle screws / turnbuckles in joining wires, care & maintenance of fibre and wire ropes including uncoiling, coiling, stowing etc., practical exercises on the use of blocks, snatch blocks and the differential pulley (chain blocks)

UNIT – II :
Maintenance of various types of blocks, tackles, shackles & bottlescrews / turnbuckles, including opening, greasing etc.,mooring arrangements, mooring shackle, Conduct practical exercises onthrowing heaving lines, use of rope & chain stoppers, mooring shackles and handling of mooring ropes, Use of slip-ropes, Anchor work, parts of windlass, terms in connection with anchor work, Cable, Link, Joining Shackle, shackles as a term of length, Bitter End, ability to use a sledgehammer, practical exercises on opening a lug and a lugless anchor shackle.

UNIT – III :
Uses of an anchor, how it is walked back, let go, heaved, housed and secured, ability to climb a ship's mast, rope climbing, Boat-work-conduct exercises in rowing and manoeuvring a boat under oars, parts of a sail and sailing terms, practical exercises on chipping & painting. Demonstrate all tools and gear available for themaintenance steel parts of a ship.

UNIT – IV :
Various cargo gear used, SWL and Breaking Stress, exercises on cargo gear rigging, rigging and climbing pilot ladders and Jacob's ladders. Maintenance of the same, use of the bosun's chair, use of over side staging for shipside maintenance, use of the safety belt and safety harness during the earlier two operations, methods of dealing with an oil spill on deck.

UNIT – V :
Plugging of scuppers during bunkering, loading and discharging of oil cargo, construction of a cement box to stop leaks, instructional visits to ships for basic familiarization, proficiency in Canvas work, hydrants, hoses and nozzles etc.,

Reference Books :
1. Seamanship – Capt. V.K.Bhandarkar
2. Notes on general ship knowledge – Capt. Dara E. Driver
3. Seamanship Techniques 2 – ship handling – D.J.House
4. Knights modern seamanship – Capt. John U.S.Navy
5. The Ship compass - GAA Grant, J.Kedinkert
6. The theory of practice of seamanship – Graham Dantan
7. Boats wain's manual – Capt.A.G.W.Miller

THEORY PAPER 7 : MAINTENANCE AND REPAIR FUNCTION

WORKSHOP PRACTICALS

UNIT –I :
Carpentry : Various types of tools and their uses e.g. nails, wood screws, screw drivers, hammers (including claw, ball-pane, sledge, mallet), crowbars, saws, chisels, wood files, drills, vice, clamps, wood planer etc., Repairs to fibre glass surfaces such as boats, etc., Uses of various adhesives in joining of materials.

UNIT – II :
Plumbing : Proper use of tools – spanners, wrenches, hacksaws, files etc., the use of T-joints, bends and couplings in pipelines. Dismantling and joining various types of pipelines. Repair of water taps. Types of pipes, pipelines, their sizes, joints, cutting of simple gaskets / packing for pipe flangers, treatment of leaks, use of various sealants for stopping small leaks in pipelines, pipe clamps, cutting of threads in pipeline, clearing of chocked water pipelines.

UNIT – III :
Machine shop :Familiarisation with and proper used of various tools. E.g. open spanners. Ring spanners, socket spanners. Ratchet spanners, torsion spanners, Allen keys, screw drivers, files, hammers, chisels, punches, reamers, vice, taps and dies etc., Special practice to be given on use of a sledge hammer. Types of nuts and bolts, studs, methods of freeing rusted nuts and bolts, proper use of the grinding machine, drilling machine (portable and mounted), use of coolants such as water, oil etc., during drilling. Use of measuring devices – feeler gauges, calipers, screw gauges etc., Overhauling of sluice valves, globe valves and butterfly valves. The importance of lubricating oil and grease in reducing friction in machines.

UNIT – IV :

Electrical shop : Precautions when using electrical appliances, fuses and circuit breakers and their uses, danger of loose or improper connections, use of insulated had tools, insulation tape, insulated footwear, danger of wet surfaces, proper connections (line, neutral and earth) in various joints. Types and specifications of electrical wire when making indents for purchase. Theory & Practical of soldering. Cargo clusters, safe use of hand held lamps. Use of Megger, testing and charging of batteries. Motor used on deck.

UNIT – V :

Hotwork : Basic theory and practical experience of gas cutting, gas welding and electric arc welding. Gas heating to free rusted and bolts. The proper precautions to be taken during each of these processes.

REFERENCES :

1. Marine Auxiliary machinery – 7th Edition by HD Mc George
2. Reeds general engineering knowledge for marine engineers