Bangladesh Maritime University

Uniform Curriculum
of the
B.Sc. (Honours) in Maritime Science

Offered By
Nautical Department
Affiliated Institutes (Marine Academy)
Bangladesh Marine Academy, Chattogram
Bangladesh Marine Academy, Pabna
Bangladesh Marine Academy, Barisal
Bangladesh Marine Academy, Rangpur
Bangladesh Marine Academy, Sylhet
Marine Fisheries Academy, Chattogram
International Maritime Academy, Gazipur

Total Credits: 160

Developed by
Uniform Curriculum Committee of Nautical Department (Affiliated Institutions)
Faculty of Shipping Administration
Bangladesh Maritime University

Approving Authority
Bangladesh Maritime University

Effective From: 2025-2026 Session
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Uniform Curriculum Committee of Nautical Department

(Affiliated Institutions)

MoU No: BSMRMU/FSA/DEAN-628/25-67

Name	Designation
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Capt. ATM Alimuzzaman Chief of Nautical Studies (Acting) Bangladesh Marine Academy, Sylhet	Member
Capt. Mohammad Refai Choudhury Chief of Nautical Studies Bangladesh Marine Academy, Barishal	Member
Capt. Subrata Kumar Saha Deputy Commandant International Maritime Academy, Gazipur	Member
Lt Cdr Nur Uddin Muhammad Khalid Chief of Nautical Studies Marine Fisheries Academy, Chattogram	Member
External Member nominated by the Vice Chancellor	
Capt. Sayeed Ahmed Controller of Maritime Education Department of Shipping	Member
Dr. Kazi Shahidullah Assistant Professor Bangladesh University of Professionals	Member
Expert Members nominated by Academic Council	
Md. Mostafa Aziz Shaheen Assistant Professor, Department of Port and Shipping Management Bangladesh Maritime University	Member
Capt. Mohammad Feroz Mostafa Chief of Nautical Studies Bangladesh Marine Academy, Chattogram	Member

Preamble

The B.Sc. (Honours) in Maritime Science curriculum has been developed to provide a comprehensive and structured program of study that meets the academic standards and professional requirements of the maritime sector. In alignment with the purpose of the IMO Model Courses, this curriculum assists maritime training institutes and their teaching staff in organizing, enhancing, and updating training schemes to improve the quality and effectiveness of maritime education. The model course framework is not intended to impose a rigid teaching package, nor to replace the instructor's role with audiovisual or programmed material; rather, it serves as a flexible guide, with course durations being indicative and adaptable based on institutional needs. The knowledge, skills, and dedication of instructors remain central to the effective transfer of competencies.

Recognizing the diverse educational systems and cultural backgrounds of maritime trainees worldwide, the curriculum incorporates universally applicable entry requirements and clearly defined technical content to ensure compliance with the intent of IMO conventions and related recommendations. This program reflects the revised structure of IMO model courses and encourages continuous feedback to maintain relevance, support safety at sea, and promote protection of the marine environment. It integrates the three operational level functions essential for preparing trainees to competently perform watchkeeping duties both at sea and in port in accordance with The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Regulation VIII/2 and STCW Code Chapter VIII.

Furthermore, the teaching scheme has been carefully scrutinized to ensure that all prescribed learning outcomes are fully addressed, unnecessary repetition is minimized, and the required underpinning knowledge is introduced progressively. Where some duplication naturally occurs across subjects, it is managed to reinforce learning without exceeding the intended depth of coverage. Adjustments are made to align the curriculum with additional administrative requirements and the timing of modular courses such as Fire Fighting and Medical Care. Through this structured approach, the curriculum aims to equip students with the essential knowledge, practical skills, and competencies required for successful careers in maritime operations and management.

The curriculum has been prepared under the guidance and coordination of the Faculty of Shipping Administration, Bangladesh Maritime University (BMU), in consultation with the

Nautical Departments of the Affiliated Institutions (Marine Academy). It is designed to ensure uniformity in learning outcomes, assessment procedures, and academic standards across all affiliated institutes.

Regulatory Compliance:

a. This curriculum has been developed in alignment with STCW standards, IMO Model Course 7.03, the regulatory guidelines of the Department of Shipping (Bangladesh), and the quality benchmarks of the Bangladesh National Qualification Framework, Bangladesh Accreditation Council, and University Grants Commission (UGC). Inspired by the principles of Outcome-Based Education, the program integrates theoretical knowledge, practical training, seamanship skills, and professional competencies required for safe and efficient maritime operations.
b. This curriculum may be reviewed as necessary to incorporate amendments to the BMU Examination Regulations or other relevant stakeholder guidelines, with the latest rules taking precedence. All proposed revisions shall be submitted to the Uniform Curriculum Committee, whose recommendations will be forwarded to the Academic Council for approval; changes take effect only after such approval.
c. The Uniform Curriculum Committee may convene at least once every three years for routine review, with additional meetings called by the Committee President in urgent situations.
d. For curriculum related academic concerns, students must first appeal to the Departmental Committee. If unresolved, the matter may be escalated according to university procedures. Issues not covered by existing rules shall be referred to the Academic Council, whose decision is final.

Scope and Applicability:

This curriculum applies to all students enrolled in the B.Sc. (Honours) in Maritime Science program through the Nautical Departments of the Affiliated Institutions (Bangladesh Marine Academy, Chattogram; Bangladesh Marine Academy, Pabna; Bangladesh Marine Academy, Barisal; Bangladesh Marine Academy, Rangpur; Bangladesh Marine Academy, Sylhet; Marine Fisheries Academy, Chattogram; International Maritime Academy, Gazipur) of Bangladesh Maritime University. This curriculum will likewise apply to all marine academies that may become affiliated in the future. It outlines the program structure, course contents, credit requirements, and assessment methods, ensuring a standardized and transparent academic framework.

Part A: Introduction

1. Title of the Academic Program: B.Sc. (Honours) in Maritime Science

2. Name of the Affiliated Institutions (Marine Academy):

- **a.** Bangladesh Marine Academy, Chattogram.
- **b.** Bangladesh Marine Academy, Pabna.
- **c.** Bangladesh Marine Academy, Barisal.
- **d.** Bangladesh Marine Academy, Rangpur.
- **e.** Bangladesh Marine Academy, Sylhet.
- **f.** Marine Fisheries Academy, Chattogram.
- **g.** International Maritime Academy, Gazipur.

3. Vision of the Affiliated Institutions (Marine Academy): To be a world-class maritime academy, developing globally competent seafarers and maritime professionals through excellence in education, research, and innovation, while supporting sustainable development of the ocean economy.

4. Mission of the Affiliated Institutions (Marine Academy): We are committed to developing globally competent maritime officers through:

S/N	Mission
M1	Delivering quality education and training aligned with IMO/STCW standards.
M2	Fostering applied research, innovation, sustainable and advanced operations.
M3	Instilling leadership, integrity, teamwork, readiness for officer roles.
M4	Promoting environmental stewardship, maritime safety, resilience.
M5	Building international collaboration and industry partnerships.

5. Name of the Program Offering Entity (Department/Faculty/Institute): Nautical Department.

6. Vision of the Program Offering Entity: To be a center of excellence in nautical science education and training, producing globally competent, ethical, and innovative deck officers to serve the international maritime industry.

7. Mission of the Program Offering Entity: The Nautical Department is dedicated to preparing cadets for successful careers as professional deck officers by:

- **a.** Providing comprehensive nautical science education aligned with IMO/STCW standards and BMU/UGC requirements.
- **b.** Combining classroom learning with advanced simulators, laboratories, and mandatory sea service to ensure operational competence.
- **c.** Instilling integrity, discipline, teamwork, and decision-making skills required for ocean-going officer roles.
- **d.** Emphasizing safe navigation, maritime security, and stewardship of the marine environment.
- **e.** Equipping graduates with the mindset to adapt to emerging technologies and global shipping challenges.

8. Objectives of the Program Offering Entity: The Department aims to:

1. Provide competency-based education in navigation, seamanship, ship operations, and maritime law.
2. Ensure operational readiness through practical training and sea service.
3. Produce qualified deck officers prepared for OOW and higher competency certifications.
4. Develop leadership, teamwork, and decision-making skills.
5. Promote safety culture and environmental responsibility.
6. Encourage research and innovation in navigation and sustainable shipping.
7. Support lifelong learning and adaptability to global maritime challenges.

9. Name of the Degree: B.Sc. (Honours) in Maritime Science

10. Description of the Program:

The B.Sc. (Honours) in Maritime Science is a four years Honours program designed to develop competent, globally employable deck officers. The curriculum integrates theoretical studies in navigation, ship handling, meteorology, cargo operations, marine environmental protection, and maritime law with advanced simulator training and a mandatory 12-month sea service or industrial training. This program is offered through the Nautical Departments of Affiliated Institutions (Marine Academy) under the Faculty of Shipping Administration, Bangladesh Maritime University, and carries 160 credits over 8

semesters.

The program is fully aligned with STCW Regulation II/1, IMO Model Course 7.03, and the regulatory guidelines of the Department of Shipping (Bangladesh), while also adhering to the Bangladesh National Qualification Framework, Bangladesh Accreditation Council, and University Grants Commission (UGC). Inspired by Outcome-Based Education (OBE) principles, the curriculum combines academic knowledge with practical training to ensure graduates acquire the professional competence required for safe navigation and watchkeeping both at sea and in port.

Emphasis is placed on leadership, safety management, communication skills (including SMCP), and professional integrity. Graduates become eligible for certification as Officer in Charge of a Navigational Watch (OICNW) and are prepared for higher professional examinations, senior ranks, and academic research opportunities. The program equips cadets with the knowledge, skills, and competencies necessary for a successful career in the global merchant shipping industry.

11. Graduate Attributes:

Graduates of the Nautical Department will be:

a. **Competent Navigators:** Able to perform all duties and responsibilities of an Officer of the Watch (OOW) at the operational level, meeting IMO/STCW competency standards.
b. **Technically Proficient:** Skilled in using modern navigational tools, simulators, and digital systems (ECDIS, radar, ARPA, AIS) for safe and efficient ship operations.
c. **Effective Leaders & Team Players:** Equipped with leadership, decision-making, and teamwork skills to operate effectively in multicultural and multidisciplinary maritime environments.
d. **Ethical & Professional:** Committed to integrity, accountability, and high ethical standards in line with international maritime conventions and professional codes of conduct.
e. **Safety & Security Conscious:** Knowledgeable in safety management systems, emergency response, firefighting, survival, and maritime security practices.
f. **Environmentally Responsible:** Advocates of sustainable shipping practices, marine environmental protection, and compliance with MARPOL and IMO environmental regulations.

g. **Critical Thinkers & Problem Solvers:** Able to analyze complex navigational and operational challenges, make sound judgments, and apply innovative solutions.
h. **Global Maritime Citizens:** Prepared to serve the international maritime industry, with strong communication skills in English and awareness of global shipping practices and cultures.
i. **Lifelong Learners:** Committed to continuous learning, research, and professional development to adapt to evolving technologies, policies, and industry needs.
j. **Innovators in Maritime Science:** Capable of contributing to research, digitalization, and sustainable innovation in the global shipping sector.

12. Program Educational Objectives (PEOs): Graduates of B.Sc. (Honours) Maritime Science program will:

1. Serve as competent Officers of the Watch (OOW)**,** performing duties at the operational level under STCW A-II/1.
2. Advance professionally to senior ranks (Chief Officer, Master Mariner) or pursue higher education/research in maritime science.
3. Demonstrate leadership, ethics, and teamwork in multicultural maritime environments.
4. Contribute to safe, efficient, and sustainable shipping operations**,** aligned with IMO conventions and global industry standards.
5. Engage in lifelong learning and stay updated with emerging maritime technologies and practices.

13. Program Learning Outcomes (PLO): On successful completion of the program, graduates will be able to:

a. Apply knowledge of mathematics, science, and nautical science to navigation and ship operations.
b. Perform navigational duties at operational level as per STCW A-II/1.
c. Use modern tools, simulators, and technologies for ship handling, chart work, radar, and ECDIS.
d. Demonstrate leadership, teamwork, and communication skills in shipboard and multicultural contexts.
e. Recognize professional, ethical, and legal responsibilities of a maritime officer.

f. Apply safety management systems and respond effectively to emergencies, firefighting, and survival situations. Promote marine environmental protection and sustainable practices in line with MARPOL and IMO codes.

g. Engage in independent learning and research to adapt to technological advances in the maritime industry.

h. Demonstrate critical thinking and problem-solving skills in navigation, cargo handling, and shipboard decision-making.

i. Contribute to global shipping industry through professionalism, innovation, and adherence to international standards.

Part B: Structure of Curriculum

14. Duration of the program: Years: 4 **Semesters:** 8

15. Admission Requirements*:* These are the minimum qualifications and standards applicants must meet to be considered eligible.

a. **Educational Qualification:** Applicants must have passed SSC and HSC or equivalent examinations in the Science group with a minimum GPA of 4.00. In the HSC or equivalent examination, they must obtain at least 60% marks or GPA 3.50 separately in Physics and Mathematics, and at least 50% marks in English. If an applicant obtains less than 50% marks or GPA 3.00 in English, an overall IELTS score of 5.5 is mandatory.

b. **English Medium (Oxford Curriculum):** For English-medium candidates following the Oxford curriculum, a minimum grade of **C** in at least **five subjects**, including Physics, Mathematics, and English, in O-Level is required, and a minimum grade of **C** in A-Level, including Physics and Mathematics, or an equivalent qualification, is mandatory.

16. Appeared Candidates: Candidates participating in the recent HSC or equivalent examination can apply as 'Appeared'. However, they will be disqualified if they fail to meet the minimum qualifications upon result publication.

17. Written Examination (Written Method): 100 Marks

Candidates will be selected based on the marks obtained in the admission test as follows:

Subject-wise mark distribution (Total 100):

i. **Physics:** 25 Marks.
ii. **Mathematics:** 25 Marks.
iii. **English:** 25 Marks.
iv. **Bangladesh and General Knowledge:** 25

The pass mark for the written examination is 50%, and candidates must obtain 50% marks separately in English.

18. Total minimum credit requirement to complete the program: 160 Credits

19. Degree requirements are as follows:

To attain an undergraduate degree, a student must fulfill the following conditions:

a. A student must successfully complete a minimum of 160 credits (or the minimum number stipulated by the respective Department/Institute/Affiliated Institution) within a of 07 (seven) academic years in the case of the B.Sc. (Honours) in Maritime Science degree conducted by the Affiliated Institutions (Marine Academy);

b. The student must appear in the final examination of every course as per the program syllabus;

c. The student must submit their Thesis Paper and present it before the designated panel after fulfilling the necessary requirements;

d. The student must achieve a minimum CGPA (Cumulative Grade Point Average) of 2.2 in the program.

20. Total class weeks in a Year/semester: Each semester is distributed as follows,

Classes	15 weeks
Mid Term Examinations	02 weeks
Preparatory Leave	02 weeks
Final Examination	03 weeks
Recess	04 weeks
Total	26 weeks

21. Minimum CGPA requirements for graduation: Scoring a CGPA 2.2 or above.

22. Maximum academic years of completion: 07 years.

23. Category of courses

Category	**No**	**Credit**	**Percentage**
General Education Course	9	27	17%
Core Course	27	81	51%
Elective Course	3	9	6%
Lab/Sessional	12	18	11%
Capstone Courses	4	25	15%
Total	55	160	100%

General education courses

1. GED 1101: Physics
2. GED 1103: Mathematics I
3. GED 1105: Maritime English and communication skills
4. GED 1213: Fundamentals of electronics and computer science
5. GED 1215: Mathematics II
6. GED 4153: Research methodology and professional ethics
7. GED 4167: Ocean science
8. GED 4269: Maritime history and Bangladesh studies
9. GED 4271: Marine engineering and controlling system

Core Courses

10. SOC 1107: General Ship Knowledge
11. NAV 1109: Meteorology I
12. NAV 1111: Principles of navigation
13. SOC 1217: Ship Stability I
14. NAV 1219: Bridge procedure and watchkeeping
15. SOC 1221: Maritime law and conventions
16. CHS 1223: Shipboard operation and cargo work I
17. SOC 2125: Marine environment and pollution
18. SOC 2127: Maritime safety and security
19. NAV 2129: Celestial navigation I
20. SOC 2131: Ship Stability II
21. NAV 2133: Electronic navigation system
22. NAV 2135: Terrestrial and coastal navigation I
23. NAV 2137: Leadership and bridge resource management
24. NAV 2239: Meteorology II
25. CHS 2241: Shipboard operation and cargo work II
26. NAV 2243: Celestial navigation II
27. SOC 2245: Ship construction
28. NAV 2247: Radar navigation and advance navigation technologies
29. NAV 2249: Terrestrial and coastal navigation II
30. NAV 2251: Collision prevention regulation
31. NAV 4155: Advance Navigation
32. SOC 4157: Cargo operation and stability

33. NAV 4159: Ocean and offshore navigation
34. NAV 4161: Coastal Navigation
35. NAV 4163: Meteorology III
36. CHS 4165: Advance ship knowledge

Elective courses

37. OPM 4273: Ship operations and management
38. OPM 4275: Port operations and management
39. OPM 4277: Ship chartering and brokering
40. OPM 4279: Maritime insurance and risk management
41. OPM 4281: Maritime Economics
42. OPM 4283: Marine survey and accident investigation
43. OPM 4285: Advanced cargo operation (Oil and Chemical Tanker)

Sessional Courses

44. NAV 1102: Basic seamanship sessional
45. NAV 1104: Signaling sessional
46. GED 1206: Maritime English and communication Sessional
47. GED 1208: Electronics and computer application sessional
48. NAV 2112: Advance seamanship sessional
49. NAV 2114: Bridge team and bridge resource management sessional
50. NAV 2216: Shipboard instruments sessional
51. CHS 2218: Shipboard operational sessional
52. NAV 4124: Ship handling and maneuvering sessional
53. NAV 4126: ECDIS sessional
54. NAV 4240: GMDSS Sessional
55. NAV 4232: Radar and ARPA sessional

Capstone courses

56. CAP 1210: Industrial visit
57. CAP 2220: Ship Visit
58. CAP 4022: Onboard training or industrial training
59. CAP 4228: Thesis

24. Year/ Level/Semester/Term wise distribution of courses

A. 1st Year / Level / Semester / Term Courses			
1st Year (1st Semester)			
S/N	**Course Code**	**Course Title**	**Credit**
01	GED 1101	Physics	3
02	GED 1103	Mathematics I	3
03	GED 1105	Maritime English and communication skills	3
04	SOC 1107	General Ship Knowledge	3
05	NAV 1109	Meteorology I	3
06	NAV 1111	Principles of navigation	3
07	NAV 1102	Basic Seamanship Sessional	1.5
08	NAV 1104	Signaling sessional	1.5
		Subtotal	**21**
1st Year (2nd Semester)			
S/N	**Course Code**	**Course Title**	**Credit**
09	GED 1213	Fundamentals of electronics and computer science	3
10	GED 1215	Mathematics II	3
11	SOC 1217	Ship Stability I	3
12	NAV 1219	Bridge procedure and watchkeeping	3
13	SOC 1221	Maritime law and conventions	3
14	CHS 1223	Shipboard operation and cargo work I	3
15	GED 1206	Maritime English and communication sessional	1.5
16	GED 1208	Electronics and Computer Application Sessional	1.5
17	CAP 1210	Industrial Visit	1.5
		Subtotal	**22.5**

B. 2nd Year / Level / Semester / Term Courses			
2nd Year (3rd Semester)			
S/N	**Course Code**	**Course Title**	**Credit**
18	SOC 2125	Marine environment and pollution	3
19	SOC 2127	Maritime Safety and security	3
20	NAV 2129	Celestial Navigation I	3
21	SOC 2131	Ship Stability II	3
22	NAV 2133	Electronic Navigation system	3
23	NAV 2135	Terrestrial and coastal navigation I	3
24	NAV 2137	Leadership and bridge resource management	3
25	NAV 2112	Advance Seamanship Sessional	1.5
26	NAV 2114	Bridge team and bridge resource management sessional	1.5
		Subtotal	**24**
2nd Year (4th Semester)			
S/N	**Course Code**	**Course Title**	**Credit**
27	NAV 2239	Meteorology II	3
28	CHS 2241	Shipboard operation and cargo work II	3
29	NAV 2243	Celestial navigation II	3
40	SOC 2245	Ship Construction	3
31	NAV 2247	Radar Navigation and advance navigation technologies	3
32	NAV 2249	Terrestrial and coastal navigation II	3
33	NAV 2251	Collision prevention regulation	3
34	NAV 2216	Shipboard instruments sessional	1.5
35	CHS 2218	Shipboard operational sessional	1.5
36	CAP 2220	Ship Visit	1.5
		Subtotal	**25.5**
C. 3rd Year / Level / Semester / Term Courses			
3rd Year (5th and 6th Semester)			
S/N	**Course Code**	**Course Title**	**Credit**
37	CAP 4022	Onboard Training or Industrial Training	16
		Subtotal	**16**

D. 4th Year / Level / Semester / Term Courses			
4th Year (7th Semester)			
S/N	**Course Code**	**Course Title**	**Credit**
38	GED 4153	Research Methodology and Professional Ethics	3
39	NAV 4155	Advance Navigation	3
40	SOC 4157	Cargo Operation and Stability	3
41	NAV 4159	Ocean and Offshore Navigation	3
42	NAV 4161	Coastal Navigation	3
43	NAV 4163	Meteorology III	3
44	CHS 4165	Advance Ship Knowledge	3
45	NAV 4124	Ship handling and maneuvering sessional	1.5
46	NAV 4126	ECDIS sessional	1.5
		Subtotal	**24**
4th Year (8th Semester)			
S/N	**Course Code**	**Course Title**	**Credit**
47	CAP 4228	Thesis / 2 Elective Courses	6
48	GED 4267	Ocean Science	3
49	GED 4269	Maritime history and Bangladesh studies	3
50	GED 4271	Marine Engineering and Control System	3
51	4	Elective 1	3
52	4	Elective 2	3
53	4	Elective 3	3
54	NAV 4240	GMDSS Sessional	1.5
55	NAV 4232	Radar and ARPA sessional	1.5
		Subtotal	**27**
		Total	**160**

Part C: Description of All Courses

Course Code:	Course Title:	Credits:
GED 1101	Physics	03

Course Learning Objective: Physics provides foundational scientific knowledge essential for understanding the physical principles governing ship behavior, environmental interactions, and the operation of maritime equipment. The course supports the competence requirements of STCW Section A-II/1 and A-II/2 by developing learners' understanding of mechanics, hydrostatics, hydrodynamics, thermodynamics, optics, and wave behavior.
This knowledge strengthens cadets' ability to interpret technical documentation, understand equipment limitations, and apply scientific reasoning to real navigational and operational scenarios. The course builds the scientific foundation necessary for advanced maritime studies in navigation, ship stability, meteorology, cargo handling, and shipboard systems.

Upon successful completion of this course, the learner will be able to:
a. Explain the fundamental principles of mechanics (force, motion, work, energy, momentum) and apply them to ship operations.
b. Apply hydrostatic and hydrodynamic principles to understand buoyancy, flotation, ship resistance, and propulsion.
c. Analyze the effects of pressure, density, and related properties of seawater on ship stability and environmental conditions.
d. Describe thermodynamic concepts—heat transfer, temperature variations, expansion—and their impact on shipboard equipment.
e. Explain wave and optical principles such as reflection, refraction, sound propagation, and radar wave behavior.
f. Interpret the functioning and limitations of navigational and operational instruments based on underlying physical principles.
g. Apply scientific reasoning to problem-solving in navigation, ship handling, and equipment performance.
h. Interpret technical manuals, specifications, and maintenance instructions using physics knowledge.
i. Relate theoretical physics concepts to real maritime operational challenges such as maneuvering, stability, and environmental effects. transform it into 5 bullet points

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**General Physics**	**02**
	Mass, weight and Force; Distance, Velocity and Acceleration;	
	Circular motion and rotation; Statics; Work, Energy and Power; Machines.	
2	**Properties of Matter**	**19**
2.1	**Mechanics of Elastic Media:**	
	Hook's law; various types of modulus and their relations; Poison's ratio;	
	Bending moment and cantilever, Torsion of Cylinder.	
2.2	**Surface Tension and Viscosity**	
	Surface energy; Surface tension and molecular theory of surface tension; Potential energy due to a surface tension;	
	Pressure within a curved film; Angle of contact; Capillarity; Measurement of surface tension by capillary method;	
	Viscosity and co-efficient of viscosity;	
	Flow of fluid through narrow tube; Poiseuille's equation.	
2.3	**Fluid Dynamics**	
	Concept of fluid flow; Streamline and Turbulent flow; Equation of continuity;	
	Bernoulli's equation and its applications;	
	Venturi meter; Torricelli's theorem.	
2.4	**Hydrostatics**	
	Fluids, Liquids and Gases; Hydrostatics Pressure, Hydrostatic Pressure due to a Liquid Column;	
	Hydrostatic paradox; Principle of Archimedes; Up thrust, Bouncy; Pressure at depth;	
	Pascale's law; Principle of Equilibrium; Rolling and Pitching of a ship;	
	Pressure due to a compressible fluid or a Gas; Measurement of a atmospheric Pressure; Hydrometer.	
3	**Heat**	**12**
3.1	**Thermometry**	
	Temperature Scale; Absolute Scale; International Temperature Scale;	

	Platinum resistance thermometer; Thermocouple.	
3.2	**Transmission of Heat:**	
	Introduction, Coefficient of Thermal Conductivity;	
	Determination of Thermal Conductivity of good and bad conductors;	
	Heat flow through a compound Wall;	
	Properties of Thermal Radiations & Black Body.	
3.3	**Kinetic theory of Gases**	
	Calculation of Pressure; Boyle's law; Avogadro's law and Graham's law	
	Determination of gas constant;	
	Mean free path; Root mean square velocity.	
4	**Waves, Sound and Light**	**09**
4.1	**Fundamental of Waves**	
	Wave motion, types of Waves, Wave Equation and Solution;	
	Energy, Power and speed of Travelling Waves;	
	Linearity and Superposition Principle; Beat;	
	Propagation and speed of Sound in Fluid and Solid Media	
	Doppler Effect.	
4.2	**Light and Image:**	
	Nature of light; Corpuscular theory; Wave theory; Fermat's Principle and application;	
	Electromagnetic Spectrum and Energy, Huygen's Principle.	
4.3	**Optical Instrument:**	
	Camera; Compound microscope; Ultra-microscope; Magnifier;	
	Telescope; Binocular; Spectrometer.	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Properties of Matter by *Brij Lal*
b.	Elements of Properties of Matter by *Mathur, DS*
c.	Heat and Thermodynamics by *Brij Lal*
d.	Text Book on Heat by *Hossain,T*
e.	A Text Book of Optics by *Brij Lal*
f.	A Text Book of Sound by *Brij Lal*
g.	Physics Part-I by *Halliday, D and Resnic, R*

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Course Code:	**Course Title:**	**Credits:**
GED 1103	Mathematics I	03

Course Learning Objective: This course is designed to provide the mathematical foundation required under STCW Section A-II/1 and A-II/2 for watchkeeping officers, chief mates, and masters. The course enhances the learner's ability to perform essential calculations in navigation, cargo work, ship stability, and related maritime operations. The objective is to ensure that officers can apply mathematical reasoning effectively at both the operational and management levels on vessels of 500 GT and above. Upon completing this course, the learner will be able to:

a. Apply essential mathematical concepts (algebra, trigonometry, geometry, basic calculus) relevant to maritime operations.
b. Perform accurate navigation calculations, including course, speed, distance, ETA, set and drift, and position fixing.
c. Use plane and spherical trigonometry for chartwork, coastal navigation, and ocean navigation tasks.
d. Calculate key stability parameters, such as displacement, draft, buoyancy, center of gravity, trim, and metacentric height (GM).
e. Analyze the effects of cargo operations, including weight shifting, loading or unloading, and redistribution on ship stability.
f. Conduct cargo-related computations, such as hold capacity, stowage factor, load density, and cargo distribution planning.
g. Integrate mathematical reasoning into broader maritime decision-making at both

operational (OICNW) and management levels (Chief Mate/Master).

h. Solve multidisciplinary maritime problems involving navigation, stability, cargo work, and shipboard operational planning.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Algebra**	**06**
	forms sums, differences, products and quotients of simple algebraic expressions, including simple fractions	
	expands the following: $(x + a)^2$, $(x + a)^3$, $(x + a)(x - a)$, $(x + a)(x + b)$, $x^3 + a^3$, $x^3 - a^3$	
	simplifies expressions by extracting common factors	
	simplifies expressions in brackets and collects common terms	
	solves problems leading to linear equations	
	solves simultaneous linear equations in two unknowns	
	solves quadratic equations by factorization or by formula (real roots only)	
	explains the meaning of 'absolute error' and 'relative error'	
	calculates percentage errors in areas and volumes, given the percentage error in linear measurements	
	Theory of equations	
	Inequality	
2	**Matrices and System of Linear Equations**	**4**
	Matrix operations (Addition, Subtraction, Multiplication, Inverse)	
	Solving linear equations using matrices.	
	Application in navigational systems	
	Transformation matrices (Basic introduction)	
3	**Graphs**	**6**
	draws and labels axes	
	defines 'origin', 'abscissa', 'ordinate', and describes how a point is identified by its Cartesian co-ordinates	
	determines suitable scales from given data	
	plots points, given their Cartesian co-ordinates	
	draws a smooth curve through plotted points	

	given the abscissa, reads the value of the ordinate and vice versa	
	extracts values from graphs of ship's data	
	draws graphs of given functions	
	solves simultaneous equations graphically	
4	**Proportion, Variation and Interpolation**	**4**
	defines the ratio of two quantities, and uses the notation a: b=a/b	
	uses the notation a:b::c:d and states that it is equivalent to a/b=c/d	
	given any three quantities of a proportion a equation, calculates the fourth	
	explains that map and drawing scales are expressed as ratios	
	solves problems involving scales	
	states that two quantities which vary so as to maintain a constant ratio are said to vary directly	
	states that a quantity is said to vary inversely as another when it varies directly as the reciprocal of the other	
	states that a quantity is said to vary jointly as a number of others when it varies directly as their product	
	solves problems on direct, inverse and joint variation	
	explains what is meant by linear interpolation	
	shows how linear interpolation is an application of proportion	
	uses linear interpolation to find intermediate values in tables such as ullage tables and deadweight scales	
	given intermediate values, performs inverse interpolation to find the value of the argument	
	uses differences in inverse interpolation	
	describes the arrangement and use of critical tables	
	interpolates in tables with two arguments	
	given the value of one argument, uses inverse interpolation to find the value of the other argument	
	performs linear extrapolation	
	explains, with the aid of a diagram, how the linear assumption may lead to error in the interpolated value	
	states that the intervals of arguments used in navigational tables are sufficiently small that linear interpolation produces negligible errors	

5	**Trigonometry**	**6**
	describes the measurement of angle in degrees, minutes and seconds of arc	
	describes the measurement of angle in circular measure and defines the radian	
	states that 1 radian is approximately equivalent to 57.3 degree	
	defines sine, cosine and tangent as ratios of the sides of a right-angled triangle	
	defines the reciprocal ratios cosecant, secant and cotangent	
	states the complementary pairs of ratios	
	solves problems reducible to right-angled triangles	
	states the values of trigonometrical functions for angles 0 degree, 40,4555,60 and 90 degrees (using scientific calculators)	
	determines the trigonometrical functions for angles of any size	
	draws graphs of the trigonometrical functions over the range -360 degree to 360 degree	
	states the period of the function's sine, cosine and tangent	
	uses trigonometrical formula $\sin^2 a + \cos^2 a = 1$ and $\frac{\sin a}{\cos a} = \tan a$ in solving simple identities	
	solves problems involving the application of objectives on right angled triangle/oblique plane triangles using the cosine and sine formulae	
	explains the ambiguous case when using the sine formulae	
6	**Geometry**	**8**
	distinguishes, equilateral, isosceles, right-angled and scalene triangles	
	defines acute, obtuse and reflex angles	
	states the sum of the angles of a plane triangle	
	proves the property of exterior angles	
	explains what is meant by congruent triangles	
	describes the properties of similar triangles	
	constructs triangles from given data	
	explains the ambiguous case, given two sides and a non-included angle	
	states Pythagoras's theorem, without proof, and uses it to calculate one side of a right-angled triangle, given the other two	

	states the relationships between angles formed by a transversal to two parallel straight lines	
	defines an arc, a sector, a chord and a segment of a circle	
	determines arc length, given radius and angle of sector	
	states that angles subtended by a chord in the same segment of a circle are equal	
	states that the angle subtended by a chord at the centre of a circle is twice the angle subtended at the circumference	
	states that the angle subtended at the circumference by a diameter is a right angle	
	defines a quadrilateral, a parallelogram, a trapezium and a rhombus	
	calculates areas of sectors and segments of a circle	
	explains and applies Simpson's first, second and five-eighth rule for their use in the computation areas, volumes and centroids (no derivations required)	
	Constructs: -a perpendicular to a line from a given point - a perpendicular to a line at a given point on the line - A tangent to a circle - the perpendicular bisector of a line - the bisector of an angle	
	Divides a line into a given number of equal parts	
	Determines - The circumcenter of a triangle & The in-center of a triangle	
	Defines a median of a triangle	
	Defines the centroid of a triangle and determines centroids by construction	
	Given three points and the angles subtended by pairs of those points at a position, determine the position by plotting	
7	**Mensuration**	**4**
	Revises calculations for the perimeters and areas of: -a square - a rectangle - a parallelogram	

	- a trapezium - a rhombus - a triangle - a circle	
	Calculates the areas of sectors and segments of a circle	
	Calculates the surface areas and volumes of -a cube -a rectangular and a triangular prism - a cylinder -a right circular cone - a sphere	
	Solves problems involving the application of objectives	
8	**Statistics**	**4**
	Defines random experiments	
	Explains and solves measure of central tendency, measures of dispersion	
	Explains continuous distributions	
	Explains and solves correlation and regression	
	Explains linear regression, method of least squares, multiple linear regression, standard error of regression estimates and its application	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Principles of Mathematical Analysis — Walter Rudin
b.	Advanced Engineering Mathematics — Erwin Kreyszig
c.	Mathematical Methods in the Physical Sciences — Mary L. Boas
d.	How to Think Like a Mathematician — Kevin Houston
e.	Introduction to Commutative Algebra — Atiyah & MacDonald

Course Code:	Course Title:	Credits:
GED 1105	Maritime English and Communication Skills	03

Course Learning Objective: This course is designed to provide maritime officers with the English language skills required under STCW Section A-II/1 for watchkeeping officers. It emphasizes the use of English in written and oral forms for effective communication on board and ashore, understanding navigational and meteorological information, and using IMO Standard Marine Communication Phrases (SMCP). The course also covers technical vocabulary needed to interpret manuals, specifications, and to communicate with technical shore staff.

In addition, this introductory course develops cadets' English language proficiency with an emphasis on basic language skills and grammatical competence. It highlights Maritime English, providing a standardized vocabulary and phraseology (such as SMCP) for critical communications and to overcome language barriers among individuals from diverse linguistic backgrounds. The course demonstrates practical language use in writing and speech while focusing on enhancing cadets' overall English proficiency. It provides a structured approach to recognize and apply different linguistic elements of English as cadets learn to speak, write, and comprehend a variety of texts. Moreover, it strengthens communication and co-curricular skills while reinforcing previously acquired knowledge.

a. Communicate effectively in written and oral English by applying appropriate grammar, vocabulary, pronunciation, and clarity in professional maritime contexts.
b. Comprehend, interpret, and analyze maritime texts and information, including charts, nautical publications, manuals, and meteorological reports.
c. Use IMO Standard Marine Communication Phrases (SMCP) and other maritime vocabulary accurately for safe and unambiguous communication with ships, shore stations, VTS, and multilingual crew.
d. Demonstrate listening and speaking proficiency for operational communication, including watchkeeping duties, emergency situations, and routine shipboard interactions.
e. Apply English language skills to technical and operational tasks, such as interpreting equipment specifications, maintenance instructions, and communicating with technical shore staff.
f. Meet the competence requirements of STCW Table A-II/1 and IMO Model Course 3.17

by integrating language skills into navigation, shipboard operations, and safety-related communication.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Grammar**	**6**
	Parts of speech	
	Tenses	
	Types of sentences & structures	
	Articles (a/an/the)	
	Prepositional phrases	
	Gerunds & infinitives	
	Adjectives: comparative & superlative	
	Conjunctions	
	Modal verbs	
	Reported speech	
	The zero article	
	Relative clauses & pronouns	
	Adverbs of time	
	Question tags	
	Conditional sentences	
	Right form of verb	
	Syntax & sentence construction	
2	**Vocabulary & Maritime Terminology**	**8**
	General vocabulary (synonyms, antonyms, idioms, transitional words)	
	Sentence completion (with & without clues)	
	Numerical and descriptive vocabulary	
	Vessel-related vocabulary (types, parts, equipment)	
	Navigation and voyage-related vocabulary	
	Cargo operations vocabulary	
	VHF readability codes	
	Industry terminology from real shipboard contexts	
	IMO Standard Marine Communication Phrases (SMCP)	

	SMCP structure & principles Navigation and ship-handling phrases Cargo handling phrases Safety and emergency communication SMCP message markers	
3	**Reading & Interpretation Skills**	**6**
	Application of the knowledge of grammar and vocabulary in reading, understanding and interpreting comprehensions. Reading material must ideally be inclusive of Maritime topics but may be adapted to suit the learning needs as deemed fit by the instructor.	
	Reading and interpreting charts, manuals, and nautical publications	
	Understanding meteorological information and navigational warnings	
	Extracting relevant information for operational and safety purposes	
4	**Academic Writing**	**6**
	Application of the knowledge of grammar and vocabulary in producing competent written material including but not limited to formal letters/applications, incident reports, notice writing, descriptive essays, summary writing, completing story, analyzing graph/ chart etc.	
4	**Difference between British & American English**	**2**
	Cultural Awareness and Professional Communication	
	- Understanding cross-cultural communication in maritime contexts - Strategies to ensure clarity, reduce ambiguity, and maintain professionalism - Effective reporting, briefing, and documentation practices	
5	**Phonology**	**4**
	Basic to intermediate level of understanding in phonology f or the application in verbal communication. Topics may include, but not be limited to, the following:	
	Sound structures, articulators, stress, intonations, phonemes, phonetics, IPA, meanings and context.	
	Listening and Speaking Skills	
	- Effective listening strategies for multi-lingual crew and shore communications	

	- Oral communication for watchkeeping, navigation, and operational duties - Role-plays and simulations of ship-to-ship and ship-to-shore communication	
6	**Public speaking**	**4**
	What is public speaking, how to improve public speaking skills	
	Integration of Language Skills in Maritime Duties	
	- Application of English and SMCP in daily watchkeeping and operational tasks - Coordination with multi-lingual crew members - Exercises, case studies, and practical scenarios to reinforce language use	
7	**Literature for language**	**6**
	Short story- The luncheon, The necklace, Lather and nothing else Poetry- Stopping by woods on a snowy evening	
	Technical English	
	- Understanding manufacturers' manuals, equipment specifications, and technical instructions - Vocabulary for ship machinery, equipment, and maintenance operations - Communication with technical shore staff	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Oxford Practice Grammar, Author: John Eastwood
b.	IMO Model course 3.17 / SMCP
c.	English for maritime studies by TN Blakey
d.	Blakey, T.N. English for Maritime Studies. 2nd ed. Prentice Hall College Div, 1988 (ISBN-13: 978-0132813792)

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Course Code:	Course Title:	Credits:
SOC 1107	General Ship Knowledge	03

Course Learning Objective: The General Ship Knowledge course (GSK) provides detailed knowledge of ship's dimensions and various hull and fittings parts of the ship, general knowledge of basic ship stability, so that a student can carry out routine operation and the maintenance of the vessel.

This Course provides the learner with foundation knowledge of shipboard operations, including Ship's types, Ship's dimension, a knowledge of the constructional features of the principal types of cargo-carrying ships. The main aspects of ship loading and stability and the application of the principal calculations associated with this.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Ship dimensions and form**	**4**
	sketches an elevation and plan views of various ship types such as a general cargo ship, crude oil carrier, and bulker showing the arrangement and illustrate a general knowledge of the primary structural members and indicate the proper names for the various parts to include holds, engine - room, peak tanks, double - bottom tanks, hatchway, tween deck and position of bulkheads, cofferdams, pump - room, cargo tanks, slop tank and permanent ballast tanks: camber rise of floor tumblehome flare sheer rake parallel middle body entrance	

	run defines: forward perpendicular(FP) after perpendicular (AP) ength between perpendiculars(LBP) length on the waterline (LWL) length overall (LOA) base line moulded depth, beam and draught extreme depth, beam and draught	
2	**Ship Stresses**	**13**
	- describes in qualitative terms shear force and bending moments - explains what is meant by 'hogging' and by 'sagging' and distinguishes between them - describes the loading conditions which give rise to hogging and sagging stresses - describes how hogging and sagging stresses are caused by the sea state - explains how hogging and sagging stresses result in tensile or compressive forces in the deck and bottom structure - describes water pressure loads on the ship's hull - describes liquid pressure loading on the tank structures - calculates the pressure at any depth below the liquid surface, given the density of the liquid - describes qualitatively the stresses set up by liquid sloshing in a partly filled tank - describes racking stress and its causes - explains what is meant by 'pounding 'or 'slamming' and states which part of the ship is affected - explains what is meant by 'panting' and states which part of the ship is affected - describes stresses caused by localized loading - describes corrosion - describes the causes of corrosion onboard - describes the various methods that being used to minimize the effect of corrosion	

3	**Load Lines and Draught Marks**	**9**
	- explains where the deck line is marked - defines 'freeboard' - explains what is meant by 'assigned summer freeboard' - draws to scale the load line mark and the load lines for a ship of a given - summer moulded draught, displacement and tonnes per centimetre immersion in salt water - explains how the chart of zones, areas and seasonal periods is used to find the applicable load line - demonstrates how to read draughts - explains that the freeboard, measured from the upper edge of the deck line to the water on each side, is used to check that the ship is within its permitted limits of loading - lists the items in the conditions of assignment of freeboard - describes why the height of sill are varies between different type of vessels based on Load Line Rules	
4	**Displacement**	**7**
	- states that, for a ship to float, it must displace a mass of water equal to its own mass - explains how, when the mass of a ship changes, the mass of water displaced changes by an equal amount - states that the displacement of a vessel is its mass and it is measured in tonnes - states that displacement is represented by the symbol △ - explains the relationship between the displacement and mean draught of a ship - by using the graph or scale - given a displacement/draught curve, finds: ▪ displacements for given mean draughts ▪ mean draughts for given displacements ▪ the change in mean draught when given masses are loaded or discharged	

	▪ the mass of cargo to be loaded or discharged to produce a required change ▪ of draught - defines' light displacement' and 'load displacement' - defines 'deadweight' - uses a deadweight scale to find the deadweight and displacement of a ship at various draughts in seawater - defines 'tonnes per centimetre immersion'(TPC) - explains why TPC varies with different draughts - uses a deadweight scale to obtain TPC at given draughts - uses TPC obtained from a deadweight to find: - the change of mean draught when given masses are loaded or discharged - the mass of cargo to be loaded or discharged to produce a required change of draught - defines 'block coefficient'(C_b) - calculates C_b from given displacement and dimensions - calculates displacement from given C_b and dimensions	
5	**Buoyancy**	**4**
	- explains what is meant by 'buoyancy' - states that the force of buoyancy is an upward force on a floating object created by the pressure of liquid on the object - states that the buoyancy force is equal to the displacement of a floating object - describes reserve buoyancy - explains the importance of reserve buoyancy - explains how freeboard is related to reserve buoyancy - explains the purpose of load lines - explains the requirements for maintaining watertight integrity	
	- demonstrates an understanding of damage stability requirements for certain vessels - explains reasons for damage stability requirements - identifies damage stability requirements for Type A	

	vessels, Type (B - 60) and Type (B - 100) vessels - identifies equilibrium condition after flooding for Type A, and all Type B vessels - identifies damage stability requirements for passenger vessels	
6	**Fresh Water Allowance**	**5**
	- explains why the draught of a ship decreases when it passes from fresh water to seawater and vice versa - states that when loading in fresh water before proceeding into seawater, a ship is allowed a deeper maximum draught - describes what it meant by the fresh water allowance (FWA) - given the FWA and TPC for fresh water, calculates the amount which can be - loaded after reaching the summer load line when loading in fresh water before sailing into seawater - describes the uses a hydrometer to find the density of dock water - describes the effect of changes of tide and rain on dock water density - explains how to obtain the correct dock water density - given the density of dock water and TPC for seawater, calculates the TPC for dock water - given the density of dock water and FWA, calculates the amount by which the appropriate load line may be submerged - given the present draught amidships and the density of dock water, calculates - the amount to load to bring the ship to the appropriate load line in seawater	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Ship Construction notes Kemp & Young (Taylor & Francis Ltd., 29 Oct 1997).
b.	Ship Construction for Engineers Reid (Bloomsbury Publishing Plc 2017).
c.	Ship construction Pursey (Sheridan House Inc; Subsequent edition (October 1, 1983).
d.	Ship Stability I & II Capt. Subramaniam H. (Vijaya Publications).
e.	Problems on M. V. Hind ship Capt. Joseph & Capt. Rewari (Applied Research International Pvt. Ltd. 2016).

Course Code:	**Course Title:**	**Credits:**
NAV 1109	Meteorology I	03

Course Learning Objective: Students to understand the principle and use of Meteorological instruments, atmospheric pressure and components, wind circulation and cloud formation system so that they can carry out navigational watch keeping duties on board by following meteorological predictions and features.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Ship borne Meteorological Instruments**	**5**
1.1	Basic principle of an aneroid barometer, reads the atmospheric pressure from an ordinary aneroid barometer and precision aneroid barometer if available	
1.2	Describes the function of a hygrometer	
	Reads the temperature from a thermometer	

	The basic principles of wind sensors and demonstrates ordinary readings of wind speed	
	Specific knowledge on shipboard meteorological equipment	
2	**The Atmosphere, its Composition and Physical Properties**	**9**
2.1	The composition of the earth's atmosphere, dry air and its constituents, water vapour and aerosols	
	Draws a typical vertical temperature profile through the lower 100 km of the earth's atmosphere	
	Defines 'troposphere', 'tropopause', 'stratosphere', 'stratopause', 'mesosphere', 'mesopause' and 'thermosphere'	
	Describes the main features of the troposphere	
2.2	Describes the importance of the sun as the principal energy source for atmospheric processes	
	Describes the nature of solar radiation, (scattering, reflection and absorption)	
	Explains the effect on insolation of a variation in latitude, the effect on insolation of a variation in the sun's declination, the effect on insolation of a variation in the length of daylight	
2.3	Defines water vapour, the properties of water vapour in the atmosphere, evaporation, condensation, latent heat of vaporization, saturated air	
	Describes the processes of mixing, cooling and the evaporation of water vapor, by which a sample of air may be brought to saturation	
	Defines 'dewpoint', 'absolute humidity', 'relative humidity', 'vapor pressure'	
3	**Atmospheric Pressure**	**9**
3.1	States that pressure equals force per unit area	
	States that the atmosphere exerts a pressure on any surface placed within it	
	States that the atmospheric pressure on a unit area of a surface is equal to the weight of the "air column" extending from that surface to the outer fringes of the atmosphere	
	States that atmospheric pressure decreases with height above sea level	
3.2	States that atmospheric pressure acts in all directions	
	States that the basic unit of pressure is N/m2	
	States that 1 millibar = 10-3 bar = 102 N/m2	

3.3	States that the atmospheric pressure at sea level normally varies between about 940 mbar and 1050 mbar	
	States that the average pressure at sea level is 1013.2 mbar	
	States that the surface pressure rises if air is added to the 'column' above the surface, and vice versa	
4	**Wind**	**11**
4.1	Defines 'wind'	
	Describes the Beaufort scale of wind force	
	Explains qualitatively the pressure gradient force	
	Explains qualitatively the Coriolis (geostrophic) force	
	Define Isobars, causes of land and sea breeze	
4.2	Explains the surface wind circulation around high and low-pressure centers	
	Inserts surface wind directions on a map showing pressure distribution and indicates relative wind speeds at various places within the pressure field	
	Explains Buys-Ballot's Law	
4.3	Explains the method of estimating the strength of the wind from the appearance of the sea surface, using the Beaufort wind scale	
	Lists the factors, other than the wind speed, which affect the appearance of the sea surface	
	Explains difference between apparent and true wind	
4.4	Determines the true wind velocity by using a vector diagram, given the apparent wind and the ship's course and speed	
	Describes the method of estimating the wind direction from the appearance of the sea surface	
	Demonstrates the use of a geostrophic wind scale	
5	**Visibility**	**8**
5.1	States that visibility is reduced by the presence of particles in the atmosphere, near the earth's surface	
	Defines 'fog', 'mist', 'haze'	
5.2	Applies the concept of processes leading to super saturation to a classification of fogs as mixing, cooling or evaporation fogs	
	Explains qualitatively the formation of radiation fog, mentioning areas,	

	seasons and reasons for its dispersal	
	Describes the effect of pollution on the formation of radiation fog	
	Explains qualitatively the formation of advection fog, mentioning areas, seasons and reasons for dispersal	
	Explains qualitatively the conditions leading to the formation of sea smoke, and typical areas where sea smoke may be encountered Describes methods of estimating the visibility at sea, by day and by night, and the difficulties involved Describe types of fog: radiation fog, advection fog, smog, arctic sea-smoke, orographic fog, etc.	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Cornish, M., Ives. E. Reeds Maritime Meteorology (Reeds Professional). Revised edition. Adlard Coles, 2010 (ISBN-13: 978-1408112069)
b.	Subramanium, H. Marine Meteorology (Nutshell Series, Book 2). 5th edition (ASIN: B082XB2666)
c.	Meteorological Office. Marine Observer's Handbook, 11th ed. London, HMSO, 1995. (ISBN 0-11-400297-5)
d.	Meteorological Office. Meteorology for Mariners, 3rd ed. 8th impression (Met.0.895). London, HMSO, 1996. (ISBN 0-114-00367X)
e.	Atmosphere and Weather-Barry R.G. , Chorley R. J.

Course Code:	Course Title:	Credits:
NAV 1111	Principles of navigation	03

Course Learning Objective:

1. To learn about solar system and Celestial bodies, co-ordinates
2. To learn celestial spheres and movements
3. To learn time and Hour angle
4. To learn about nautical tables
5. To learn about chart constructions and Natural scale
6. To learn about sailing
7. To learn about Equinoctial system

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Definitions**	**6**
	Latitude, Longitude, Parallel of Latitude, Meridian, Prime Meridian, Equator, Great Circle, Semi Great Circle, Smal circle, Spherical angle, Spherical Triangle, Pole, Difference of Latitude, Difference of Longitude, International Nautical Mile, Cable and Knot.	
	Mathematical calculation based in Dlat and Dlong	
2	**Charts**	**6**
	Basic Knowledge of Chart Projection	
	Natural scale and why it varies	
	Mercator projection, advantage and disadvantage	
	Polar Gnomonic Chart, advantage and disadvantage	
	General features of Mercator Chart and calculation of Natural scale for a given Latitude	
3	**Sailing**	**8**
	Definition: Departure, MP, DMP, Rhumb Line	
	Plane sailing formula, limitation and Mathematical calculation	
	Parallel sailing, formula, and Mathematical calculation	
	Mercator sailing formula and Mathematical calculation. Why DMP is used	
	Rhumb Line Sailing	

	Mathematical calculation based on sailing	
4	**Nautical Almanac and Norie's nautical Table**	**4**
	Information contained in Nautical Almanac	
	Content of daily pages	
	How to use Almanac for increment and other information of celestial bodies	
	Information contained in Norie's Nautical table	
	How to use Norie's Nautical table	
5	**Time and Hour Angle**	**6**
	- Basic Time Definitions – UT or GMT, LMT, ZT, SMT, Standard time and day light saving time. Time Zones	
	Longitude and Time relationship - Conversion between Longitude and time - Local time at a given Longitude - Effect of East/West Longitude on Time Calculation	
	Hour Angle concepts - GHA, LHA, SHA, RA - Relationship between GHA, LHA and Longitude	
	Time and Date calculation - Conversion between GMT and Zone Time - Use of Almanac for calculation of GHA of celestial bodies - Interpolation of minutes and seconds - International date Line and nautical date Line - Civil Calendar and Corrections - Siderial Day and mean solar day - Equation of time, history and use Time signal and correction	
	Problem solving and Practice	
6	**Solar System**	**6**
	Composition and dimension of solar system	
	Earth's Elliptical orbit and Approx perihelion and aphelion distance and dates. Superior planet, inferior planet, Quadrature, Opposition and Elongation. Elongation of Planet	
	Eccentricity of the earth's orbit. Kepler's laws of Planetary movement and	

	use.	
	Dates of solstices and equinoxes	
	Explain day and night. Circumpolarity of the body, continuous day and night.	
	Significance of Tropic of Cancer and Capricorn.	
	Venus as Morning and evening star	
7	**Celestial sphere and Equinoctial system of Co-ordinate**	**6**
	Describe the celestial sphere	
	Apparent annual motion of sun and Ecliptic	
	Definition: Celestial Poles, celestial Meridian, equinoctial, obliquity of ecliptic, declination, zenith, nadir, amplitude, TZD, elevated pole, 1st Point of Aries and Libra.	
	Definition and Basics of PZX triangle and Napier's Rules	
	Use of star finder	
	Twilight's definition, variation with latitude and continuous twilight, use of Almanac for Twilight.	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Principles of Navigation – Capt. T.K. Joseph and Capt. S.S.S Rewari
b.	Principles and Practice of Navigation – A. Frost

Course Code:	Course Title:	Credits:
NAV 1102	Basic Seamanship Sessional	1.5

Course Learning Objective: By the end of Basic Seamanship, the student will learn theoretical understanding of ship construction, deck equipment and shipboard procedures. Skills in rope work, rigging, mooring, and anchoring. Safety awareness and familiarization with basic shipboard emergency equipment.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Introduction & Theory**	**12**
	Introduction to seamanship: definitions, history, parts of a ship, ship types	
	Ship's construction: decks, bulkheads, compartments, hatches, ladders	
	Anchors and cables: parts of an anchor, types of anchors, securing for sea	
	Mooring equipment: Bollards, bitts, fairleads, winches	
	Types of ropes and wires: Natural fibre ropes, synthetic ropes, wire ropes, care & maintenance	
	Knots, bends, hitches: theory and uses	
	demonstrates how to make: - reef knot - rolling hitch - timber hitch - figure of eight - clove hitch - wall and crown - bowline and bowline on the bight. - sheet bend (double and single). - Sheepshank - round turn and two half hitches a marline spike hitch. - demonstrates how to whip a rope's end using plain or palm and - needle whipping - demonstrates how to put a seizing on a rope and wire	
	demonstrates how to make: Splicing - splicing of fiber rope (eye splice, short splice and back splice)	

	- splicing of wire rope (eye splice, short splice and back splice) - states the tools needed for splicing	
	Blocks, sheaves, purchases: mechanical advantage	
	Rigging: standing vs running rigging, blocks, shackles, hooks	
	Store inventory and management	
	Compass Card and helm order	
	Hand lead line	
	Various types of ladders	
	Painting, corrosion, maintenance of hull and fittings	
	Hatch covers, deck machinery, cranes, derricks (basic introduction)	
	Drills and seamanship duties in emergencies (abandon ship, man overboard)	
2	**Practical Session**	**20**
	Visit to ship model / full ship: learn parts of the ship on deck	
	Coiling, splicing, whipping ropes	
	Practice: knots, bends, hitches	
	Rigging blocks & tackles, calculating mechanical advantage	
	Anchoring practical: working windlass, dropping and heaving up anchor (demonstration or simulator)	
	Mooring practice: throwing heaving line, tying to bollards, use of breast and spring lines	
	Life-saving appliances and fire appliances familiarization	
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-Voce (Oral Exam): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Seamanship Techniques by D.J. House
b.	Reeds Seamanship and Nautical Knowledge
c.	Manual of Seamanship (Royal Navy)

Course Code:	Course Title:	Credits:
NAV 1144	Signaling Sessional	1.5

Course Learning Objective: The primary objective of signaling and basic radio communication for merchant officers is to ensure safe navigation and effective communication at sea. Effective communication is vital for preventing collisions, coordinating maneuvers and responding to distress situations. This includes using various visual and audible signals, as well as radio communication to interact with other vessels, shore-based stations and for internal communication on board. The course centers on distress communications in all sea areas and the methods of communication available using different equipment systems. Emphasis is placed on Search and Rescue (SAR) communications techniques, however the nine functions of the GMDSS system, and basic equipment maintenance are also covered. This module also delivers the use of the International Code of Signals as a means of communication at sea. This module is taught as an individual short course unit; assessments are carried out at the end of the course.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Signaling by Morse code**	**14**
	Identifying Morse symbols for the alphabet and numerals	
	Sending and receiving the distress signal SOS by flashing light	
	State the recommendations on sound signaling	
	List the single-letter signals which may be sounded only in compliance with the requirements of the International Regulations for Preventing Collisions at Sea	
2	**International Code of Signals**	**10**
	Recognize all International Code flags and pendants	
	Explains the purpose of the International Code of Signals	
	Usage of substitute flags	

	Demonstrate how to call, using flags	
	Demonstrate the use of the answering pendant	
	Explain actions to take when signals are not understood	
	Describe how the end of a signal is indicated	
	Explain the names in the text of a signal are to be spelt out in plain language	
	Explain the use of identity signals	
	State that, in flag signaling, the answering pendant is used to indicate the decimal point in numbers	
	Demonstrate how to signal azimuth or bearing, course, date, latitude, longitude, distance, speed, time	
	Describe the arrangement of the Code into: - single-letter signals - two-letter signals for the General Section - three-letter signals beginning with 'M' for the medical section	
	- describes the use of complements and the tables of complements - describes how to signal depths - explains the significance of text in brackets - states that cross-referencing of signals in the right-hand column is used to facilitate coding - describes the meanings of single-letter signals - states that there are single-letter signals for use between an ice-breaker and assisted vessels - states that time of origin may be included codes and decodes messages, using the General Section codes and decodes messages, using the Medical Section and complements - describes the International Code Signal of distress	
3	**Standard Marine Communication Phrases**	**4**
	Use the IMO Standard Marine Communication Phrases	
4	**VHF Communication practice / Marine Radio and Electro Magnetic Communications:**	**4**
	Ship-Ship, Ship-Shore/Ground Station/VTMIS-Ship	
	Introduce to Marine Communications service	
	Maritime Mobile Services	
	Radio frequencies: VHF, MF/HF, DSC	
	Satellite communications equipment: EPIRB, SART, NAVTEX, EGC.	
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-Voce (Oral Exam): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Amendments to SOLAS Convention Manual for Maritime Mobile Communication and Maritime Mobile Satellite Communication: ITU
b.	International Volume of Radio Signals: HMSO
c.	International Code of Signals: IMO
d.	GMDSS for GOC: Clifford Merchant.

Course Code:	**Course Title:**	**Credits:**
GED 1213	Fundamental of Electronics & Computer Science (FECS)	03

Course Learning Objective: This course introduces cadets to the essential principles of electronics and computer science required for modern maritime operations. It covers the basic theory of electricity, electronic components, digital systems, and the operation of common shipboard electronic equipment. Aligned with STCW requirements, the course develops the technical understanding necessary for safe and effective use of navigation, communication, monitoring, and control systems.

In addition, the course provides foundational knowledge of computer systems, software, data processing, and information systems used aboard ships and ashore. Cadets learn how electronic and computer-based technologies support navigation, automation, engineering functions, communication, and administrative processes onboard.

a. Explain basic electrical concepts, including current, voltage, resistance, power, and Ohm's Law.
b. Identify and describe common electronic components such as resistors, capacitors, inductors, diodes, and transistors.

c. Understand the principles of AC and DC circuits, circuit behavior, and safety precautions.
d. Explain the working principles of shipboard electronic equipment, such as sensors, alarms, communication devices, and control panels.
e. Interpret simple circuit diagrams and electrical schematics used in maritime systems.
f. Describe how electronic systems support navigation and communication, including radar, GPS, and radio equipment.
g. Explain the basic structure and functioning of computer systems, including hardware, software, memory, and processing.
h. Understand operating systems and essential software applications used on board ships.
i. Apply fundamental concepts of data processing, networking, and information flow relevant to ship operations.
j. Describe cybersecurity principles and safe digital practices for maritime environments.
k. Use computer systems for shipboard tasks, including communication, reporting, record keeping, and operational planning.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Electricity & Magnetism:**	**02**
	Electric circuit, Work, Energy and Power in an Electric circuit, Coulomb's Law, Electric field (E), Electric potential (V); Capacitors and capacitance, Capacitors with dielectrics, Charging and discharging of a capacitor, Ohm's Law, Kirchhoff's Law;	
	Magnetic field, Magnetic induction, Hall Effect, Faradays Law of electromagnetic induction, Self-induction, Mutual induction, Magnetic properties of matter, Hysteresis curve, Alternating Voltage and Current.	
2	**Electronics**	
2.1	**Digital Electronics**	**02**
	Introduction to Digital Electronics; Number system; Binary to Decimal and Decimal to Binary conversion; various types of logic Gates; Their truth tables; CKT Symbols.	
	Boolean algebra: Boolean Expressions; De- Morgan's theorem; SOP; POS. Half adder; Full adder; Half and full Subtractor.	

2.2	**Introduction to Semiconductors**	
	Classifications of solids; semiconductors; Formation of P-N junctions and depletion layers;	
	Forward bias and reverse bias characteristics; Standard symbols; Theory of operations of P-N junction diodes;	
	Half and Full wave Rectifiers; Ripple factor;	
	Avalanche effect and Zener effect.	
2.3	**Transistors**	**02**
	Concepts of Bi Polar Junction Transistors, FET, MOSFET, UJT; PNP and NPN transistors;	
	Different modes of operations; Transistor Characteristics.	
2.4	**Amplifiers**	**07**
	Definition of amplifier, Kinds of amplifier, Uses;	
	RC Coupled amplifiers; Power amplifiers;	
	Feedback amplifiers; Gain; Band width.	
2.5	**Oscillators:**	
	What is oscillator, Different between oscillator and alternator, advantages;	
	Oscillator/Tank ckt. Formation & its circuit operation, Types oscillator;	
	Tuned Collector Oscillator;	
	LC Oscillators (Hartley & Colpitts); RC Oscillators (Phase – Shift).	
2.6	**Principle of Radio Communications**	
	Principle of Radio Communications: Modulation & Demodulation;	
	A.M Transmitter; A.M. Radio Receiver (Block Study);	
	Superheterodyne receiver.	
3	**Computer Science Fundamentals**	
3.1	**Basic Computing Part**	**12**
	Introduction to Computers: Definition, Characteristics, History and Generation of Computers, Applications of Computers, role of computers in modern life.	
	Computer Hardware and Software: Input/output devices, CPU components, memory hierarchy, storage devices, difference between hardware and software, system and application software	
	Number Systems and Data Representation: Binary, octal, decimal,	

	hexadecimal systems, conversions, binary arithmetic, ASCII/Unicode	
	Operating System Concepts: Functions of OS, types of operating systems, process management, memory management, file systems	
	Computer Networks and Internet Basics: Types of networks (LAN, WAN, MAN), network devices, IP address, Internet basics, email and web concepts	
3.2	**Programming Part**	**09**
	Algorithms and Flowcharts: Problem-solving methods, steps of algorithm design, flowchart symbols, examples of problem logic; **Introduction to Programming and C Language:** Program vs algorithm, compiling and linking, structure of a C program, keywords, identifiers, syntax rules	
	Variables, Constants, and Operators: Data types, variables, constants, arithmetic, relational, and logical operators, precedence	
	Control Statements: Decision-making: if, if-else, nested if, switch; looping: for, while, do-while	
	Functions and Modular Programming: Function definition, prototypes, parameter passing, return values, recursion	
	Arrays and Strings: One-dimensional and two-dimensional arrays, string handling, basic operations	
	File Handling and Program Organization: File I/O (reading/writing), file pointers, header files, compilation units	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Concepts of Electricity and Magnetism by *Rafiqullah, AK et al*
b.	Electricity and Magnetism by *Tewari, KK*
c.	Physics Part-II by *Halliday, D and Resnic, R*
d.	Principle of electronics by *V.K. Mehta*
e.	Basic Electronics Solid State by *B.L. Theraja*
f.	Electronics Principle by *Malvino, A. P.*
g.	Introduction to Electronics by *Millman, J. and Halkias, CC*
h.	Digital system Principles and Application by *Tocci, RJ*
i.	Programming with Fortran 77 by *Ram Kumer*
j.	Introduction to Computers by *Peter Norton*
k.	Computer Fundamentals by *Kelvin Wilson*
l.	Programming In ANSI C by *E. Balagurusamy*
m.	C Programming Language by *Brain W. Kernighan*

Course Code:	**Course Title:**	**Credits:**
GED 1215	Mathematics II	03

Course Learning Objective: This course develops the advanced mathematical knowledge and problem-solving skills required for navigation, cargo operations, ship stability, and other maritime applications under STCW Sections A-II/1 and A-II/2. It provides watchkeeping officers, chief mates, and masters with the ability to apply mathematical reasoning in operational and management-level decisions. Topics include spherical trigonometry, conic sections, vector analysis, differentiation, integration, and differential equations—all taught with direct relevance to navigation, chartwork, stability, and cargo calculations. Upon successful completion, learners will be able to perform accurate and reliable computations essential for safe vessel operation on ships of 500 GT and above.

a. Apply spherical trigonometry to maritime navigation, including solving right-angled, oblique, polar, and quadrantal spherical triangles using Napier's Rules, cosine/sine formulae, haversine formula, and perpendicular-drop methods for great-circle and ocean-navigation problems.
b. Analyze and apply properties of circles, ellipses, parabolas, and hyperbolas, including

standard equations, tangents, loci, and their applications to navigation, chartwork, and satellite-geometry concepts.

c. Use vector mathematics to solve maritime problems, including vector addition/subtraction, component resolution, average velocity and acceleration, and graphical or analytical solutions for forces, motion, currents, and wind effects.
d. Apply differentiation and related techniques, including partial and successive derivatives, to determine rates of change, velocity, acceleration, and physical variations relevant to ship operations, stability, and environmental conditions.
e. Use integration for maritime applications, including solving definite and indefinite integrals, determining area under curves, and applying integral concepts to displacement, consumption, and performance calculations.
f. Formulate and solve first-order ordinary differential equations, including linear ODEs and inverse operator methods, with applications to ship motions, fluid dynamics, and engineering-related operational problems.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Spherical Triangles**	**12**
	defines great circle, small circle, pole and a small circle	
	defines a spherical triangle as a figure on the surface of a sphere bounded by arcs of three great circles	
	defines the angle between two great circles as the angle between the planes in which they lie	
	describes how the length of a side is measured as an angle	
	states the sum of the angles of a spherical triangle exceeds 180 degree but is less than 540 degree	
	states that no side exceeds 180 degree	
	explain right-angled spherical triangles and their properties	
	explain napier's rule for right angled spherical triangles and quadrantal spherical triangles.	
	explain polar triangles and their application in the solution of spherical triangles	
	given two parts of a right-angled spherical triangle, uses Napier's rules to	

	solve for any other part	
	states what is meant by a quadrantal triangle	
	given two parts of a quadrantal triangle, uses Napier's rules to solve for any other part	
	solves problems involving oblique spherical triangles by use of the cosine and sine formulae.	
	uses haversine formula to solve right-angled spherical triangle and explains its advantage over the sine and cosine formulae.	
	solves problems on spherical triangles by dropping a perpendicular and solving the resulting right-angled triangles.	
2	**Circle, Ellipse and Hyperbola**	**04**
	explains standard and general equations of circles, tangent to a circle and applications	
	explains standard forms of equations of parabola, ellipse, hyperbola and it's application with regards to navigation.	
	explains what is meant by a locus	
	defines an ellipse as the locus of a point which moves so that the sum of its distances from two fixed points is constant.	
	states that the fixed points are called the foci	
	describes the major and minor axes of an ellipse	
	defines a hyperbola as the locus of a point which moves so that the locus of a point which moves so that the differences from two fixed foci is constant	
	states that the locus of points for which the difference is zero is the perpendicular bisector of the line joining the foci.	
3	**Vectors**	**06**
	states the vector quantities have direction as well as magnitude	
	distinguishes between scalar and vector quantities and gives examples of each	
	calculates the vector sum of two or more vectors by graphical methods	
	calculates the difference between two vectors by graphical methods	
	resolves a given vector into components in two specified directions by drawing	
	resolves a given vector into components in two specified perpendicular	

	directions by calculation	
	calculates sums and differences of vectors by resolution into perpendicular directions	
	derives average velocity vector from given position vectors	
	derives average acceleration vector from given velocity vectors	
	solves problems involving forces, velocities and accelerations	
4	**Differentiation and Applications**	**06**
	Derivatives of algebraic and trigonometric functions	
	velocity, acceleration from position time equations	
	rate of change in flow, temperature etc.	
	successive differentiation	
	partial differentiation	
5	**Integration and area under curves**	**6**
	Indefinite and Definite integrals	
6	**Differential Equations**	**8**
	define and classify ordinary differential equations	
	linear differential equations of first order and first degree	
	inverse operator	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Principles of Mathematical Analysis — Walter Rudin
b.	Advanced Engineering Mathematics — Erwin Kreyszig
c.	Mathematical Methods in the Physical Sciences — Mary L. Boas
d.	How to Think Like a Mathematician — Kevin Houston
e.	Introduction to Commutative Algebra — Atiyah & MacDonald

Course Code:	Course Title:	Credits:
SOC 1217	Ship Stability I	03

Course Learning Objective:

1. To understand how the stability changes with the movement of liquids in ship and how to handle this to get always stability in range.
2. To learn and understand measuring area of curved surface
3. To learn the Effect of List on stability and correctio.
4. To learn Intact stability criteria and checking method for the compliance of IMO requirement.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Movement of the Centre of Gravity**	**10**
	- states that the centre of gravity (G) of a ship can move only when masses are moved within, added to, or removed from the ship - states that: - G moves directly towards the centre of gravity of added masses - G moves directly away from the centre of gravity of removed masses - G moves parallel to the path of movement of masses already on board - calculates the movement of G (GG_1) from: $GG_1 = \frac{mass\ added\ or\ removed\ \times\ distance\ of\ mass\ from\ G}{new\ displacement\ of\ the\ ship}$ $GG_1 = \frac{mass\ moved\ \times distance\ mass\ is\ moved}{displacement\ of\ the\ ship}$ - performs calculations as in the above objective to find the vertical and horizontal shifts of the centre of gravity resulting from adding, removing or moving masses - states that if a load is lifted by using a ship's derrick or crane, the weight is immediately transferred to the point of suspension - states that if the point of suspension is moved horizontally, the centre of gravity of the ship also moves horizontally - states that if the point of suspension is raised or lowered, the centre of gravity of the ship is raised or lowered - calculates, by using moments about the keel, the position of G after loading or discharging given masses at stated positions - calculates the change in KG during a passage resulting from:	

	- consumption of fuel and stores - absorption of water by a deck cargo accretion of ice on decks and superstructures given the masses and their positions	
2	**Statical Stability**	**8**
	- states that weight is the force of gravity on a mass and always acts vertically downwards - states that the total weight of a ship and all its contents can be considered to act at a point called the centre of gravity (G) - states that the centre of buoyancy (B) as being the centre of the underwater volume of the ship - states that the force of buoyancy always acts vertically upwards - explains that the total force of buoyancy can be considered as a single force acting through B - states that when the shape of the underwater volume of a ship changes the position of B also changes - states that the position of B will change when the draught changes and when heeling occurs - labels a diagram of a midship cross - section of an upright ship to show the weight acting through G and the buoyancy force acting through B - states that the buoyancy force is equal to the weight of the ship - labels a diagram of a midship cross - section of a ship heeled to a small angle to show the weight acting through G and the buoyancy force acting through B - describes stability as the ability of the ship to return to an upright position after being heeled by an external force states that the lever GZ as the horizontal distance between the vertical forces acting through B and G - states that the forces of weight and buoyancy form a couple - states that the magnitude of the couple is displacement × lever, $\Delta \times GZ$ - explains how variations in displacement and GZ affect the stability of the ship - on a diagram of a heeled ship, shows: - the forces at B and G - the lever GZ - states that the length of GZ will be different at different angles of heel - states that if the couple $\Delta \times GZ$ tends to turn the ship toward the upright, the ship is stable - states that for a stable ship: • $\Delta \times GZ$ is called the righting moment • - GZ is called the righting lever	
3	**Initial Stability**	**11**
	- states that it is common practice to describe the stability of a ship by its reaction to heeling to small angles (up to approximately 10°) - defines the transverse metacentre (M) as the point of intersection of	

	successive buoyancy force vectors as the angle of heel increases by a small angle - states that, for small angles of heel, M can be considered as a fixed point on the centreline on a diagram of a ship heeled to a small angle, indicates G, B, Z and M - shows on a given diagram of a stable ship that M must be above G and states that the metacentric height GM is taken as positive - shows that for small angles of heel, $GZ = GM \times sin?$ - states that the value of GM is a useful guide to the stability of a ship - describes the effect on a ship's behaviour of: ▪ - a large GM (stiff ship) ▪ - a small GM (tender ship) - uses hydrostatic curves to find the height of the metacentre above the keel (KM) at given draughts - states that KM is only dependent on the draught of a given ship - given the values of KG, uses the values of KM obtained from hydrostatic curves to find the metacentre heights, GM - states that, for a cargo ship, the recommended initial GM should not normally be less than 0.15m	
4	**Angle of Loll**	**3**
	- shows that if G is raised above M, the couple formed by the weight and buoyancy force will turn the ship further from the upright - states that in this condition, GM is said to be negative and $\Delta \times GZ$ is called the upsetting moment or capsizing moment - explains how B may move sufficiently to reduce the capsizing moment to zero at some angle of heel - states that the angle at which the ship becomes stable is known as the angle of loll - states that the ship will roll about the angle of loll instead of the upright - states that an unstable ship may loll to either side - explains why the condition described in the above objective is potentially dangerous	
5	**Curves of Statical Stability**	**10**
	- states that for any one draught the lengths of GZ at various angles of heel can be drawn as a graph - states that the graph described in the above objective is called a curve of statical stability - states that different curves are obtained for different draughts with the same initial GM - identifies cross curves (KN curves and MS curves) - derives the formula $GZ = MS + GM\ sin\theta$ - derives the formula $GZ = KN - KG\ sin\theta$ - derives GZ curves for stable and initially unstable ships from KN curves - from a given curve of statical stability obtains: - the maximum righting lever and the angle at which it occurs	

	- the angle of vanishing stability - the range of stability - shows how lowering the position of G increases all values of the righting lever and vice versa - states that angles of heel beyond approximately 40°are not normally of practical interest because of the probability of water entering the ship at larger angles	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Ship Stability – Martin A. Rhodes
b.	Ship Stability – Bryan Brass and Dr. Deret

Course Code:	**Course Title:**	**Credits:**
NAV 1219	Bridge procedure and watchkeeping	03

Course Learning Objective: This should be based on the requirements set out in the appropriate regulations and recommendations, Section A-VIII/1 and A-VIII/2 of the STCW Code. In most cases, a failure to keep an adequate navigational watch caused or contributed to the accident. Particular attention should be drawn to the recommendation to fix the ship's position by more than one method whenever possible. The tendency to rely entirely on radar fixes in coastal waters should be discouraged.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Keeping a safe navigational watch**	**6**
	states that the officer of the watch is responsible for navigating safely, with particular regard to avoiding collision and stranding	
	describes the principles to be observed in keeping a navigational watch as set out in Section A-VIII of the STCW Code regarding: - Navigation - navigational equipment - navigational duties and responsibilities - handing over and taking over the watch - look-out - navigation with a pilot embarked - protection of the marine environment - Bridge Navigation Watch Alarm system - Blind pilotage technique - General principles for ships reporting systems and with VTS procedures.	
2	Describes the recommendations on operational guidance for officers in charge of a navigational watch contained in chapter VIII, section A-VIII/2 of the STCW Code: - maintenance of an efficient look-out - the use of engines and sound signaling apparatus - taking over the navigational watch - periodic checks of navigational equipment - compliance with SOLAS *V/19* regarding the use of the automatic pilot and the change-over to manual steering and vice-versa - electronic navigational aids - the use of radar - navigation in coastal waters - conduct of the watch in clear weather - actions to take in restricted visibility - the circumstances in which the officer of the watch should call the	**6**

	master - navigation with a pilot embarked - briefing of watch keeping personnel - describes the duties of the officer of the watch while at anchor - lists the entries which should be made in the log-book	
3	**Keeping a Watch in Port**	
3.1	**Keeping an effective deck watch in port under normal circumstances**	**4**
	states the arrangements for keeping watch in port should: - ensure the safety of life, ship, cargo and port - observe international, national and local rules - maintain order and the normal routine of the ship	
	describes taking over the watch and lists the information which the officer being relieved should pass to the relieving officer	
	lists the matters on which the relieving officer should satisfy themselves before assuming charge of the watch	
	describes how the watch should be kept and lists the points to which attention should be paid	
	describes the actions to take on receiving a storm warning or in an emergency threatening the safety of the ship	
	lists the entries which should be made in the log-book	
3.2	**Keeping a safe deck watch in port when carrying hazardous cargo**	**4**
	defines 'hazardous cargo'	
	states that sufficient personnel should be readily available on board when carrying hazardous cargo in bulk	
	states that special requirements may be necessary for special types of ships or cargo, particularly with respect to: - the number of crew required on board - the state of readiness of fire-fighting appliances and other safety equipment. - special port regulations - communications with the shore in the event of an emergency arising - special precautions to prevent pollution of the environment	
	states that the officer of the watch should be aware of the nature of the	

	hazards and any special precautions necessary for the safe handling of the cargo	
	states that the officer of the watch should be aware of the appropriate action in the event of a spillage or fire	
	describes the procedure for entry into enclosed spaces using a 'permit to work', and the monitoring of work in progress	
	describes the arrangements and procedures for rescue from an enclosed space in an emergency	
4	**Keeping a Watch at anchor**	**02**
	How to select a suitable anchoring position	
	Preparation prior to anchor let go	
	Understanding the anchor brought up technique.	
	Contingency anchorage	
	Swinging circle	
5	**COLREG**	**20**
	The content, application and intent of the International Regulations for preventing collisions at sea 1972, as amended	
	explains the application of the rules as set out in Rule 1	
	defines the term traffic separation scheme'	
	describes the responsibility to comply with the rules as set out in Rule 2	
	describes and cites examples of precautions which may be required by the ordinary practice of seamen or by the special circumstances of the case	
	gives examples of circumstances which may make a departure from the rules necessary	
	describes the general definitions which apply throughout the rules	
	explains the term 'vessel constrained by her draught'	
	distinguishes between 'under way' and 'making way'	
	explains 'a proper look-out' and interprets the intent of 'full appraisal of the situation and the risk of collision'	
	explains the use of radar in the context of Rule 5 - explains what is meant by a safe speed	

	- describes, with reference to court cases, how 'proper and effective action' and 'within a distance appropriate to the prevailing circumstances and conditions' may be interpreted	
	states the factors to be taken into account in determining a safe speed	
	explains how the use of radar affects the determination of safe speed	
	explains what is meant by risk of collision	
	describes the proper use of radar equipment in determining whether a risk of collision exists	
	explains the dangers of making assumptions on the basis of scanty information, citing examples from clear weather as well as the use of radar	
	illustrates, using examples from court cases, how failure to plot may lead to a lack of appreciation of a developing situation	
	illustrates, using examples from court decisions, the following actions to avoid collision referred to in Rule 8: - positive action in ample time large enough to be readily apparent - alteration of course alone - passing at a safe distance - checking the effectiveness of action taken - reduction of speed - taking all way off	
	demonstrates an understanding of Rule 9 by: - defining the terms 'narrow channel' and 'fairway' - describing how to proceed along the course of a narrow channel - describing the navigation of small craft and sailing vessels in a narrow channel - stating the restrictions on crossing the channel or fairway - describing the conduct of vessels engaged in fishing - stating the procedure for overtaking in a narrow channel - describing the actions to be taken on nearing a bend in a narrow channel or fairway	
	defines 'traffic lane', 'separation lane', 'separation zone', 'inshore traffic zone'	
	describes how to navigate in a traffic separation scheme with reference to:	

	- entering and leaving the traffic separation scheme - entering and leaving traffic lanes - crossing lanes - the use of inshore traffic zones - crossing separation lines or entering separation zones other than when crossing, joining or leaving a lane	
	describes the requirements for vessels: - navigating in areas near the terminations of traffic separation schemes - anchoring - not using a traffic separation scheme - engaged in fishing	
	states that a vessel of less than 20 meters in length or a sailing vessel must not impede the safe passage of a power-driven vessel following a traffic lane	
	states that the exemptions for vessels restricted in their ability to maneuver when engaged in an operation for the: - maintenance of safety of navigation - laying, servicing or picking up of a submarine cable	
	explains the meaning of 'precautionary area'	
	defines 'deep water route' and describes for whom such a route is intended	
	explains what is meant by 'vessels in sight of one another	
	demonstrates, with the use of models displaying proper signals or lights, a navigation light simulator or otherwise, the proper action to take to avoid collision with other vessels in sight	
	explains how to decide when a vessel is an overtaking vessel	
	compares and analyses the various avoiding actions which may be taken by an overtaking vessel	
	explains the application of Rule 14, Head-on situation	
	explains why the give-way vessel in a crossing situation shall, if the circumstances admit, avoid crossing ahead of the other vessel	
	explains the application of Rule 15 when crossing narrow channels and traffic lanes	

	explains how Rule 16 and Rule 8 relate regarding the action by a give-way vessel	
	explains the position of stand-on vessel in cases where a risk of collision exists between more than two vessels	
	explains how to decide when to take avoiding action as stand-on vessel	
	describes the actions which may be taken by the stand-on vessel	
	states the avoiding action which must be taken by the stand-on vessel	
	states that a potential collision situation may be divided into the following four stages: - at long range, before risk of collision exists and both vessels are free to take any action - risk of collision applies, the give-way vessel is required to take action and the other vessel must keep her course and speed - the give-way vessel is not taking appropriate action - collision cannot be avoided by the action of the give-way vessel alone	
	explains the responsibilities between vessels with reference to Rules 18 and 3	
	explains the application of Rule 19	
	compares Rule 6 and Rule 19 regarding the determination of safe speed	
	explains how courts have interpreted 'a close-quarters situation'	
	explains how courts have interpreted 'navigate with extreme caution'	
	demonstrates, using a maneuvering board or radar simulator, how to determine risk of collision and the proper action to take to avoid collision in restricted visibility	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	International Conference on Revision of the International Regulations for Preventing Collisions at Sea, 1972 (COLREG 1972)
b.	Cockroft, AN. and Lameijer, J.N.F., A Guide to the Collision Avoidance Rules, 6th ed. Oxford, Butterworth-Heinemann, 2004. (ISBN : 0-7506-6179-8)
c.	International Chamber of Shipping, Bridge Procedures Guide, 6th. Ed. London, ICS Publications.
d.	International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW), 1978, as amended

Course Code:	**Course Title:**	**Credits:**
SOC 1221	Maritime law and conventions	03

Course Learning Objective: This course introduces students to the principles of maritime law and the international conventions that regulate global shipping. It covers the legal framework established by IMO instruments such as SOLAS, MARPOL, STCW, UNCLOS, and COLREGs, along with the responsibilities of flag, port, and coastal states. Through real cases and practical examples, students gain a clear understanding of how maritime laws ensure safety, security, environmental protection, and professional accountability in ship operations.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**IMO conventions concerning safety of life at sea, security and protection of the marine environment**	**12**
	Introduction to Maritime Law	
	Maritime Labour Convention	
	Law of the Sea	
2	**Safety**	**40**
	International Convention on Load Lines, 1966 (LL 1966), as amended	
	International Convention for the Safety of Life at Sea, 1974 as amended (SOLAS) - General Provisions	

	SOLAS Subdivision and Stability, Machinery and Electrical Installation	
	SOLAS - Fire Protection, Fire Detection and Fire Extinction	
	SOLAS - Life - Saving Appliances and Arrangements	
	SOLAS – Radio communications (amended chapter IV)	
	SOLAS - Carriage of Grain	
	SOLAS - Carriage of Dangerous Goods	
	The International Safety Management (ISM) Code	
	International Convention on Standards of Training, Certification and Watch keeping for Seafarers, 1978, as amended (STCW)	
	Special Trade Passenger Ships Agreement, 1971, and Rules, 1971 R82 (STP 1971)	
	Protocol and Rules on Space Requirements for Special Trade Passenger Ships, 1973 (SPACE STP 1973)	
	Athens Convention relating to the Carriage of Passengers and their Luggage by Sea (PAL 1974)	
	International Convention on Tonnage Measurement of Ships, 1969	
	International Convention for the Control and Management of Ship's Ballast Water and Sediments, 2004	
	International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001	
	Guidelines on the Enhanced Programme of Inspections During Surveys of Bulk Carriers and Oil Tankers	
	Code of Safe Working Practices for Merchant Seamen	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Maritime Law — Christopher Hill
b.	Introduction to Maritime Law — Edgar Gold
c.	Maritime Law (6th Edition) — Yvonne Baatz (Informa Law)
d.	Marine Pollution: International Law and Policy — A. A. Mahon & Alan Boyle
e.	The International Law of the Sea — Donald R. Rothwell & Tim Stephens

Course Code:	Course Title:	Credits:
CHS 1223	Shipboard operation and cargo work I	03

Course Learning Objective:

1. Students will enable to understand different types of cargo ships and cargo carried.
2. Cargo spaces preparation and inspection to receive particular cargo.
3. Care during the voyage.
4. Thorough knowledge about cargo handling equipment and their care and maintenance.
5. Securing of different types of cargo.
6. Transportation of hazardous and dangerous cargoes.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Draught, Trim and Stability**	**17**
	- defines 'deadweight' and 'displacement tonnages' - sketches a ship's load line indicating marks for various seasonal zones, areas and periods - uses a ship's hydrostatic particulars and given mean draughts to determine the approximate weight loaded or discharged - uses a deadweight scale to determine the change in mean draught resulting from loading or discharging a given tonnage - given the present draughts and the density of dock water,	

	calculates the draughts in seawater - given the draught amidships and dock-water density, calculates the amount to load to bring the ship to the appropriate load line in seawater - uses hydrostatic data to find the position of the centre of flotation, MCT and TPC for a given draught - calculates the change of trim resulting from loading or discharging a given weight at a specified position - given the initial draughts, forward and aft, calculates the new draughts after loading or discharging a given quantity of cargo - uses a trimming table or curves to determine changes in draughts resulting from loading, discharging or moving weights - calculates final draughts and trim for a planned loading by considering changes to a similar previous loading - calculates, by using moments about the keel, the position of G for a given disposition of cargo, fuel and water - uses hydrostatic data to find the KM and thence the GM - states that, for a cargo ship, the recommended initial GM should not normally be less than 0.15m - uses KN curves to construct a curve of statical stability and from it reads the maximum righting lever and angle at which it occurs - calculates the arrival of GM from the departure conditions and the consumption of fuel and water, including the loss of GM due to FSE - plans the use of fuel and water to keep free surface effects to a minimum - estimates the loss of GM resulting from absorption of water by deck cargo	
2	**Securing Cargoes**	**10**
	- explains the need for solid stow and securing of all cargoes - states that cargo liable to slide during rolling, such as steel	

	rails, should be stowed fore and aft - describes methods of blocking, lashing, shoring, chocking and tombing cargo - describes methods of securing cargo faces resulting from part discharge before making a sea passage - describes methods of securing heavy loads and heavy lifts - describes methods of stowing and securing vehicles and trailers - states that unitized, containers, trailers, portable tanks and other cargo units should be secured in accordance with the ship's cargo securing arrangements manual - describes passenger operations including passenger cargo, passenger comfort and safety	
3	**Deck Cargo**	**7**
	- states that cargoes, other than in containers, commonly carried on deck are: - dangerous goods not permitted below decks - large units, difficult or impossible to stow below deck, which can safely be exposed to the elements - cargoes which can be exposed to the weather and which would occupy a very large space below decks livestock in limited numbers - explains why efficient securing of cargoes is essential for the safety of the ship as well as the cargo - states that stowage and securing of deck cargo should be adequate for the worst conditions which could be experienced - states that hatches should be securely closed and cleated before loading over them - states that stowage should leave safe access to essential equipment and spaces needed to navigate and operate the ship such as: - sounding pipes to tanks and bilges - devices for the remote operation of valves - mooring arrangements	

	- fire-fighting and life-saving equipment - crew accommodation and working spaces - protection for the crew - states that deck cargo should not obstruct the view from the navigating bridge or overside at the bow - states that the weight of deck cargo should not exceed the maximum permissible load on the deck or hatches - describes how the effects of a concentrated load can be spread over a wider area by the use of dunnage and deck shoring taking into consideration the positioning of girders, transverses and longitudinals under the tank top - explains the effect of deck cargo on stability with reference to: - its vertical moment about the keel - the absorption of water or accretion of ice - the clearing of water from the deck in heavy weather - increased reserve buoyancy of a timber deck cargo - describes in outline the recommendations on the stowage and lashing of timer deck cargoes as set out in the IMO Code of Safe Practice for Ships Carrying Timer Deck Cargoes - describes the guard lines or rails to be provided at the sides of a deck stow and at openings in the stow - describes the provision of means of safe access between the deck and the top of the stow - describes the method of safe stowage and securing of containers on deck on vessels not specially designed for the carriage of containers - describes the safe loading/discharging of Ro-Ro cargoes	
4	**Container Cargo**	**3**
	- describes the arrangement of a container ship and explains how the position of a particular container is designated	

	- explains briefly the sequence of operations during discharging and loading at a terminal
	- explains the factors involved in planning a container stow with reference to:
	  - stability, trim and list
	  - stresses
	  - stack height and weight
	  - dangerous goods
	  - special stowage restrictions
	  - out of gauge
	- describes methods of securing containers on deck
	- describes the types and sizes of container in use	

5	**Bulk Cargo (Other Than Grain)**	**5**

	- describes in outline the contents of the IMO International Maritime Solid Bulk Cargo (IMBSC) Code
	  - defines:
	  - angle of repose
	  - cargoes which may liquefy - flow moisture point
	  - flow state
	  - transportable moisture limit
	- describes in detail the preparation of cargo holds prior to loading bulk cargoes
	- explains that separation between certain bulk cargoes and other than bulk cargoes or package of dangerous goods is required
	- explains that some bulk cargoes may deplete the oxygen content of holds or produce toxic gases and describes the precautions to take before entry of holds
	- describes the hazards associated with coal cargoes
	- describes the importance of monitoring the temperature of the holds associated with carriage of coal cargoes
	- describes the precautions to take during loading and discharging coal
	- explains how coal should be ventilated	

	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials (FM)	
a.	Theory and Practice of Seamanship - G. Danton
b.	Seamanship Notes - Kemp and Youn
c.	Nicholls Seamanship - Brown, Son and Ferguson Ltd.
d.	Seamanship technique – D.J. House

Course Code:	**Course Title:**	**Credits:**
GED 1206	Maritime English and communication skills sessional	1.5

Course Learning Objective:

1. To facilitate communication among individuals from diverse linguistic and cultural backgrounds, fostering collaboration and smooth operations in the global shipping industry.

2. To master a specific set of linguistic tools that are vital for safe and effective operation in the maritime world.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Spoken English**	**6**
	Supervised spoken English practice sessions with focus on speech delivery and pronunciation skills, which may include, but are not limited to, the following activities:	
	Personal introduction and group familiarization, Group discussions on	

	contemporary Maritime topics, Role playing sessions based on ship work scenarios, Debates, Storytelling, Picture description, etc.	
2	**Reading**	**6**
	Reading and understanding of Maritime publications under the supervision of the instructor. The kinds of reading materials may include, but not be limited to, the following:	
	SOLAS, MARPOL, MLC, Engine and Deck machinery manuals, Ships operational checklists, Maritime Circulars, etc.	
3	**Operational Maritime English**	**8**
	Familiarization and proficiency in the use of operational terms and phrases which are used in the practical scenarios on board which may include, but not be limited to, the following:	
	SMCP, Language associated with taking over and handing over a watch, Language associated with emergency and safety procedures, Language associated with liaison with Port authorities, Language associated with leadership and teamworking skills, Language associated with cargo operations, Language associated with bunkering operations, Language associated with major maintenance operations, etc.	
4	**Listening and Comprehension**	**6**
	Practice of listening and comprehension skills through the use of audiovisual aids in order to attain familiarization with native accents, intonation and rhythms, body language and facial expressions, clarity, and fluency. Application of the same in spoken form to the best possible extent.	
5	**Public speaking**	**6**
	An all-inclusive course on public speaking which will focus on the following key areas:	
	Foundation and importance of public speaking, Speechwriting, Audience awareness, Verbal delivery and Vocal Techniques, Nonverbal Communication, Combating Stage Fright, and a Final Project.	
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	SMCP
b.	Nautical glossary
c.	English for logistics by Marison Grossendorf

Course Code:	Course Title:	Credits:
GED 1208	Electronics and Computer Application Sessional	1.5

Course Learning Objective: This sessional course provides hands-on practical training in basic electronics and computer applications essential for maritime operations. It allows learners to develop technical competence through real-world exercises involving electrical measurements, circuit assembly, troubleshooting, and the practical use of shipboard electronic concepts. Additionally, the course builds operational skills in computer usage, documentation, data handling, and digital communication relevant to shipboard tasks. Through structured laboratory experiments and computer-based activities, cadets gain confidence in applying electronic principles and using digital tools commonly found in navigational, engineering, and administrative operations on board ships. The sessional ensures that cadets can operate equipment safely, interpret technical data, and perform essential tasks that support effective ship operation and maintenance.

Upon completing the Electronics and Computer Application Sessional, the learner will be able to:

a. Identify, test, and handle basic electronic components safely while measuring electrical quantities using standard instruments.
b. Construct, operate, and troubleshoot simple AC/DC circuits and interpret basic

shipboard electronic system diagrams such as sensors, alarms, and control circuits.

c. Operate computer systems effectively for maritime documentation, reporting, and communication tasks.
d. Manage digital files and create documents using productivity software, including performing basic data entry, tabulation, and chart preparation.
e. Use computer-based tools and applications relevant to ship operations, including simulation or navigation-related software where applicable.
f. Apply essential cybersecurity practices and prepare digital records or reports aligned with maritime operational requirements.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Electronics**	**8**
	CE Amplifier – voltage gain, frequency response, plotting A.C. & D.C. load lines	
	Emitter Follower – voltage gain & output resistance.	
	Op-Amp – inverting & non-inverting amplifier, voltage follower, summer & difference amplifiers.	
	Op-Amp – square wave generator, slew rate.	
	555 timer – a stable & monostable multivibrator	
	Wien Bridge Oscillator – transistor & op-amp versions	
	Study of Basic logic gates – NOT, AND, OR, NAND, NOR	
	De Morgan's Laws & use of NAND & NOR as basic building blocks.	
	J-K Flip Flop – Truth table, Ripple & Decade counters.	
2	**Computer Sessional**	**8**
2.1	**Basic Computing**	
	Understand components and working of a computer: - Identify hardware components (CPU, RAM, HDD, I/O Devices) - Boot process demonstration - File system overview	
	Operating System Basics: File/folder operations (create, rename, delete) - Use command prompt (dir, copy, del, mkdir) - Install/uninstall applications	
	Office Tools (Word Processing): - Create CV/resume in MS Word - Use styles, headers, footers, and tables	
	Office Tools (Spreadsheet & Presentation): Perform basic formulas	

	(SUM, AVG) in Excel - Create charts - Design a PowerPoint presentation	
2.2	**Computer Programming**	**8**
	Introduction to Programming & IDE Setup: Install and configure C compiler - Write and run "Hello World" program - Understand compile-run-debug cycle	
	Variables, Data Types, and I/O: Implement programs using basic syntax, Program to calculate area, perimeter - Celsius to Fahrenheit conversion	
	Operators and Conditional Statements: Apply logic using conditions, Even/Odd, Leap year, Grade calculator, Simple Calculator using switch	
	Loops and Iteration: Perform repetition-based computation, Factorial, Fibonacci, Prime check, Pattern printing	
	Functions and Modular Programming: Divide problems into functions, Factorial using function - Recursive sum of digits	
	Arrays and Strings: Handle multiple data and text inputs, Sum of array, Find max/min - String length, reverse, palindrome	
	Simple File Handling: Read/write files, Write student data to file - Display contents	
3	**Practical Components**	**8**
	Component identification (passive & semiconductor) Soldering, PCB work Breadboard circuits Ohm's law practical Circuit measurements (voltage, current, resistance) Capacitor & inductor experiments Transformer & rectifier practical Transistor amplifier practical Logic gates & digital circuit experiments Simple oscillator experiments Instrument handling (ammeter, voltmeter, oscilloscope) Electrical safety demonstrations Computer basics (file handling, word processing, spreadsheets, database) Marine software usage (loading/stability if applicable)	
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials (Online)	
a.	Concepts of Electricity and Magnetism by *Rafiqullah, AK et al*
b.	Electricity and Magnetism by *Tewari, KK*
c.	Physics Part-II by *Halliday, D and Resnic, R*
d.	Principle of electronics by *V.K. Mehta*
e.	Basic Electronics Solid State by *B.L. Theraja*

Course Code:	Course Title:	Credits:
CAP 1210	Industrial Visit	1.5

Course Learning Objective:

Upon completion of this shipboard industrial visit, cadets will be able to:

For visiting a Port Authority and Vessel Traffic Service (VTS) Center

a. Describe the role and function of a Port Authority in maritime trade and port safety.

b. Identify cargo handling equipment (e.g., gantry cranes, RTGs, forklifts) and terminal layouts.

c. Understand port safety systems and emergency response arrangements.

d. Observe berthing/unberthing coordination and tug operations.

e. Explain the function and structure of a VTS and how it contributes to navigational safety.

f. Observe live traffic monitoring systems (radar, AIS, radio communication).

g. Understand ship reporting systems (e.g., VTS zones, traffic separation schemes).

h. Recognize coordination between VTS, port operations, and pilots

For visiting a Shipyard or Dry dock

a. Describe ship construction and repair processes, including hull maintenance and machinery overhauls.

b. Understand drydock types (floating, graving) and docking/undocking procedures.

c. Identify welding, painting, thickness gauging, and other repair techniques.

d. Understand safety practices in shipyards, including confined space entry and hot work procedures.

Course Content:

S/N	Course Content (as Summary)	Hrs.
	This industrial visit aims to expose deck cadets to the broader maritime industry ecosystem beyond the ship itself. By visiting a Port Authority, Shipyard, Dry dock, or Vessel Traffic Service (VTS) Center, cadets will gain valuable insights into: • Shore-based maritime operations • Port traffic and cargo logistics • Ship repair and construction processes • Vessel traffic monitoring and safety regulations • Dry docking procedures and ship maintenance infrastructure This visit will bridge the understanding between onboard operations and the shore-side systems that support and regulate them, helping cadets appreciate the full chain of maritime logistics and safety.	
	Total	**42**

Assessment & Evaluation		
a.	**Assessment Strategy**	Attendance, Field Report.
b.	**Marks Distribution:**	This visit should be documented with a structured field report where cadets reflect on what they learned, sketch or annotate layouts, and answer assigned questions.
c.	**Makeup Procedures**	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	The Shipyard Safety Handbook – ISF/ICS
b.	Bridge Procedures Guide – ICS
c.	SOLAS and ISPS Code (relevant chapters)
d.	IMO Resolution A.857(20) – Guidelines for Vessel Traffic Services
e.	Local Port Authority Manuals / SOPs
f.	Port layout and terminal maps
g.	VTS radar and AIS screenshot samples
h.	Dry dock and shipyard process flowcharts
i.	Mooring safety posters and tug assistance procedures
j.	Hot work permits, confined space entry logs (sample copies)

Course Code:	**Course Title:**	**Credits:**
SOC 2125	Marine environment and pollution	03

Course Learning Objective: The students will be able to understand the pollution prevention regulation by ships at sea. Also, the students will learn the civil and criminal liability of environmental pollution including the impact on sea environment by marine pollution.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Fundamentals of Environmental Science**	**4**
	Objectives of Environmental Science (UNESCO 1971), scope of environmental science, Greenhouse Gas, effects of Green House Gases, Annual Green House Gas Emission sector wise, Ozone Layer Depletion, Action to reduce the emission of Green House Gases, Kyoto Protocol, etc.	
2	**Physical Environment:**	**4**
	Hydrological cycle & its stages, how ocean is created, composition of ocean water, ocean trenches, acid rain, causes of acid rain, effects and prevention of acid rain.	
	Description of the living species and plants under sea, short- and long-term	

	effect of marine lives due to pollution, Shore reception facility. Emergency oil pollution preparedness and response, Ships recycling.	
3	**International Convention for the Prevention of Pollution from Ships,1973 and the Protocol of 1978 relating thereto (MARPOL 73/78)**	**14**
3.1	**Technical Annexes: Annex I to VI of MARPOL 73/78 in detail**	
	Annex I-Oil	
	Annex II - Noxious Liquid Substances in Bulk	
	Annex III-Harmful Substances Carried by Sea in Packaged Forms, or in Freight Containers, Portable Tanks or Road and Rail Tank Wagons	
	Annex IV – Sewage	
	Annex V – Garbage	
	Annex VI – Air Pollution	
3.2	**Conventions and legislations adopted by various countries**	**5**
	Convention of the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention) (LDC)	
	International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969	
	International Convention on Civil Liability for Oil Pollution Damage, 1969(CLC 1969)	
	Oil Pollution Preparedness, Response & Cooperation Convention (OPRC) as amended (OPRCHNS Protocol)	
	OPA – 90 and other U.S. legislation	
4	**Anti - pollution procedures and all associated equipment**	
	Control of discharge of oil	**3**
	Oil Record Book (Part I - Machinery Space Operations and Part II – Cargo/Ballast Operations)	**3**
	Shipboard Oil Pollution Emergency Plan (SOPEP) including Shipboard Marine Pollution Emergency Plans (SMPEP) for Oil and/or Noxious Liquid Substances and Vessel Response	**2**

	Plan	
	Shipboard Marine Pollution Emergency Plan (SMPEP)	
	Vessel Response Plan (VRP)	
	Overview of anti-pollution equipment, Sewage plant, incinerator, comminutor, ballast water treatment plant	**2**
	Volatile Organic Compound (VOC) Management Plan, Garbage Management System, Anti-fouling systems, Ballast Water Management and their discharge criteria	**3**
	Volatile Organic Compound (VOC) Management Plan	
	Garbage Management Plan	
	Garbage Record Book	
	Anti-fouling systems	
	Ballast Water Management Convention 2004	
5	**Importance of proactive measures to protect the marine environment**	**2**
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials (Previous Syllabus)	
a.	Marine Pollution — Christopher L. J. Frid & Bryony A. Caswell
b.	Coastal and Marine Pollution: Source to Sink, Mitigation and Management — Meththika Vithanage et al.
c.	Marine Pollution – Monitoring, Management and Mitigation — Amanda Reichelt-Brushett (Ed.)
d.	Practical Handbook of Estuarine and Marine Pollution — Michael J. Kennish
e.	Marine Pollution Control: Legal and Managerial Frameworks — Iliana Christodoulou-Varotsi

Course Code:	Course Title:	Credits:
SOC 2127	Maritime Safety and security	03

Course Learning Objective: This course aims to provide comprehensive understanding essential management tools required to implement Maritime safety and security standards on board ship. After attending the course students will enable to understand the basic safety procedure and medical first aid including the security precautions to be taken on board.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Life-saving appliances and arrangements**	**08**
1.1	Personal Life-Saving Appliances	
	Life Buoy - Construction of life buoy and testing criteria, - Stowed requirements, - Requirements for attachment with life buoys (Grab line, Retro reflecting tape, Buoyant life line, Self-igniting line, MOB marker etc.)	
	Life Jacket - Construction of life Jacket and testing criteria - Attachments with the life jacket - Stowed criteria	
	Muster list and emergency instructions - Requirements for the contents and the display areas on board ship.	
	Launching stations - Criteria for location and positioning.	
	Survival craft and rescue boat stowage and embarkation arrangements - Design for survival craft embarkation arrangement, - Requirements for boarding and launching of davit-launched life-rafts, - Stowed criteria for rescue boat, - boarding and launching requirements.	
	Muster stations - Requirements of muster station location.	
	Life rafts - Float-free stowage arrangements	

	- Total numbers to be carried on board, Equipments of the life rafts - Stowed criteria - HRU functions and attachment requirement	
	Life Boat - Total numbers of lifeboat to be carried - Construction criteria - Davit arrangement and testing procedures - Free fall life boat stowage - Boarding requirements & release mechanism - Fire protection arrangement for the life boat use in tanker ship	
	Rescue Boat - launching and recovery arrangements	
	Drills - Types of contingency drill - Drill conducting interval criteria - Life boat launching - water borne requirements	
	Training manual and on-board training aids - Distribution location on board - Instructions, information content in the manual	
2	**Personal Survival Technique**	**06**
	Introduction, Safety and survival	
	Safety guidance	
	Principles of survival at sea	
	Definitions, survival craft and appliances	
	Safety symbols	
	Emergency situations	
	Crew expertise	
	Muster list and emergency signals	
	Crew and emergency instructions	
	Extra equipment and survival	
	Evacuation	
	Abandoning ship- last resort	

	Personal preparation for abandoning ship	
	Need to prevent panic	
	Crew duties to passengers	
	Crew duties-launching survival craft	
	Masters order to abandon ship	
	Means of survival	
	Personal survival without a lifejacket	
	Boarding survival craft	
	Survival at sea	
	Dangers to survivors	
	Best use of survival craft facilities	
	Emergency position indicating radio beacon (EPIRB)	
	Search and rescue transponders (SART)	
	Emergency radio equipment	
	Helicopter assistance	
	Communication with the helicopter	
	Evacuation from ship and survival craft	
	Helicopter pick up	
3	**Construction - Fire protection, fire detection and fire extinction**	**06**
	Prevention of fire and explosion - Probability of ignition - Fire growth potential - Smoke generation potential and toxicity	
	Suppression of fire - Detection and alarm - Control of smoke spread - Containment of fire - Firefighting - Structural integrity	
	Escape - Notification of crew and passengers - Means of escape	

	Operational requirements - Operational readiness and maintenance - Instructions, on-board training and drills - Fire control plans - Operations	
	Special requirements: - Helicopter facilities - Carriage of dangerous goods - Protection of vehicle, special category and ro-ro spaces	
4	**Fire Safety operations on board**	**04**
	Minimizing the risk of fire	
	Maintaining a state of readiness to respond to emergency situations involving fire	
	Fighting and extinguishing a fire	
	Ship board firefighting organization	
	Location of firefighting appliances and emergency escape routes	
	The elements of fire and explosion	
	Types and source of ignition	
	Flammable material, fire hazards and spread of fire	
	Fire and smoke detection and automatic alarm systems	
	Classification of fire and applicable extinguishing agents	
5	**Special measures to enhance maritime security**	**04**
	Obligations of Contracting Governments with respect to security	
	Requirements for Companies and ships	
	Specific responsibility of Companies	
	Ship security alert system	
	Threats to ships	
	Master's discretion for ship safety and security	
	Control and compliance measures: - Control of ship in port - Ship intending to enter a port of another Contracting government	
	Requirements for port facilities	
	Alternative security agreements	

	Equivalent security arrangements	
	Communication of information	
6	**Security Awareness and Designated security duties on Board Ship**	**06**
	Recognize the importance of awareness of all crew members on board in relation to protection.	
	Skill to be obtained	
	Definitions, terms and factors relating to maritime security	
	Present maritime security policy and the national and international legislation	
	Maritime security levels and procedures on board and in port	
	Ship Security plan and contingency plans	
	Responsibilities of the Administration, Company Security Officer (CSO), the ship (SSO and his team) and Port Facility Security Officer (PFSO).	
	Present security threats and techniques used to circumvent security measures.	
	Recognize possible material threats to ship security such as weapons, bomb and dangerous substances devices.	
	Recognize a non-discriminatory assessment, people who present potential security risks to the ship.	
	Mention the procedures to be followed when a threat to the security of the ship is recognized.	
	The correct way to handle sensitive information and communications related to security, such as in security incidents reports.	
	Requirements relating to the education and periodic training exercises provided by the conventions, codes and notices from the IMO.	
	Knowledge of current security threats and patterns.	
	Recognition, on a non-discriminatory basis, of characteristics and behavioral patterns of persons who likely to threaten security	
	Techniques used to circumvent security measures	
	Security related communications	
	Knowledge of emergency procedures and contingency plans	
	Operation of security equipment and systems	
	Testing, calibration and at-sea maintenance of security equipment and	

	systems	
	Inspection, control, monitoring techniques, methods of physical searches of persons, personal effect, baggage, cargo and ship stores.	
7	**Security officer on board ship**	**04**
	Understanding the International Ship and Port Security (ISPS) code	
	Provide knowledge for the Ship Security Officer (SSO)	
	Construct and understand Ship Security Assessment (SSA)	
	Construct and understand Ship Security Plan (SSP)	
	The roles of the Company Security Officer (CSO), Ship Security Officer (SSO) and Port Facility Security Officer (PFSO)	
	Relevant Security Equipment and understanding their use	
	Maritime piracy and world hotspots	
	Search plans and techniques	
	Threats assessment, recognition and response	
	Profile of terrorists and terrorists' groups	
	Weapons and improvised explosive devices	
8	**Cyber Security on board ship**	**02**
	Introduction - Importance of cyber security in the maritime industry - Increasing digitalization and interconnected systems on ships	
	Overview of Shipboard Systems at Risk	
	Types of Cyber Threats	
	Potential Consequences of Cyber Incidents	
	Cyber Risk Assessment Onboard	
	Cyber security Measures and Best Practices	
	Incident Response Planning	
	Regulatory and Industry Guidelines	
	Future Challenges and Trends	
	Summary & Recommendations	
9	**The International Ship and Port Facility Security Code (ISPS Code)**	**2**
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials (old syllabus)	
a.	Reed's Seamanship and Nautical Knowledge- H. J. Couper & A. C. C. Barrass
b.	Introduction to Marine Safety- G. O. Watson
c.	Life-Saving Appliances (LSA) Code
d.	FSS Code (International Code for Fire Safety Systems)
e.	SOLAS (International Convention for the Safety of Life at Sea)
f.	ISPS code
g.	Maritime Security: An Introduction- Michael McNicholas
h.	Introduction to ISPS Code- Graham Gerard
i.	The ISPS Code: A Practical Guide- Rolf Neise
j.	Maritime Security Handbook (published by Lloyd's Register / Fairplay)
k.	a. Maritime Security: Protection of Marinas, Ports, Small Watercraft, Yachts, and

Course Code:	**Course Title:**	**Credits:**
NAV 2129	Celestial Navigation I	03

Course Learning Objective: Planning and conducting of a passage and for determining position Maintaining a safe navigational watch.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Solar System**	**03**
	describes the composition and dimensions of the solar system names inferior and superior planets	
	describes the earth's elliptical orbit, and states approximate perihelion and	

	aphelion distances and dates	
	explains the eccentricity of the earth's orbit	
	describes the inclination of the earth's axis to the plane of the orbit and the stability of the axis (ignoring precession) and its effect on the seasons	
	states the dates of the solstices and equinoxes	
	Define Elongation, Conjunction, Opposition and Quadrature	
2	**Solar System**	**3**
	explains the concept of the earth's axial rotation giving day and night	
	explains the varying length of daylight through the year explains daylight and darkness conditions in various latitudes at the solstices and equinoxes	
	describes the significance of the tropics of Cancer and Capricorn and of the Arctic and Antarctic Circles	
	Describe the Kepler's laws of planetary motion.	
	Explain why Venus is referred to as a morning or evening star	
3	**Solar System – Apparent motion of celestial bodies & Apparent magnitude of planets**	**3**
	Apparent diurnal motion of celestial bodies	
	Apparent motion of celestial bodies due to orbital motion of the earth	
	Apparent motion of the sun	
	Apparent motion of planets	
	Apparent magnitude of planets	
4	**Celestial sphere and equinoctial system of co-ordinates**	**3**
	describes the celestial sphere	
	defines 'celestial poles', 'celestial meridians', 'equinoctial' , 'obliquity of the ecliptic'	
	explains the apparent annual motion of the sun and the concept of the ecliptic	
	Define Zodiac, First point of Aries and first point of Libra.	
5	**Celestial sphere and equinoctial system of co-ordinates**	**3**
	states that the equinoctial as a fixed reference plane and the direction of the First Point of Aries as a reference direction (ignoring the effect of precession)	
	describes the equinoctial system of co-ordinates and defines sidereal hour	

	angle, declination and polar distance	
	extracts information from the star diagrams in the Nautical Almanac or equivalent star finding device	
6	**Hour Angle**	**3**
	describes the concept of the earth's axial rotation causing change in the hour angle of bodies	
	defines 'Greenwich Hour Angle (GHA)', 'Local Hour Angle (LHA)' and longitude, and explains their relationship	
	Define SHA & RA	
	describes the rate of change of GHA of the sun and Aries	
	Relationship between GHA*, GHA Aries and SHA & explain why does the introduction of SHA for each star become necessary in lieu of tabulating GHA directly in the Almanac.	
	Identifies the tabulation of SHA, GHA, and declination (and 'd' and 'v' corrections) in the Nautical Almanac for all celestial bodies determines the geographical position of a body for any given GMT	
7	**Daily Motion and Horizontal System of Co-ordinates**	**3**
	defines 'rational horizon', 'zenith' and 'nadir'	
	defines 'vertical circle' and 'prime vertical circle'	
	defines 'elevated pole' and 'depressed pole'	
	proves that the altitude of the elevated pole is equal to the observer's latitude	
	defines the observer's upper and lower celestial meridian	
	identifies the apparent daily path of all bodies	
	defines 'true altitude', 'azimuth', and 'true zenith distance'	
	explains the relationship between azimuth, quadrantal bearings and 360° notation bearing	
	recognizes rising and setting points and defines amplitude	
8	**Daily Motion and Horizontal System of Co-ordinates**	**3**
	recognizes the parts of the PZX triangle	
	draws figures on the plane of the rational horizon and of the observer's celestial meridian, using the equidistant projection to illustrate navigational	

	problems and principles	
	explains the meaning of the term circumpolar and describes the conditions necessary for a body to be circumpolar	
	describes the condition necessary for a body to cross the prime vertical	
9	**Twilight**	**3**
	Describe each type of twilight	
	Which is the best time for stellar observations & why?	
	Explain why twilight lasts longer in higher latitude than in lower latitudes.	
	Conditions for continuous twilight throughout the night.	
	Tabulation of twilight time from nautical almanac for any given date.	
10	**Nautical Almanac**	**3**
	describes the information contained in general in the Nautical Almanac (NA) and in detail in the daily pages	
	uses the tables of corrections and incremental corrections in the Nautical Almanac	
	finds the LHA of a body, given the date, GMT and longitude of the observer explains the importance of the First Point of Aries	
	finds the LHA of Aries, given the date, GMT and longitude of the observer	
	explains what is meant by the sidereal hour angle of a star and obtains it from the Nautical Almanac	
	derives the LHA of a star from the LHA of Aries and the SHA of the star	
11	**Sextant and Altitude Corrections**	**3**
	defines ‘sextant altitude’	
	describes the parts of a sextant	
	demonstrate how to retrieve and return a sextant into the storage box	
	demonstrates how to read a sextant	
	shows how to correct a sextant into which has been introduced one or more of error of perpendicularity, side error or index error	
	demonstrates how to find the index error of the sextant by the horizon	
	describes how to find the index error of the sextant by the sun uses the sextant for taking vertical and horizontal angles	
	describes the purpose of altitude correction	

12	**Sextant and Altitude Corrections**	**3**
	defines 'visible', 'sensible' and 'rational' horizons	
	defines 'observed altitude' and 'true altitude' defines 'dip', 'refraction', 'semi-diameter' and 'parallax' and explains their causes applies index error applies the corrections for the items listed in 2.5.10 and explains the factors determining their magnitude illustrates the effect of terrestrial refraction on the dip and distance of the sea horizon	
	demonstrates the use the altitude correction tables in the Nautical Almanac, including reference to critical tables, interpolation tables and low-altitude correction tables obtains the true zenith distance from the true altitude of the body	
13	**Chronometer time**	**3**
	The ambiguity of chronometer time & procedures for solving the ambiguity	
	Gaining & losing of chronometer time	
	How to correct chronometer time	
14	**Amplitude**	**3**
	determines the observed altitude of the sun when the true altitude is zero explains the effect of latitude on the accuracy of amplitude observations calculates the LAT and LMT of the theoretical and visible rising and setting of the sun	
	Calculation of compass error by amplitude method.	
	Extracts information from the tabulation of the rising and setting of the sun in the Nautical Almanac	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	JONES, T.G. - Practical navigation for second mates. 2nd ed. Glasgow, Brown, Son & Ferguson Ltd, 1991. (ISBN 0-85174-397-8)
b.	Frost, A The Principles and Practice of Navigation. 3rd ed. Glasgow, Brown, Son & Ferguson, 1988 (ISBN 0-85174-444-3)
c.	Principles of Navigation, Capt T.K. JOSEPH & Capt. S.S.S REWARI

Course Code:	**Course Title:**	**Credits:**
SOC 2131	Ship Stability II	03

Course Learning Objective:

1. To learn about Longitudinal Stability
2. To learn about stresses
3. To learn basic knowledge about squat and Interaction
4. To learn basic knowledge about damage stability

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**List and its Correction**	**6**
	- shows on a diagram the forces which cause a ship to list when G is to one side of the centreline - states that the listing moment is given by displacement × transverse distance of G from the centreline - shows on a diagram that the angle of list (θ) is given by - $tan\theta = \frac{GG_1}{GM}$ where GG_1 is the transverse shift of G from the centerline - states that in a listed condition the range of stability is reduced - given the displacement, KM and KG of a ship, calculates the angle of list resulting from loading or discharging a given mass at a stated position, or from moving a mass through a given transverse distance - explains, with reference to moments about the centreline, how the list may be removed	

	- given the displacement, GM and the angle of list of a ship, calculates the mass to load or discharge at a given position to bring the ship upright - given the displacement, GM and angle of list of a ship, calculates the mass to move through a given transverse distance to bring the ship upright - given the draught, beam and rise of the floor, calculates the increase in draught resulting from a stated angle of list	
2	**Effect of Slack Tanks**	**3**
	- states that if a tank is full of liquid, its effect on the position of the ship's centre of gravity is the same as if the liquid were a solid of the same mass - explains by means of diagrams how the centre of gravity of the liquid in a partly filled tank moves during rolling - states that when the surface of a liquid is free to move, there is a virtual increase in KG, resulting in a corresponding decrease in GM - states that the increase in KG is affected mainly by the breadth of the free - surface and is not dependent upon the mass of liquid in the tank - states that in tankers the tanks are often constructed with a longitudinal subdivision to reduce the breadth of free surface	
3	**Trim and draught calculations using trim tables**	**6**
	- states that "trim" is the difference between the draught aft and the draught forward - states that trim may be changed by moving masses already on board forward or aft, or by adding or removing masses at a position forward of or abaft the centre of flotation - states that 'centre of flotation' is the point about which the ship trims, and states that it is sometimes called the tipping centre - states that the centre of flotation is situated at the centre of area of the waterplane, which may be forward of or abaft amidships - demonstrates the uses hydrostatic data to find the position of the centre of flotation for various draughts - states that a trimming moment as mass added or removed × its distance forward or aft of the centre of flotation; or, for masses already on board, as mass moved × the distance moved forward or aft - states that the moment to change trim by 1 cm (MCT 1cm) as the	

	moment about the centre of flotation necessary to change the trim of a ship by 1 cm - demonstrates the uses hydrostatic curves or deadweight scale to find the MCT 1cm for various draughts - given the value of MCT 1cm, masses moved and the distances moved forward or aft, calculates the change in trim - given the value of MCT 1 cm, the position of the centre of flotation, masses added or removed and their distances forward of or abaft the centre of flotation, calculates the change of trim - given initial draughts and the position of the centre of flotation, extends the calculation in the above objective to find the new draughts - given initial draughts and TPC, extends the calculation in the above objective to find the new draughts - given initial draughts and TPC, extends the calculation to find the new draughts - demonstrates the uses of a trimming table or trimming curves to determine changes in draughts resulting from loading, discharging or moving weights - states that in cases where the change of mean draught is large, calculation of change of trim by taking moments about the centre of flotation or by means of trimming tables should not be used - calculates final draughts and trim for a planned loading by considering changes to a similar previous loading	
4	**Actions to be Taken in the Event of Partial Loss of Intact Buoyancy**	**1**
	- states that flooding should be countered by prompt closing of watertight doors, valves and any other openings which could lead to flooding of other compartments - states that cross - flooding arrangements, where they exist, should be put into operation immediately to limit the resulting list - states that any action which could stop or reduce the inflow of water should be taken	
5	**Stress tables and stress calculating equipment (Loadicator)**	**3**
	- states that each ship above a specified length is required to carry a loading manual, in which are set out acceptable loading patterns to keep shear forces and bending moments within acceptable limits - states that the classification society may also require a ship to carry an approved means of calculating shear forces and bending moment at stipulated stations - demonstrates the basic knowledge and use of a stress tables - demonstrates the basic knowledge and use of a stress calculating	

	equipment (loadicator) - states the information available from loadicator - states that the loading manual and instrument, where provided, should be used to ensure that shear forces and bending moments do not exceed the permissible limits in still water during cargo and ballast handling - describes the likelihood of overstressing the hull structure when loading certain bulk cargoes	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	The Navigation control Manual – Bole, Dinely & Nocholis
b.	Marine Electronic Navigation – S. Appleyard
c.	Practical Electronics Handbook – L.Sinclair & J Dunton
d.	Electronics Navigation System – L Tettly & D Calcut

Course Code:	**Course Title:**	**Credits:**
NAV 2133	Electronic Navigation system	03

Course Learning Objective:

1. To equip Officer of the Watch (OOW) candidates with the knowledge, understanding, and proficiency to safely and effectively conduct navigation at the operational level using electronic systems.
2. To make them understand regarding GPS, Echo sounders, Speed logs, Magnetic and Gyro compass, steering control and related technologies.
3. Trainees will develop the ability to interpret, operate, and critically analyze electronic

navigation equipment in accordance with STCW Code Table A-II/1.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Global Navigation Satellite Systems (GNSS)**	**1**
	Describes the principles of operation of global navigation satellite systems	
	States that the system will provide continuous world-wide position-fixing capabilities	
	Describes the intended level of accuracy of the system	
	Electronic system of position fixing and Navigation: Ability to determine the ships position by use of GPS/GLONASS/Galileo.	
2	**GPS Systems**	**09**
	Describes the basic principles of the Global Positioning System (GPS)	
	Describes the system configuration	
	States the frequencies that are used	
	Describes the C/A & P codes	
	Describes how the basic line measurement is obtained	
	Describes the Dilution of Precision (DOP)	
	Describes the various DOPs that are used	
	Describes the various errors of GPS	
	Describes the reasons for selective availability and the effect it may have on the accuracy of a fix	
	Describes differential GPS	
	Describes the accuracy obtainable with GPS and how the accuracy can be downgraded	
	Explains WGS 84	
	Explains when a fix obtained from the GPS receiver cannot be plotted direct onto a navigational chart and why	
	Explains datum shifts	
	Describes the advantages and limitations of GPS	
	Describes the importance of not over relying on GPS	
	Describes GPS signal Jamming and Spoofing	
	Describes the importance of GPS position verification by alternate method	

	where available	
3	**Augmented Satellite Systems**	**1**
	Describes the basic principle of Differential GPS	
	Describes how DGPS stations can transmit the corrections	
	Describes the Regional Satellite Navigation Systems such as China's BeiDou (COMPASS) Navigation Satellite System, India's Indian Regional Navigational Satellite System (IRNSS), Japan's Quasi-Zenith Satellite System (QZSS) and France's Doppler Orbitography and Radio positioning Integrated by Satellite (DORIS)	
	Describes the limitation of the DGPS receiver	
4	**GLONASS**	**1**
	Describes the principle on which the GLONASS works	
	Explains the different satellite constellation configurations under GLONASS	
	Describe the advantage of the receiver capable of operating both GLONASS and GPS "combined GPS/GLONASS receiver equipment"	
	Describes the limitation of the GLONASS system receiver	
5	**Galileo**	**1**
	Explains the principle of Galileo as the European satellite navigation system	
	States the satellite geometry and dual atomic clocks in the Galileo system	
	States that atomic clock signal information is used to calculate the position of the receiver by triangulating the difference in received signals from multiple satellites	
	Describes the limitations of the Galileo system receiver	
6	**Echo-Sounder**	**5**
	Describes the basic principles of marine echo-sounding equipment	
	Identifies the main components on a simple block diagram of an echo-sounder, and states the function of each	
	Describes the accepted value of the velocity of sound in seawater and the limits within which the true value may lie	
	Describes the physical factors which affect the velocity sound in seawater	
	Operates a typical echo-sounder and demonstrates an ability to carry out	

	basic user maintenance, e.g. clean platen, change paper, change and adjust stylus	
	Differentiates between range and phase, and demonstrates an awareness of the dangers of using the wrong phase	
	Distinguishes between inaccuracies caused by instrument and scale error and those caused by false echoes	
	Explains the causes of inaccuracies to instrument or scale error and states their likely magnitude and measures that may be taken to eliminate them	
	Recognizes the various types of "false" echo that may be observed, describes their formation and states the possible action to remove them from the trace	
	Describes the potential errors due to trim, heel and transducer separation	
	Demonstrate the ability to operate the Echo sounder and apply the information correctly.	
7	**Speed log**	**6**
	Describes how speed and distance are measured through the water.	
	Describes the use of Doppler logs including: Doppler shift principle, method used in doppler log to measure ship speed, the errors or a doppler log system, the dangers associated with doppler logs for speed input true motion RADAR and ARPA, Janus Configuration	
	Describes the use of electromagnetic and impeller logs including: knowledge of the principles of operation, understand these logs read speed through the water and understands the errors of these logs	
8	**The Magnetic Compass**	**6**
	describes the construction of a liquid card magnetic	
	- sketches a section through the compass to show the float chamber, the pivot support and the arrangement of magnets	
	- how the card is kept practically horizontal in all latitudes	
	- the composition of the liquid and explains how allowance is made for changes in volume of the liquid	
	- describes how to remove an air bubble from the compass bowl	
	- describes how to check that the card is turning freely on its pivot	
	- explains how the compass bowl is supported in the binnacle	

	– describes the marking of the lubber line and its purpose	
	-describes a binnacle and the arrangement of correcting devices provided - defines 'deviation' and states how it is named - illustrates with sketches the deviations on various headings produced by permanent magnetism with a pole or poles lying in the plane of the compass card - explains the need for care in the placing of portable items of magnetic material, including spare corrector magnets, or electrical equipment in the vicinity of compasses - explains the need for regular checking of the compass error - explains why compass error should be checked after a major alteration of course - why regular comparisons of standard compass, steering compass and gyro-compasses should be made - that the approximate error of the standard compass can be obtained by comparison with the gyro-compass if no other means is available	
9	**The Gyro-Compass**	**6**
	-describes a free gyroscope and its gimbal mountings - states that in the absence of disturbing forces the spin axis of a free gyroscope maintains its direction in space - explains what is meant by gyroscopic inertia and precession - describes the precession resulting from a torque about axes perpendicular to the spin axis - explains that friction at gimbal pivots produces torques which give rise to precession - states that the rate of precession is proportional to the applied torque - states that 'tilt' as movement of the spin axis in the vertical plane - states that 'drift' as the apparent movement of the gyroscope in azimuth resulting from the earth's rotation - explains how a free gyroscope can be made north-seeking by the use of gravity control and describes the resulting oscillations of the axis - describes the use of damping in azimuth and damping in tilt to cause settling of the axis and thus produce a gyro-compass - explains that control and damping can be achieved by replacing the ballistic elements with electrical signals, provided by tilt sensors, to produce torques about the vertical and horizontal axes	

	- describes a familiar gyro-compass with particular reference to: - the method of support - and damping arrangements - the method of maintaining the heading indication in line with the axis of the gyro - describes how gyro heading input is supplied to a radar installation - describes the alarms fitted to a gyro-compass	
10	**Steering Control Systems**	**6**
	-explains the principle of an automatic pilot system -explains the functions of the manual settings - describes the procedures for change-over from automatic to manual steering and vice versa - explains what is meant by an adaptive automatic pilot and briefly explains how it functions - describes the course monitor and the off-course alarm - describes the operation of the course recorder log - lists the other alarms fitted to the system - states that the automatic pilot should be included in the steering gear testing prior to the ship's departure - explains the regulation regarding the use of the automatic pilot - explains in the recommendation on performance, standards for automatic pilots - explains the need for regular checking of the automatic pilot to ensure that it is steering the correct course - states that the automatic pilot should be tested manually at least once per watch - describes the factors to take into account regarding the change-over to manual control of steering in order to deal with a potentially hazardous situation	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978, as amended (ISBN 978-92-801-1528-4)
b.	International Convention for the Safety of Life at Sea (SOLAS) (IMO Sales No IE110E) SOLAS - Consolidated Edition, 2009 (ISBN Number: 9789280115055)
c.	Assembly Resolution A.224 (VII) - Performance Standards for Echo-Sounding
d.	Equipment
e.	Assembly Resolution A.526 (13) - Performance Standards for Rate-of-Return Indicators ("Refer to res.A.281(VIII"), Assembly Resolution A.281(VIII) - Recommendation on general requirements for electronic navigational aids
f.	Assembly Resolution A.694 (17) - General Requirements for Shipborne Radio Equipment Forming Part of the Global Maritime Distress and Safety System (GMDSS) and for Electronic Navigational Aids
g.	Assembly Resolution A.488 (XII) - Use of the Standard Marine Navigational Vocabulary
h.	Admiralty Manual of Navigation. Vo II. London, Nautical Institute 2011 (ISBN 9781860077651)
i.	Cockroft, AN. and Lameijer, J.N.F., A Guide to the Collision Avoidance Rules, 6th ed. Oxford, Butterworth-Heinemann, 2004. (ISBN : 0-7506-6179-8)
j.	JONES, T.G. - Practical navigation for second mates. 2nd ed. Glasgow, Brown, Son & Ferguson Ltd, 1991. (ISBN 0-85174-397-8)
k.	Frost, A the Principles and Practice of Navigation. 3rd ed. Glasgow, Brown, Son & Ferguson, 1988 (ISBN 0-85174-444-3)
l.	Lownsborough, R. and Calcutt, D. Electronic Aids To Navigation: Radar and ARPA 1 st ed. London, Edward Arnold, 1993. (ISBN 0-340-59258-3)
m.	NP 100 The Mariner's Handbook. 6th ed. Taunton (UK), Hydrographer of the Navy, 1989
n.	Toft, H. GPS Satellite Navigation. Stoevring, SHIPMATE, Rauff and Soerenson Ltd (Oestre Aile 6, DK-9540 Stoevring, Denmark, 1987) (ISBN 87-982698-3-6)
o.	Wright, C.H. The Collision Regulations, 1981, Fully Explained. 2nd ed. Glasgow, Brown, Son & Ferguson, 1989 (ISBN-13: 978-0851745664)
p.	Nadeem, Anwar. *Navigation Advanced Mates/Masters*. Latest ed. Lahore: M. Nadeem & Sons, 2019 (ISBN: 978-969-8855-00-7)

q.	The Navigation control Manual – Bole, Dinely & Nocholis
r.	Marine Electronic Navigation – S. Appleyard
s.	Practical Electronics Handbook – L.Sinclair & J Dunton
t.	Electronics Navigation System – L Tettly & D Calcut

Course Code:	**Course Title:**	**Credits:**
NAV 2135	Terrestrial and coastal navigation I	03

Course Learning Objective: The objectives of this course are to:

1. Introduce basic nautical concepts of Earth geometry, latitude/longitude systems necessary for marine navigation.
2. Enable understanding and application of chart-based navigation, including chart types, projections, and updating procedures using Notices to Mariners.
3. Develop skills in position fixing, course plotting, and estimating positions through visual and radar methods.
4. Teach measurement of distance and direction using navigational tools and Mercator charts based on Earth's geometry.
5. Introduce marine units of measurement such as nautical miles, knots, cables, and their practical application.
6. Provide practical knowledge of chart symbols, nature of seabed, tidal information, radar targets, and coastal features for safe navigation.
7. Train cadets in course correction techniques, including handling leeway, set and drift, and calculation of speed and distance made good.
8. proficiency in chart work exercises, enabling cadets to apply the learned theory in real-life navigational planning and execution.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Definitions - Earth**	**3**
	defines 'great circle', 'small circle', 'spherical angle', 'spherical triangle', 'poles of a great circle'	
	defines 'earth's poles', 'equator' and 'meridians'	
	defines 'latitude' and 'parallels of latitude', 'prime meridian' and 'longitude'	

	defines 'difference of latitude' and 'difference of longitude'	
	describes the earth as an ellipsoid	
	defines 'compression', and states its value	
	defines 'international nautical mile', 'cable' and 'knot'	
2	**Charts**	**3**
	demonstrates basic knowledge of chart projections	
	defines 'natural scale' of a chart	
	describes the requirements of a chart appropriate for marine navigation	
	identifies the Mercator chart as a mathematical projection and understands the principles of its construction.	
	describes the properties of the chart and the degree to which it meets navigational requirements and also its limitations	
	demonstrates the use of a chart catalogue	
	demonstrates the correcting of charts according to Notices to Mariners	
3	**Datum**	**2**
	explains the rotation of the earth about its axis	
	describes the directions on the earth's surface	
	describes the direction of the ship's head on a gyro-compass (gyro course)	
	describes the direction of the ship's head on a magnetic compass (compass course)	
4	**Distances and Course**	**2**
	describes the approximate polar and equatorial circumferences of the earth	
	demonstrates how to measure the distance between two positions on a Mercator chart based on the latitude of the two positions	
	defines 'course' and 'distance'	
5	**Position Lines and Positions**	**11**
	defines a position	
	gives the radar distance off a charted object and plots its position circle on a chart	
	plots a position on the chart from simultaneous cross bearings and from bearing and distance off	
	explains the methods used to obtain simultaneous cross bearings with least error	

	defines 'dead reckoning position (DR)', 'estimated position (EP)' and 'fixed position'	
	plots a dead reckoning position on the chart and marks accordingly	
	plots an estimated position on the chart and marks accordingly	
	plots position lines - straight line, circle, hyperbola	
	finds a position line by bearing, horizontal angle, vertical sextant angle, and transit line	
	determines a position by a combination of bearing, distance and the methods in the above objective	
	finds a position by simultaneous bearings of two objects	
	finds the distance that the ship will pass off a given point when abeam	
	constructs a position line to clear a navigational danger by a given distance	
6	**Information from Charts**	**9**
	identifies the symbols for chart depths and nature of the bottom and explains the use of soundings	
	recognizes coastlines, coast and radar-responsive targets	
	interprets coastline contours, bottom topography, depths and nature of bottom	
	uses the tidal information given on a chart	
	recognizes traffic lanes and separation zones	
7	**Chart work Exercises**	**12**
	plot Latitude and Longitude	
	find out Latitude and Longitude of prominent land fix from chart	
	find compass error by transit bearings	
	plot ship’s position given the compass bearings of two or more shore objects.	
	The Cocked hat’ and the reasons for its formation.	
	defines 'course' and 'distance'	
	lays off true course between two positions and marked with appropriate symbol	
	finds the distance between two positions	
	calculates the speed between two positions	

	defines 'set', 'rate', 'drift' and 'leeway' due to wind	
	describes 'ship's speed', 'effective speed', 'course and 'distance made good', 'applied leeway'	
	finds the course and distance made good with a tidal stream or current	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Catalogue of British Admiralty Charts and other Hydrographic Publications
b.	British Admiralty Notices to Mariners
c.	BA Chart
d.	Deviation Table
e.	Symbols and Abbreviations used on Admiralty Paper Charts (NP 5011)
f.	Introduction to charts and their use- M.Chris & GR Hayes
g.	Seaman's guide to basic chart work
h.	Introduction to coastal navigation- a seaman's guide
i.	Chart Work for mariners- Capt S.K.Puri
j.	Marine Chart Work – D.A.Moore

Course Code:	**Course Title:**	**Credits:**
NAV 2137	Leadership and bridge resource management	03

Course Learning Objective: This course aims to equip participants with the essential knowledge, understanding, and proficiency in leadership and teamwork required at the operational level on board a ship, in full alignment with the STCW 2010 Manila Amendments. Upon completion, trainees will be able to competently perform the duties of

an officer in charge of a navigational or engineering watch by demonstrating a comprehensive working knowledge of shipboard personnel management and training, an understanding of international maritime conventions, recommendations, and national legislation, and the ability to effectively apply task and workload management. They will also develop the capacity to utilize effective resource management techniques and sound decision-making practices in both routine and high-pressure maritime situations, thereby contributing to safe handling of ships under various conditions and will make a more effective contribution to the bridge team during ship manoeuvring and emergency situations.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Introduction to Leadership & Maritime Regulations**	**3**
	- Importance of leadership in safe shipboard operations - Human element and maritime safety culture - Overview of STCW requirements for leadership and teamwork - Relationship with ISM Code, MLC 2006, and company SMS - International and national legal responsibilities of shipboard officers	
2	**Shipboard Personnel Management & Training**	**3**
	- Roles and responsibilities of shipboard teams - Management structures: Master–Chief Officer–Department Heads–Watch keepers - Shipboard communication channels - Motivating diverse multinational crews - Training obligations under STCW, ISM Code & company policies - Conducting onboard training & drills (fire, abandon ship, security) - Performance monitoring, mentoring, and feedback systems	
3	**Maritime Labour Convention (MLC 2006) and Human Element**	**4**
	- Purpose and pillars of MLC 2006 - Seafarers' rights and employer obligations - Working and rest hour requirements (MLC & STCW VIII/1) - Fatigue management and wellness - Living conditions, recreational facilities, and mental health at sea	

	- Complaint procedures and protections - • Sexual harassment, discrimination, and workplace misconduct prevention	
4	**Task & Workload Management**	**6**
	- Principles of task allocation and supervision - Prioritization under operational pressure - Bridge Resource Management (BRM) concepts - Time management techniques for watchkeepers - Fatigue indicators and workload balancing - Use of checklists (pilotage, passage planning, bunkering, PSC inspections) - • Planning for emergencies vs. routine operations	
5	**Bridge Resource Management**	**10**
	- Describes the basic principles of bridge teamwork resource management - Explains how responsibility for the safety is clearly defined at all times, including periods when the master is on the bridge and while under pilotage - Demonstrates clear, concise communications and acknowledgements (at all times) in a seaman-like manner demonstrates the allocation, assignment and prioritisation of resources - Demonstrates the importance of ensuring the effectiveness of communication between bridge team members - Explains the importance of ensuring the effectiveness of information exchange with pilot - Demonstrates effective information exchange - Defines “situational leadership” - Explains the relationship between assertiveness and leadership - Explains the importance of challenge and response - Explains the importance of obtaining and maintaining situational awareness - Demonstrates appropriate challenges and responses - Demonstrates the ability to maintain situational awareness in complex situations	

9	**Effective Team work**	**06**
	- Team coordination and shared mental models - Team formation stages - Cultural awareness in multinational crews - Recognizing behavioral warning signs of poor teamwork - Delegation and empowerment - Conflict management and resolution - Leadership styles in maritime operations (authoritative, democratic, situational) - Crisis management principles	
10	**Respond To Emergencies**	**06**
	- Familiarization with the bridge - Standard Manouvres - Shalow water effect, Bank, channel interaction effect - Anchoring and single buoy mooring - Master pilot relationship - Decision making - Planning and carrying out a voyage in normal and emergency situation	
	Practical Activities	**4**
	- Case study: COLREG collision case due to poor decision-making - Simulator scenario: "Engine failure during pilotage" requiring rapid decisions - Debrief using structured reflection mode	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Swift, Capt A.J. Bridge Team Management - A Practical Guide. The Nautical Institute, London

b.	Rowe, R.W. The Shiphandler's Guide for Masters and Navigating Officers, Pilots and Tug Masters. The Nautical Institute, London,
c.	Samuel C. Certo, Modern Management, 8th Edition, Prentice Hall, London
d.	Kuo. Chengi., Safety Management and its Maritime Application, The Nautical Institute, London, 2007

Course Code:	**Course Title:**	**Credits:**
NAV 2112	Advance Seamanship Sessional	1.5

Course Learning Objective: The students will enable to understand the advance level of seamanship on board specially slinging, rigging and the care and maintenance of hatch cover and water tight elements.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Review & Advanced Rope work**	**03**
	Types and properties of synthetic and wire ropes.	
	Splicing (wire rope splicing, multi-braid rope splicing).	
	Whipping, seizing, and advanced knots.	
	Care, maintenance, and inspection.	
2	**Rigging & Lifting Gear**	**08**
	Blocks, tackles, and purchase systems, Safe rigging of derricks, cranes, and gangways. states various types of blocks (wooden and steel) describes various parts of different blocks, derricks (hallen derrick, velle derrick, stulken derrick, etc.) different types of derricks and its connections describes and demonstrates how to rig derricks describes different types of cranes Slinging, staging, rigging & painting Greasing and Lubrication Use and inspection of lifting appliances and gear (LOLER awareness).	
3	**Mooring Operations (Practical)**	**04**

	Types of mooring lines and arrangements.	
	Mooring to buoys, dolphins, and alongside under various conditions.	
4	**Use of winches, stoppers, tension monitoring, and snap-back zones.**	**03**
5	**Anchoring Operations**	**04**
	Types of anchors and their use.	
	Practical anchoring under different seabeds and weather conditions.	
	Walk-back, short stay, and anchoring with two anchors.	
6	**Towing & Emergency Towing**	**04**
	Types of tows: coastal tow, sea tow.	
	Preparing a vessel for towing and rigging towlines.	
	Emergency towing methods and procedures.	
7	**Advanced Ship Handling (Simulation & Practical)**	**04**
	Effects of wind, current, shallow water, and bank suction.	
	Turning, stopping, pivot points.	
	Berthing and unberthing under adverse conditions.	
8	**Cargo Handling & Deck Maintenance**	**04**
	Securing deck cargo, lashings, dunnage.	
	Hatch Cover operations.	
	Care and maintenance of hatch cover (i.e. greasing, oiling, painting and overhauling)	
	Rust removal, painting, and maintenance of deck fittings.	
	describes and states use of various lashing materials	
9	**Emergency Seamanship**	**04**
	Jury rigs, temporary repairs.	
	Use of oil to calm seas.	
	Abandon ship and man overboard recovery drills.	
10	**Practical Assessment & Revision**	**04**
	Comprehensive seamanship drills.	
	Oral questioning and practical test.	
	Feedback and review.	
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Nicholl's Seamanship and Nautical Knowledge
b.	Reed's Seamanship and Nautical Knowledge- William Embleton & John McEwen
c.	Seamanship Techniques- D J House
d.	The Seamanship Examiner- D J House
e.	Seamanship Notes- Barbara Russel

Course Code:	Course Title:	Credits:
NAV 2114	Bridge team and bridge resource management sessional	1.5

Course Learning Objective: The student will enable to understand the bridge navigation including the operation and limitation of RADAR while being used as navigational and collision avoidance aids.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	Operates main controls (power, antenna),	
	Operates transmitter controls (standby/transit, pulse length, PRF),	
	Adjust receiver controls to give an optimal picture (tuning, gain, linear/logarithmic gain, sensitivity time control, fast time control),	
	Adjust display controls (brilliance, illumination, focus, shift, range selector, range rings, VRM, EBM, mechanical cursor, heading marker, clear scan, anti-clutter),	
	Demonstrates correct order of making adjustments and states the criteria	

	for optimum setting of the controls,	
2	States that small or poor echoes may escape detection,	
	Describes the effects of saturation by receiver noise,	
	States the importance of frequent changes in range scale,	
	Identifies different types of display mode (true motion, relative motion-unstabilized, relative motion-stabilized, north up, course up, ship's head up),	
	Explains the advantages and limitations of the different types of display mode	
	Explains the need for compass input for relative stabilized display , and compass and log input for true motion display,	
3	Identifies effects of transmitting compass error on stabilized and true motion display,	
	Identifies effects of transmitting log error on true motion display, manual display, manual, speed input error, operations special controls (presentation, speed, re-set, course made good correction, compass repeater),	
4	Identifies maladjusted controls and explains their effects and dangers, detects and corrects maladjustments	
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Bridge Resource Management, Vol 1: The Human Element — The Nautical Institute
b.	Bridge Resource Management Guidance — UK Chamber of Shipping / Witherbys
c.	Bridge Resource Management for Small Ships: The Watchkeeper's Manual —

	Daniel S. Parrott
d.	Bridge Team Management: A Practical Guide — Captain A. J. Swift (The Nautical Institute)
e.	Improving Bridge Resource Management — Edited by Jürgen Neff (focus on human factors, communication, decision making)

Course Code:	**Course Title:**	**Credits:**
NAV 2239	Meteorology II	03

Course Learning Objective: Students to understand states of visibility, wind and pressure system, depression and TRS so that they can carry out navigational watch keeping duties on board by following meteorological predictions and features.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Clouds and Precipitation**	**3**
1.1	Formation of clouds (Basics: air containing water vapour rises, cools adiabatically and becomes saturated) Four ways of cloud formation	
1.2	Cloud classifications according to height	**3**
	Cloud classification (10 types) according to features	
	Defines ‘precipitation’	
	Defines 'rain', 'drizzle', 'hail', 'snow' and 'sleet'	
2	**The Wind and Pressure Systems over the Oceans**	
2.1	Explains the formation of anabatic and katabatic winds	**3**
	Lists the regions of occurrence of anabatic and katabatic winds	
	Provides examples of local winds; tornado and waterspout, bora, gregale, harmattan, levanter, scirocco, shamal, mistral, pampero, roaring forties, southerly buster, Sumatra, etc.	
2.2	Describes a monsoon regime	**3**
	Lists the areas which experience a true monsoon regime	
	Applies previous concepts to a qualitative explanation of the causes of	

	monsoon regimes	
2.3	Describes monsoon of Indian ocean	**3**
	Qualitative explanation of the weather associated with the January and July monsoons of the Indian Ocean, China Sea, north coast of Australia, west coast of Africa and the north east coast of Brazil	
2.4	Explains qualitatively, with the aid of sketches, the circulation cells which would exist on a rotating earth, not inclined to its orbit of rotation around the sun, and with a homogeneous surface	**3**
	Draws the mean surface pressure and wind distribution over the earth's surface in January and July	
	Describes the characteristics and location of the doldrums, intertropical convergence zone, trade winds, sub-tropical oceanic highs, westerlies and polar easterlies	
3	**Structure of Depressions, TRS**	
3.1	Defines 'air mass'	**3**
	Explains the formation of an air mass	
	Defines 'source region'	
3.2	Describes the source-region characteristics of arctic, polar, tropical and equatorial air-mass types	**4**
	Defines 'warm front', 'cold front'	
	Knows the symbols for warm and cold fronts and identifies them on a weather map	
3.3	Describes, with the aid of a diagram, the weather experienced during the passage of an idealized warm front	**3**
	Describes, with the aid of a diagram, the weather experienced during the passage of an idealized cold front	
3.4	Defines 'depression'	**3**
	Identifies a depression on a surface synoptic or prognostic chart	
	Describes the stages in the life cycle of a polar front depression	
	Describes a family of depressions	
3.5	Draws a diagram of a polar front depression, for both northern and southern hemispheres, showing isobars, warm and cold fronts, wind circulation and warm sector	**4**

	Draws a cross-section through a polar front depression, on the pole ward and equatorial side of the center, showing fronts, cloud and precipitation areas	
	Describes the usual movement of a polar front depression	
	Applies previous concepts to an explanation of the weather changes experienced when a frontal depression passes with its center on the pole ward side of an observer in the northern hemisphere and in the southern hemisphere	
3.6	Describes the process leading to the occlusion of a polar front depression	**3**
	Identifies a trough of low pressure on a surface synoptic or prognostic chart	
	Describes the weather associated with the passage of a trough	
3.7	Describes TRS	**4**
	Visual storm signals	
	Describes wind movement in a TRS	
	Describes differences between a TRS and a temperate latitude depression	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Cornish, M., Ives. E. Reeds Maritime Meteorology (Reeds Professional). Revised edition. Adlard Coles, 2010 (ISBN-13: 978-1408112069)
b.	Subramanium, H. Marine Meteorology (Nutshell Series, Book 2). 5th edition (ASIN: B082XB2666)
c.	Meteorological Office. Marine Observer's Handbook, 11th ed. London, HMSO, 1995. (ISBN 0-11-400297-5)
d.	Meteorological Office. Meteorology for Mariners, 3rd ed. 8th impression (Met.0.895). London, HMSO, 1996. (ISBN 0-114-00367X)

	Atmosphere and Weather-Barry R.G. , Chorley R. J.
e.	Admiralty List of Radio Signals, Vol. 6 (NP283) and Diagrams relating to Weather Reporting and Forecast Areas (NP283(a)). Taunton, Hydrographer of the Navy

Course Code:	**Course Title:**	**Credits:**
CHS 2241	Shipboard operation and cargo work II	03

Course Learning Objective:

1. Advance operation of cargo securing and keeping records.
2. Stowage and separation of dangerous goods.
3. Transportation of bulk cargo other than grain.
4. Details familiarization and toil tanker operation.
5. Risk assessment and precautions for entry into enclosed spaces.
6. Develop skill to prepare cargo plan and cargo calculations.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Bulk Grain Cargo**	**2**
	- defines the following terms as used in the International Grain Code: - grain - filled compartment - partly filled compartment - describes the cleaning and preparation of holds and decks for the carriage of grain - states that a thorough check for insect or rodent infestation should be made - describes the dangers associated with using insecticide in cargo holds - explains the importance of trimming and states how it should be made - distinguishes between the trimming of filled and partly filled compartments - describes the use of fitting of shifting boards - describes how saucers or bundles of bulk grain are arranged in the square of a hatch to reduce heeling moments resulting from	

	a shift of grain - describes how the surface of a partly filled compartment is secured against movement describes how to separate two different bulk grain cargoes loaded into the same compartment	
	Safe handling stowage and securing of cargoes	
2	**Cargo Care**	**9**
	Inspection and Preparation of Holds	
	Segregation and Separation of Cargoes	
	Ventilation and Control	
	Refrigerated Cargo	
3	**Dangerous, Hazardous and Harmful Cargoes**	**8**
4	**Cargo Handling Equipment and Safety**	**7**
	Cargo Handling Equipment	
	Cargo Handling Safety	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	***Cargo Work for Maritime Operations* — D. J. House**
b.	***Maritime Cargo Operations* — Weilbach / Marine Society**
c.	***Shipboard Operations* — H. I. Lavery**
d.	***The Ultimate Guide to Cargo Operations for Tankers* — Marine Insight (2nd Edition)**
e.	***Introduction to Container Ship Operations and Onboard Safety* — Alexander Arnfinn Olsen**

Course Code:	Course Title:	Credits:
NAV 2243	Celestial navigation II	03

Course Learning Objective:

1. Planning and conducting of a passage and for determining position
2. Maintaining a safe navigational watch

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Time and Equation of Time**	
1.1	describes the apparent solar day and states the relationship between LHA (sun) and LAT	**1.5**
	defines 'sidereal day' and states that it is a fixed time interval	
	Explains the reasons for the sun's irregular rate of change of SHA and hence the	
	necessity to adopt the astronomical mean sun for timekeeping purposes	
	describes the equation of time (ET) and its components	
	determines the ET from the Almanac and its sign of application	
	defines GMT, LMT and longitude	
1.2	defines zone times and standard time	**1.5**
	explains how to alter the ship's time during a passage with increasing or decreasing longitude	
	demonstrates the use of time signals	
	determines the error of a chronometer or watch	
2	**Position Lines**	
	Theory of astronomical Position Lines	**06**
	Methods of obtaining Position Lines	
	Azimuth & Position Line relationship	
3	**Latitude by Meridian Altitude**	**03**
	Demonstrates the uses the information in the Nautical Almanac to obtain the LMT of the meridian passage of a body to the nearest minute and interpolates for the observer's longitude when necessary	
	Applies the true zenith distance of a body when it is on the observer's	

	meridian to the declination of the body, to obtain the observer's latitude	
	applies these correctly when the declination and latitude have the same name applies these correctly when the declination and latitude have different names describes the relationship between the altitude of the elevated pole and the latitude of the observer	
4	**Latitude by Meridian Altitude**	**03**
	explains what is meant by a circumpolar star, and the terms upper and lower transit finds the value of the polar distance of the body, using its declination applies the polar distance to the true altitude of a body at lower transit to find the altitude of the elevated pole and the latitude	
	describes the direction of the position line through the observer when taking a meridian altitude	
5	**Pole Star Observations**	
5.1	identifies certain major stellar constellations and navigational stars,	**1.5**
	describes their movement relative to Polaris and the movement of Polaris with change of latitude	
	identifies Polaris	
	identifies some major constellations	
	describes the motion of the stars about Polaris	
	describes the relationship between the altitude of Polaris and the observer's latitude deduces from 2.10.4 that the true altitude of Polaris can be used to find the latitude of the observer	
5.2	obtains the corrections, -1o, +ao, +a1, +a2, from Pole Star tables in the 'Nautical Almanac' and applies them to the altitude of Polaris to find the latitude of the observer	**1.5**
	finds the true azimuth of Polaris from the tables and the direction of the position line	
6	**Compass Error by Azimuth**	**3**
	Obtaining correct GMT	
	Finding GHA & Declination from Nautical Almanac	
	Calculation of Azimuth by ABC Tables	

7	**Position Fixing**	
7.1	combines the equinoctial and horizon system of co-ordinates to determine the Centre and radius of a position circle and its direction in the vicinity of a selected position	**3**
7.2	applies the principles of a method of enabling the navigator to draw a small part of the position circle in his vicinity to a practical problem	
	determines the direction of a position line through an observer and a position through which it passes by Intercept method	
7.3	Applies this calculated Zenith distance to the true zenith distance of the body to find the intercept and the intercept terminal point	**3**
7.4	explains the assumptions made when plotting celestial position lines and the circumstances in which they may become significant	**1.5**
	defines and evaluates the co-latitude, polar distance and zenith distance and uses them as the sides of the PZX triangle	**1.5**
7.5	Solves the PZX triangle to find the calculated zenith distance of the body when it is out of the meridian	**03**
8	**Earth Moon System**	**3**
	Phases of the Moon	
	Daily retardation of the moon	
	Appearance of moon relative to horizon	
	Liberation of the moon	
	Eclipses	
	Occultation	
9	**Corrections of simple errors in sights**	**3**
	Errors those affect true altitude	
	Errors those affect hour angle	
10	**Graphical combination of sights**	**3**
	Plotting two or more astronomical sights & obtaining position of the vessel.	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	JONES, T.G. - Practical navigation for second mates. 2nd ed. Glasgow, Brown, Son & Ferguson Ltd, 1991. (ISBN 0-85174-397-8)
b.	Frost, A The Principles and Practice of Navigation. 3rd ed. Glasgow, Brown, Son & Ferguson, 1988 (ISBN 0-85174-444-3)
c.	Principles of Navigation, Capt. T.K. JOSEPH & Capt. S.S.S REWARI
d.	Catalogue of British Admiralty Charts and other Hydrographic Publications
e.	British Admiralty
f.	Notices to Mariners
g.	Chart
h.	Deviation Table
i.	British Admiralty List of Lights
j.	National List of lights and Buoyage System
k.	British Admiralty Tide Table of the area concerned
l.	National tide table
m.	Tidal stream atlas
n.	British Admiralty 'Pilot' book for the area concerned
o.	National sailing directions
p.	Pilot chart of the ocean concerned (US Hydrographic Office publication)
q.	IALA Maritime Buoyage System. British Admiralty NP735
r.	British Admiralty List of Radio Signals, Vol. 2: Radio Navigational Aids
s.	Ship's Log-book
t.	Voyage planning (Code No. 758)

Course Code:	Course Title:	Credits:
SOC 2245	Ship Construction	03

Course Learning Objective:

This course provides foundational knowledge of ship construction, enabling students to understand the major principles behind the design and structural development of ships and boats. It equips learners to work effectively in shipbuilding, engineering planning, scheduling, and production environments. Emphasis is placed on the integration of modern ship design with efficient shipyard/boatyard manufacturing systems, preparing students for both academic and professional applications.

The course focuses on verifying the structural strength and integrity of essential hull components and appendages, as well as the reliability of propulsion, steering, power generation, and other auxiliary systems required to maintain essential services on board. Students will also develop a clear understanding of ship dimensions, hull components, and fittings necessary for routine vessel operation and maintenance.

By the end of the course, trainees will be familiar with the principal structural members of a ship and the correct terminology for various parts. They will be able to conduct informed observations during regular operations and prepare accurate reports on any faults or minor damage identified.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Introduction**	**4**
2	**Hull Structure**	**11**
	—— identifies structural components on ships' plans and drawings: ——frames, floors, transverse frames, deck beams, knees, brackets ——shell plating, decks, tank top, stringers ——bulkheads and stiffeners, pillars ——hatch girders and beams, coamings, bulwarks ——bow and stern framing, cant beams, breasthooks —— describes the types of materials that are used in the construction of a ship —— describes and illustrates standard steel sections: ——flat plate ——offset bulb plate ——equal angle	

	——unequal angle ——channel ——tee —— describes with aids of sketches the longitudinal, transverse and combined systems of framing on transverse sections of the ships —— sketches the arrangement of frames, webs and transverse members for each system —— illustrates double - bottom structure for longitudinal and transverse framing —— illustrates hold drainage systems and related structure —— illustrates a duct keel —— sketches the deck edge, showing attachment of sheer strake and stringer plate —— sketches a radiused sheer strake and attached structure —— describes the stress concentration in the deck round hatch openings —— explains compensation for loss of strength at hatch openings —— sketches a transverse section through a hatch coaming, showing the arrangement of coamings and deep webs —— sketches a hatch corner in plain view, showing the structural arrangements —— sketches deck - freeing arrangements, scuppers, freeing ports, open rails —— illustrates the connection of superstructures to the hull at the ship's side —— sketches a plane bulkhead, showing connections to deck, sides and double bottom and the arrangement of stiffeners —— sketches a corrugated bulkhead —— explains why transverse bulkheads have vertical corrugations and for - and - aft bulkheads have horizontal ones —— describes the purpose of bilge keels and how they are attached to the ship's side	
3	**Bow and Stern Regions**	**6**
	—— describes the provisions of additional structural strength to withstand pounding —— describes and illustrates the structural arrangements forward to withstand panting —— describes the function of the stern frame —— describes and sketches a stern frame for a single - screw ship —— describes and illustrates the construction of a transom stern, showing the connections to the stern frame	
4	**Fittings**	**10**

	— describes and sketches an arrangement of modern weather - deck mechanical steel hatches — describes how watertightness is achieved at the coamings and cross joints — describes the cleating arrangements for the hatch covers — describes the arrangement of portable beams, wooden hatch covers and tarpaulins — sketches an oiltight hatchcover — describes roller, multi - angle, pedestal and Panama fairleads — sketches mooring bitts, showing their attachment to the deck — sketches typical forecastle mooring and anchoring arrangements , showing the leads of moorings — describes the construction and attachment to the deck of tension winches and explains how they are used — describes the anchor handling arrangements from hawse pipe to spurling pipe — describes the construction of chain lockers and how the bitter-ends are secured in the lockers — explains how to secure anchors and make spurling pipes watertight in preparation for a sea passage — describes the construction and use of a cable stopper — describes the construction of masts and Sampson posts and how they are supported at the base — describes the construction of derricks and deck cranes — describes the bilge piping system of a cargo ship — states that each section is fitted with a screw-down non-return suction valve — describes and sketches a bilge strum box — describes a ballast system in a cargo ship — describes the arrangement of a fire main and states what pumps may be used to pressurize it — describes the provision of sounding pipes and sketches a sounding pipe arrangement — describes the fitting of air pipes to ballast tanks or fuel oil tanks — describes the arrangement of fittings and lashings for the carriage of containers on deck	
5	**Rudder and Propellers**	**11**
	— describes the action of the rudder in steering a ship — reproduces drawings of modern rudders: semi balanced, balanced and spade — explains the purpose of the rudder carrier and pintles	

	—— explains how the weight of the rudder is supported by the rudder carrier —— describes the rudder trunk —— describes the arrangement of a watertight gland round the rudder stock —— explains the principle of screw propulsion —— describes a propeller and defines, with respect to : ——boss ——rake ——skew ——face ——back ——tip ——radius ——pitch —— compares fixed - pitch with controllable - pitch propellers —— sketches the arrangement of an oil - lubricated sterntube and tailshaft —— describes how the propeller is attached to the tailshaft —— sketches a cross - section of a shaft tunnel for water cooled and oil cooled type —— explains why the shaft tunnel must be of watertight construction and how water is prevented from entering the engine - room if the tunnel becomes flooded	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Ship Construction notes - Kemp and Young
b.	Ship Construction for Engineers - Reid
c.	Ship Construction – Pursey
d.	Ship Construction - Eyres

Course Code:	Course Title:	Credits:
NAV 2247	Radar Navigation and advance navigation technologies	03

Course Learning Objective:

This course aims to provide learners with the theoretical knowledge and practical proficiency necessary to:

1. Operate RADAR and ARPA systems for safe navigation and collision avoidance.
2. Interpret and analyze RADAR and ARPA information to assess navigational situations.
3. Apply RADAR-based decision-making in compliance with COLREGs.
4. To make OOW understand regarding advance navigation aids ECDIS, AIS, BNWAS VDR and SVDR.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Describes the knowledge on the fundamentals of RADAR**	**2**
	States the elaboration of RADAR	
	Describes the evolution of RADAR and ARPA in marine navigation	
	IMO performance standards (MSC.192(79)	
	States the carriage requirement (SOLAS Chapter V Reg. 19)	
	Types of Marine RADAR (X and S Band)	
2	**Operating Principle of RADAR and errors**	**5**
	States the echo ranging principle	
	Describes the main characteristics of the radar beam	
	Describes the function of the radar antenna (scanner) and associated aerial system	
	Describes how bearing is determined by the azimuth of scanner	
	Describes the effect that beam width has on bearing discrimination	
	Describes the formation of spurious returns including - Side lobes - Multiple echoes - False echoes	
	Describes the importance and purpose of vertical beam width.	
	State the factors affecting minimum range and discrimination such as:	

	- Pulse length; - Vertical beam width; - Height of scanner.	
	Describes the factors affecting target size and quality such as: - Aspect of target - Material	
	Describes the errors and interference on a radar display such as: - Multiple echoes - Side lobes - Shadow and Blind sectors - Second trace echoes - Meteorological effects	
3	**Operation and setting of the RADAR**	**8**
	Explains correct setting up procedure	
	Explains the action of each of the following controls: - Brilliance - Gain - Tuning - Pulse length - Range - Sea and rain Clutter and Auto clutter controls	
	Describes the difference between X & S band and the effect on clutter, resolution and range.	
	Explains the purpose of the heading marker and can explain: - The dangers of incorrectly aligned heading marker - The methods used to check the alignment of the heading marker - The use of the heading marker switch	
	Explains the need to check the accuracy of range rings, electronic bearing line (EBL) and variable range markers.	
	Describes the sources of errors in range and bearing	
	Describes the use of the offset electronic range and bearing line (EBL & VRM)	
4	**Interpretation of RADAR**	**4**

	Demonstrate the Ability to operate and to interpret and analyze information obtained from radar, including the following: - Setting up and maintaining displays - Understands heap up/North up/Course up - SART and RACON detection - Detecting course and speed changes of other ships - Effect of own ship's course or speed changes - Can find plotted targets CPA, TCPA, course, speed and aspect. - Can find the set and rate of drift of own vessel using a fixed plotted target. - Can interpret plotted information correctly and take appropriate action with regard to COLREGS both in clear and restricted viability. - Understands past position and trails - Detection of misrepresentation of information, false echoes, sea return, etc.	
5	**Knowledge of the fundamentals of ARPA**	**1**
	Knowledge and understanding of Principal types of ARPA, their display characteristics, performance standards and the dangers of over-reliance on ARPA	
6	**IMO performance standards for ARPA**	**1**
	Can list the performance standards, in particular the standards relating to accuracy (IMO Resolution A.823(19)	
	Explains the factors which influence vector accuracy	
7	**Tracking capabilities and limitations**	**2**
	Describes the criteria for the selection of targets by automatic acquisition	
	Describes the criteria for the selection of targets for manual acquisition	
	Describes the effects on tracking of lost targets and target fading	
	Describes the circumstances causing 'target swap' and its effects on displayed data	
	Describes the limits imposed on both types of acquisition in multi-target scenarios	
	Describes the effect of processing delays on the display of ARPA information	
8	**Presentation of vectors, target information and danger areas**	**3**

	Describes the use of true and relative vectors for the derivation of targets' courses and speeds, and also for the following: - Threat assessment, derivation of predicted closest point of approach (CPA) and predicted time to closest point of approach (TCPA) from forward extrapolation of vectors; - The use of graphic representation of danger areas; - The effects of alteration of course and/or speed of own ship and/or targets on predicted closest point of approach and predicted time to closest point of approach and danger areas; - The effects of incorrect vectors and danger areas; - The benefits of switching between true and relative vectors.	
9	**ECDIS (Electronic Chart Display and Information System)**	**8**
	Describes principal types of Electronic Chart System - describes the differences between Vector and Raster Charts - describes the terms and definitions used in the context of ECDIS - explains the major characteristics of ECDIS data such as data term and definition; data contents; data structure; attribute; data quality and it accuracy - describes the position reference system - describes ECDIS display characteristics - explains the scope and selection of chart data display categories - explains the safety value available in ECDIS - describes the automatic and manual functions of ECDIS - explains various sensors, its accuracy requirement and state proper action to take in case malfunction - describes the production and distribution of updates-manual, semi-automatic and automatic updating - describes the route planning and route monitoring in ECDIS - describes the route planning information; route planning calculation; calculation the voyage schedule; construction of a route; planned route checking for navigator safety; alternative route; optimization of route planning and ultimate route selection - - explains route and voyage monitoring; check route measurement	

	and calculations; navigation in open sea, coastal and confined waters using ECDIS; current and wind effects Explains the meaning of Status Indications, Indicators and Alarm relating to ECDIS - explains the typical errors of interpretation and take proper action to avoid these errors - explains the meaning of voyage recording, operate the corresponding functions and the reconstruction of past track - describes the possible risk of over-reliance and complacency on ECDIS.	
10	**Title: BNWAS (Bridge Navigation Watch Alarm System)**	**2**
	Describes the regulatory requirement	
	Explains the purpose and function of BNWAS	
	Explains the importance of familiarization with the system's operational modes (Automatic mode and Manual mode)	
	Explains the setting of dormant period	
	Explains the procedures of reset function	
	Describes the alarm sequence/stages (First, second and third stage)	
	Explains the ability to interpret alarms and indications	
	Explains the emergency call function	
11	**VDR/ S-VDR**	**2**
	Explains the purpose and regulatory background - SOLAS Chapter V, Regulation 20: Carriage requirements for VDR/S-VDR IMO Performance Standards (A.861(20), A.533(13), MSC.163(78))	
	Describes the system overview - What is VDR and S-VDR - Differences between VDR and S-VDR (data scope and system complexity) Mandatory vs. simplified units (S-VDR on smaller vessels)	
	Describes the main components - Data acquisition unit - Protective storage capsule - Microphones and audio recorders	

	Interfaces with ship systems (AIS, ECDIS, radar, GPS, engine systems, bridge audio, VHF)	
	Describes what kind of data are recorded - Bridge audio - Radar and ECDIS displays - GPS position, heading, speed, engine data, alarms AIS information and rudder orders	
	Describes the regulation regarding data retention and playback - Minimum recording duration (12 hours for S-VDR, 48 for VDR) - Downloading data after an incident; Playback software and analysis	
12	**AIS (Automatic Identification System)**	**4**
	States the objectives of AIS	
	Outlines the concept of Self Organizing Time Division Multiple Access (SOTDMA) with reference to the AIS transmission	
13	**Describes the elements of AIS data which includes**	
	state the information included in static data	
	state the information included in dynamic data	
	state the information included in voyage related data	
14	**Explains the use of the AIS at Sea**	
	Explain the need for checking of own ship input data.	
	Explain the use of AIS data on a radar or ECDIS display.	
	State the need for caution when making decisions based on AIS target data.	
	State the advantages and disadvantages of AIS compared with radar.	
	AIS data use in relation to COLREG	
	Limitations of AIS in relation to COLREG	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	The Navigation control Manual – Bole, Dinely & Nocholis
b.	Marine Electronic Navigation – S. Appleyard
c.	Practical Electronics Handbook – L.Sinclair & J Dunton
d.	Electronics Navigation System – L Tettly & D Calcut
e.	Use of visual Aids to navigation – ND Squire
f.	Radar and ARPA manual – Bole, Dineley & Wall
g.	Target detection by marine radar – J Briggs
h.	Parallel Indexing Technique – Smith & RA Mulrone

Course Code:	Course Title:	Credits:
NAV 2249	Terrestrial and coastal navigation II	03

Course Learning Objective: The course is designed to:

1. Introduce the principles of tidal phenomena**,** including the theory, terminology, and methods of calculating tide height and timing for standard and secondary ports.
2. Develop practical understanding of electronic navigation systems**,** including the differences between Raster and Vector charts, and the structure and application of ECDIS and ECS in modern bridge operations.
3. Train cadets in the use and interpretation of the IALA Maritime Buoyage System**,** including recognition of lateral, cardinal, and special marks and lights for both Region A and B.
4. Build competency in using navigational publications**,** such as tide tables, notices to mariners, sailing directions, and lists of lights, to support safe and efficient voyage planning.
5. Teach accurate logbook keeping practices during ocean voyages, coastal navigation, and in-port conditions in line with company ISM requirements and maritime regulations.
6. Develop cadets' skills in coastal and ocean navigation, including chart work exercises related to course plotting, dead reckoning, running fix, current calculation, and distance/time estimations.

7. Enable effective voyage planning, from berth to berth, in accordance with IMO Resolution A.893(21), ensuring understanding of all four stages of passage planning: appraisal, planning, execution, and monitoring.
8. Equip cadets with the ability to interpret and calculate the effects of tidal streams, currents, and leeway on ship's course and speed, and adjust navigation accordingly.

Course Content:

S/N	Course Content (as Summary)	Hrs
01	**Tides**	**6**
	-explains the basic theory of tide - defines 'spring tides', 'neap tides', 'height of tide' 'high water' and 'low water', 'mean high water springs', 'mean high water neaps', 'mean low water springs', 'mean low water neaps', 'range', 'chart datum', "highest astronomical tide" - calculates the spring and neap ranges for standard and secondary ports - finds the predicted time and height of high and low water at standard and secondary ports - finds the time of a desired height of tide	
02	**Electronic Charts**	**2**
	- demonstrates knowledge of electronic charts - describes the differences between Vector and Raster electronic charts - explains the major characteristics of ECDIS and ECS data such as data term and definition; data contents; data structure; attribute; data quality and it accuracy - describes the terms and definitions used in the context of ECDIS and ECS - describes ECDIS and ECS display characteristics - explains the scope and selection of chart data display categories	
03	**IALA Maritime Buoyage System and Lists of Lights and Other Publications**	**9**
	-explains the principles and rules of the International Association of Lighthouse Authorities (IALA) Maritime Buoyage System, Systems "A" and "B" - recognises the lights and shapes displayed on lateral and cardinal marks - recognises the lights and shapes displayed on other types of buoys in the system - recognises and demonstrates the use of the symbols and abbreviations on a chart, especially lighthouses, buoys, beacons, radio beacons and	

	other navigational marks - identifies the characteristics and range of lights	
04	**Keeping a Log**	**02**
	- describes the rules, regulations and common practice regarding keeping of a navigational log and voyage records - describes the proper keeping of different kinds of log during ocean passages, coastal navigation and in port in line with the requirement in the company's ISM Safety Management System	
05	**Passage Plan**	**08**
	- explains the danger of placing implicit reliance upon floating navigational aids - explains the danger of approaching navigational aids too closely -obtains and appraises information from navigational publications including sailing directions, notices to mariners, radio navigational warnings and ship's routeing information. - demonstrates simple passage planning and execution including use of sailing directions, tide tables, radio navigational warning and ship's routeing information within parameters established by the Master	
06	**Chart work Exercises**	**15**
	-finds the course to steer, allowing for tidal stream or current - finds the set and rate of tidal stream or current from charts or tables - explains the term 'running fix' and uses the method to plot a position - finds positions by running fix in a tidal stream or current - calculates the actual set and rate of tidal stream or current from DR and fixed positions - find compass course to seer between two positions on the chart so as to counteract the given and drift of current and given leeway. - explains the use of clearing marks and horizontal and vertical danger angles - demonstrate planning of a passage between two ports from berth to berth using the procedures for passage planning as per the Guidelines for Voyage Planning provided by IMO in Resolution A.893(21)	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Code of safe working practices
b.	Seamanship Technique by D.J. House.
c.	BA Chart
d.	Symbols and Abbreviations used on Admiralty Paper Charts (NP 5011)
e.	Admiralty Guide to ENC Symbols used in ECDIS (NP 5012)
f.	Admiralty Tide Table
g.	IALA maritime buoyage system (NP 735)
h.	Tidal stream Atlas
i.	The electronic chart : fundamentals, functions, data and other essentials : a textbook for ECDIS use and training- Publisher Lemmer, the Netherlands : Geomares
j.	The Admiralty guide to ECDIS Implementation, Policy and Procedures (NP 232)
k.	Introduction to charts and their use- M.Chris & GR Hayes
l.	Seaman's guide to basic chart work
m.	Introduction to coastal navigation- a seaman's guide
n.	Chart Work for mariners- Capt S.K.Puri
o.	Marine Chart Work – D.A.Moore
p.	Voyage Planning and Chart work – Capt M.V.Naik and Capt Varty

Course Code:	Course Title:	Credits:
NAV 2251	Collision Prevention Regulation	03

Course Learning Objective: Upon completing this part of the syllabus, the learner will be able to:

1. Identify and interpret all mandatory lights and shapes required for vessels under various operational conditions, including power-driven, sailing, towing, fishing, RAM, NUC, and CBD vessels.
2. Apply correct lighting and sound signals in practical navigational scenarios, including restricted visibility, overtaking, crossing, towing, and anchoring situations.
3. Explain the visibility requirements of lights and their significance for collision avoidance.
4. Differentiate between the signals of vessels engaged in specialized operations, such as fishing with long gear, dredging, mine clearance, cable laying, and pilotage.
5. Demonstrate correct use of maneuvering and warning signals and evaluate their role in safe navigation.
6. Recognize internationally accepted distress signals and describe the correct response when sighted.
7. Analyze real-world examples and court cases showing the consequences of improper light or sound signaling.
8. Evaluate exemptions under Rule 38 and understand their application to older or special-purpose vessels.
9. Use simulators, models, or diagrams to determine the correct interpretation of another vessel's signals and decide appropriate actions to avoid collision.

Course Content:

S/N	Course Content (as Summary)	Hrs
01	**Rule 20, Rule 21, Rule 22, Rule 23**	**6**
	Rule 21 – Definitions (Lights and Shapes) • defines the terms *masthead light, sidelights, stern light, towing light, all-round light,* and *flashing light*	

	• explains the color, arc of visibility, and installation requirements for each light • describes the definition and visibility requirements of shapes: *ball, cone, cylinder, diamond* • interprets how these definitions apply in different vessel categories and configurations **Rule 22 – Visibility of Lights** • states the minimum visibility ranges required for lights based on vessel length and type • explains the operational importance of meeting visibility criteria • describes how environmental conditions can affect visibility ranges • discusses court interpretations where improper light visibility contributed to collision **Rule 23 – Power-Driven Vessels Underway** • describes the lights required for power-driven vessels underway • explains requirements for vessels <12 m, <7 m, and high-speed craft • illustrates correct lighting for vessels with multiple masts and special configurations • explains the meaning and requirement of "additional all-round flashing yellow light" for WIG craft • demonstrates scenarios using models/simulator to identify correct lights	
02	**Rule 24 , Rule 25 , Rule 26**	**6**
	Rule 24 – Towing and Pushing • explains lighting requirements for towing vessels, including tows >200 m • describes lighting and shapes for pushing ahead and towing alongside • explains the correct display of *diamond shapes* for long tows	

	• describes lighting for objects being towed • interprets examples where incorrect display led to misunderstanding of tow length **Rule 25 – Sailing Vessels Underway and Vessels Under Oars** • describes lights and shapes required for sailing vessels underway • distinguishes between optional and mandatory lighting arrangements • explains the "combined lantern" for small sailing vessels • describes "motor-sailing" and the requirement to show a *cone, apex downward* • explains lighting options for vessels under oars **Rule 26 – Fishing Vessels** • defines "vessel engaged in fishing," including trawling and other fishing methods • describes required lights and shapes for vessels engaged in fishing • explains lights for vessels fishing with gear extending >150 m • describes limitations of maneuverability during fishing operations • interprets the meaning of *red over white* and *green over white* combinations	
03	**Rule 27, Rule 28 and Rule 29**	**6**
	Rule 27 – Vessels Not Under Command or Restricted in Their Ability to Manoeuvre • defines "NUC" (Not Under Command) and "RAM" (Restricted Ability to Manoeuvre) • states lights and shapes for NUC vessels (e.g., two all-round red lights, two balls) • states lights and shapes for RAM vessels (red-white-red; ball-diamond-ball)	

	• explains additional signals for dredging operations, cable laying, mine clearance, etc. • describes towing restrictions and safe passing zones for RAM operations **Rule 28 – Vessels Constrained by Their Draught** • defines the term "vessel constrained by her draught" • describes the required lights (three all-round red lights) and shape (cylinder) • explains limitations on maneuverability due to draft in narrow channels or deep-water routes **Rule 29 – Pilot Vessels** • describes lights and shapes for pilot vessels on duty • explains the combination *white over red* • states lighting for pilot vessels underway vs. at anchor vs. not on duty • interprets examples where pilot vessel signals were misunderstood	
04	**Rule 40, Rule 31, Rule 32 and Rule 33**	**8**
	- Rule 40 – Anchored Vessels and Vessels Aground • describes lights and shapes required for vessels at anchor • states additional lights for large vessels (>100 m) • describes required signals and shapes for vessels aground (three balls, two red lights) • explains anchor lights for small vessels (<50 m) • interprets visibility requirements for deck illumination **Rule 31 – Seaplanes** • explains how seaplanes should show lights "as closely as possible" to the requirements for vessels • describes differences in interpretation due to seaplane design	

	• outlines special circumstances in which seaplane lights differ from marine vessels **Rule 32 – Definitions (Sound Signals)** • defines sound-signal equipment: *whistle, bell, gong* • specifies audibility requirements for vessels of various lengths • explains the required technical properties of sound devices **Rule 33 – Equipment for Sound Signals** • states equipment requirements by vessel length • describes maintenance and operational readiness of sound signaling devices • explains why certain vessels are exempt from carrying full equipment	
05	**Rule 34, Rule 35 and Rule 36**	**6**
	Rule 34 – Manoeuvring and Warning Signals • explains the meaning of short blasts and prolonged blasts • describes signals for altering course to starboard/port and going astern • explains signals for vessels nearing bends or areas of restricted visibility • illustrates correct use of whistle signals in crossing, overtaking, and head-on situations • discusses misinterpretation of maneuvering signals through court examples **Rule 35 – Sound Signals in Restricted Visibility** • explains required signals for power-driven vessels underway • describes signals for NUC, RAM, CBD, fishing vessels, towing vessels, and anchored vessels • explains signals for pilot vessels in restricted visibility	

	• illustrates scenarios where failure to sound signals contributed to collisions **Rule 36 – Signals to Attract Attention** • describes the limitations on using light or sound to attract attention • explains what constitutes a "danger signal" • discusses improper or misleading signals prohibited under the rules	
06	**Rule 37**	**5**
	Rule 37 – Distress Signals • lists all internationally recognized distress signals • explains the meaning of each signal (e.g., SOS, red flare, EPIRB, smoke, orange flag) • describes responsibilities upon sighting a distress signal • describes modern GMDSS-based distress alerting equipment	
	Rule 38	**5**
	Rule 38 – Exemptions • explains exemptions for vessels built before the entry into force of amendments • states conditions and durations under which exemptions apply • describes practical considerations for older vessels, small vessels, and special craft	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	International Conference on Revision of the International Regulations for Preventing Collisions at Sea, 1972 (COLREG 1972)
b.	Cockroft, AN. and Lameijer, J.N.F., A Guide to the Collision Avoidance Rules, 6th ed. Oxford, Butterworth-Heinemann, 2004. (ISBN : 0-7506-6179-8)
c.	Browns Rules of the road manual – HH Brown
d.	The collision regulation fully explained – Capt P Wailwood
e.	Collision at Sea – How – Cdr Md Dewar

Course Code:	Course Title:	Credits:
NAV 2216	Shipboard instruments sessional	1.5

Course Learning Objective: To develop cadets' practical competence in the operation, calibration, maintenance, and safe handling of shipboard navigational and operational instruments in accordance with STCW requirements, enabling them to accurately perform watchkeeping and bridge duties onboard.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	Introduction to Bridge Layout and Instrument Arrangement	**2**
2	Magnetic Compass: Construction, Deviation Checks, and Adjustment Principles	**2**
3	Gyro Compass: Principles, Errors, Settling Procedures, and Changeover Operations	**3**
4	Radar Operation: Tuning, Target Detection, CPA/TCPA, and Plotting	**4**
5	ARPA Functions: Target Acquisition, Tracking, Danger Assessment	**3**
6	ECDIS Familiarization: Chart Loading, Route Planning, Alarms, Safety Settings	**4**
7	GPS, DGPS, and Satellite Navigation Systems: Setup and Performance Checks	**2**
8	AIS Operation: Identification, Data Input, Message Interpretation	**2**
9	Echo Sounder: Operation, Calibration, and Shallow Water Procedures	**2**
10	Speed Log (Doppler/EM Log): Principles and Operational Use	**2**

11	Steering Gear Familiarization: Manual/Auto Modes and Emergency Steering	**3**
12	Bridge Watchkeeping Simulation: Use of Instruments in Integrated Scenarios	**3**
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	**STCW Including 2010 Manila Amendments** – International Maritime Organization (IMO)
b.	**Reed's Seamanship and Navigation Series** – Thomas Brice / I. J. Allen
c.	**The Ship Officer's Handbook** – F. J. W. Hutton
d.	**Seamanship Techniques: Shipboard and Marine Operations** – David J. House
e.	**Bridge Procedures Guide** – The Nautical Institute

Course Code:	**Course Title:**	**Credits:**
CHS 2218	Shipboard operational sessional	1.5

Course Learning Objective: Upon completion of the Shipboard Operational Sessional, cadets will be able to competently operate, inspect, and maintain all major shipboard systems and safety equipment in accordance with IMO Model Course 7.03 and STCW Table A-II/1 requirements. They will demonstrate proficiency in the safe operation and routine maintenance of lifesaving appliances, firefighting systems, pilot and accommodation ladders, mooring and anchoring equipment, hatch covers, watertight doors, and ventilation closures, ensuring compliance with SOLAS and company SMS procedures. Cadets will be able to identify defects, perform basic servicing, follow checklists, and

maintain accurate records for each equipment type. They will also apply proper safety practices during mooring, anchoring, cargo operations, and emergency drills. In addition, cadets will understand and effectively implement the Permit to Work (PTW) system—including enclosed space entry, hot work, working aloft/overboard, and electrical panel work—through hazard identification, risk assessment, correct use of PPE, and adherence to isolation and communication protocols. Overall, cadets will gain the practical operational skills, safety awareness, and professional discipline necessary for safe and efficient watchkeeping duties on board.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	Lifesaving appliances operation care and maintenance	**5**
	• Inspection of lifeboats, rescue boats, liferafts (weekly/monthly/annual requirements) • Davit launching systems: operation, safety checks & common faults • Lifeboat engine starting procedures, fuel system, cooling system checks • On-load/off-load release gear: operation & maintenance precautions • Inflation systems of liferafts (hydrostatic release unit, painter line handling) • Personal Life Saving Appliances: immersion suits, lifejackets, anti-exposure suits • Emergency alarms and muster procedures • Equipment inside lifeboats & liferafts (rations, water, pyrotechnics) • Survival techniques: hypothermia prevention, group survival, drinking water production • Record keeping and LSA maintenance	
2	**Firefighting appliances operation care and maintenance**	**3**
	• Portable extinguishers: types, inspection, refilling, recharging • Fire hydrants, hoses, and nozzle handling procedures • SCBA operation, care, inspection, working duration calculation • Fireman's outfit components and testing • Fire control plan symbols and interpretation • Fire emergencies in machinery spaces, galley, accommodation, cargo areas • Boundary cooling and containment techniques • Hot work precautions and fire watch duties	

	• Fixed fire-extinguishing systems (CO_2 room, foam system, water mist, inert gas)	
3	All types of ladder operation, care and maintenance	**5**
	• Types: pilot ladder, embarkation ladder, accommodation ladder, gangway • SOLAS/IMO requirements for pilot ladders (length, steps, spreaders) • Combined ladder arrangement (pilot + accommodation ladder) • Proper rigging procedures & securing points • Safe approach for pilot boarding operations • Night rigging, lighting requirement, PPE for deck team • Embarkation ladder for lifeboat operations • Maintenance: anti-corrosion treatment, lashings, winch checks	
4	Mooring winch and anchor operation, care and maintenance	**5**
	• Types of mooring lines (synthetic, wire, HMPE) and their characteristics • Snap-back zone awareness & control measures • Mooring configuration for different berths (breast lines, spring lines, head/stern lines) • Anchoring procedures: letting go, walking back, anchor watches at anchor • Cable length calculation (scope), anchor in shallow/deep water • Windlass and winch lubrication and maintenance •	
5	Hatch cover operation, care and maintenance	**4**
	• Types of hatch covers: folding, rolling, side-rolling, pontoon, MacGregor • Pre-operation checks (obstructions, seals, tracks, hydraulic lines) • Securing devices: cleats, wedges, cross-joint wedges, rubber packing • Leak testing methods (hose test, chalk test, ultrasonic test) • Cargo hold ventilation and moisture control	

	• Maintenance: greasing points, hydraulic system inspection, drain channels • Safety precautions while opening/closing during cargo operations • Heavy weather precautions for hatch cover securing	
6	All water tight door, ventilator operation, care and maintenance	**3**
	• Types: hinged, sliding, power-operated watertight doors • SOLAS requirements for watertight integrity • Ventilator closing appliances: types and operational use • Fire flaps, air dampers: testing & maintenance • Weekly/monthly testing routines • Record keeping of watertight door tests	
7	Work permit system: Enclosed space entry, Hot work, working aloft and overboard, working on electrical panel.	**7**
	• Enclosed Space Entry Permit • Hazard identification: oxygen deficiency, toxic gases, flammable vapors • Gas testing sequence & safe limits • Isolation & ventilation requirements • Standby personnel, rescue plan, communication procedures • Use of SCBA and rescue equipment • Enclosed space entry drills (as per SOLAS III/19) • Hot Work Permit	

	• Fire risk zones: cargo tanks, engine room, deck areas • Pre-work precautions: gas-free certificate, removal of combustibles • Fire watch duties and post-work monitoring • Use of welding screens and PPE • Working Aloft / Working Overboard Permit • Risk assessment & toolbox talk • Fall arrest systems, safety harness, staging, bosun's chair • Safety boat requirements for overboard work • Communication with bridge and deck team • Permit validity and weather restrictions • Working on Electrical Panels • Insulated tools and arc flash protection • Emergency shutdown arrangements • Precautions during maintenance of switchboards, MCCs, starters	
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Code of safe working practices
b.	Seamanship Technique by D.J. House.

Course Code:	Course Title:	Credits:
CAP 2220	Ship Visit	1.5

Course Learning Objective: As part of their pre-sea training, deck cadets will undertake a structured industrial visit onboard an operational seagoing vessel (general cargo ship, container ship, or oil/chemical tanker). This visit aims to provide cadets with first-hand exposure to real shipboard environments, systems, and operations. The focus will be on gaining practical understanding of the navigational bridge, life-saving appliances, cargo handling gear, deck machinery, and essential arrangements at fore and aft stations. Additionally, cadets will tour the engine room to observe its layout and emergency systems, and understand the integration of bridge and engine room operations. This experience will help cadets contextualize classroom instruction and better prepare for shipboard life and responsibilities.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Navigational Bridge Familiarization**	**7**
	Identify and describe the layout of a ship's navigational bridge and its key operational areas.	
	Recognize the use and function of critical bridge equipment (radar, ECDIS, gyro/magnetic compass, autopilot, AIS, GMDSS, etc.).	
	Understand navigational watch arrangement, lookout duties, and bridge team organization as per STCW requirements.	
2	**Life-Saving Appliances (LSA)**	**7**
	Locate and identify onboard life-saving equipment such as lifeboats, life rafts, lifejackets, lifebuoys, EPIRBs, and SARTs.	
	Describe launching and recovery procedures of lifeboats and life rafts.	
	Understand routine maintenance procedures and safety checks of LSA equipment.	
3	**Cargo and Deck Operations**	**7**

	Observe the cargo gear arrangement, including cranes, derricks, and winches.	
	Identify cargo hold layout and tank configuration (for tankers: pump room and cargo control room).	
	Describe bilge system operation and the layout and function of hatch covers.	
	Understand deck machinery functions, including windlass, capstan, winches, and cargo gear.	
4	**Mooring and Anchoring Arrangements**	**7**
	Identify mooring arrangements at both forward and aft stations, including bitts, fairleads, and winches.	
	Understand the operation and purpose of the anchor windlass and anchoring procedures.	
5	**Firefighting and Safety Systems**	**7**
	Locate the ship's mustering station and understand the muster procedure.	
	Identify onboard firefighting equipment and fixed firefighting installations.	
	Understand the ship's emergency response plan, fire control plan, and security arrangements (including ISPS Code basics).	
6	**Engine Room Familiarization**	**7**
	Tour the engine room to understand its general layout and key systems (main engine, auxiliary engines, boilers).	
	Locate and describe the function of emergency systems such as: - Emergency fire pump - Emergency generator - Emergency steering gear	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Assignment: 40 Marks
		Presentation: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Bridge Procedures Guide – International Chamber of Shipping (ICS)
b.	Official Manuals and Documents Onboard
c.	International Safety Management (ISM) Manual
d.	Ship's Fire Control and Safety Plan
e.	Shipboard Equipment Operation Manuals
f.	Mooring Arrangement Plan
g.	Lifeboat and Life Raft Launching Procedures Manual
h.	Piping and Instrumentation Diagram (P&ID) – for Tankers
i.	Engine Room Layout Diagram
j.	SOPEP Manual (Shipboard Oil Pollution Emergency Plan)

Course Code:	**Course Title:**	**Credits:**
CAP 4022	Onboard Training or Industrial Training	1.5

Course Learning Objective: The STCW Convention lays great emphasis on practical competence, as practical training allows seafarers to put into practice what they have learned in the classroom. Certain competencies can only be gained at sea under the supervision of appropriately trained and experienced personnel, which is why experienced seafarers must take every opportunity to train those who are less experienced and pass their knowledge to the next generation. All on-board training carried out under Regulation III/1 must be recorded in a Training Record Book (TRB) approved by the administration, and the assigned tasks are to be completed under the supervision of certified designated Deck Officers. The institute may monitor the candidate's progress when necessary, and the TRB should be checked regularly by the Chief Officer and Master. For industrial training, an industry-specific training record book must be followed. Upon completion of all tasks, the cadet submits the TRB to the concerned department for verification before it is forwarded to the examiner or authority. An examination committee is formed in accordance with BMU and administrative requirements, comprising external members, marine professional instructors, and qualified assessors (Deck Officer COC-I). The training program must be approved by the maritime administration, and a training service of not less than 12 months on board seagoing merchant vessels must be documented in the CDC as required by STCW

Section A-III/1. After completing the required sea time, cadets submit the DoS-approved TRB with all assignments duly signed by the supervising Deck Officer. The committee inspects the TRB and conducts oral and written examinations upon payment of the prescribed exam fees. Successful completion of the assessment serves as evidence that the cadet has achieved the required standard of competence to qualify for enrolment in the 7th semester of the 4th Academic Year.

Course Content:

S/N	Course Content (as Summary)	
	On board Training An approved seagoing service of not less than 12 months as part of an approved training programme, which includes onboard training that meets the requirements of section A-II/1 of the STCW Code and is documented in an approved training record book. **Alternative** Students may perform 12 months apprenticeship in a ship management, owners, or agency company, port authority, Ship yard, dry-dock, marine workshop or any other similar organization approved by the Bangabandhu Sheikh Mujibur Rahman Maritime University.	
01	- Introduction to shipboard organization, ranks & responsibilities - Personal safety, risk assessment, PPE - Familiarization with the ISF Training Record Book and competency tasks - SOLAS, MARPOL, STCW overview related to cadet duties - Familiarization with Ship particulars, Muster list and contingency plans	
02	**Watchkeeping & Bridge Procedures**	
	- Principles of bridge watchkeeping (STCW A-VIII/2) - Duties of OOW during navigation & at anchor - Bridge watch handover procedures - Lookout responsibilities and COLREGS interpretation - Use of compass, log, echo sounder, rudder, helm orders - Course-keeping, helm steering practice - Bridge resource management basics - Record keeping (logbook, bell book, movement book, deck log)	
03	**Navigational Equipment & Instruments**	

	- Radar operation, ARPA principles, blind sectors, limitations - ECDIS and electronic chart handling - AIS, GPS, GMDSS navigational alarms - Use of sextant and celestial navigation basics - Gyro & magnetic compass error correction - Speed & distance measurement systems	
04	**Meteorology & Environmental Protection**	
	- Weather reporting, shipboard meteorological instruments - Interpretation of synoptic charts, wind, sea state - Tropical revolving storms, avoidance procedures - MARPOL annexes relevant to deck cadets - Garbage management, SOPEP/SMPEP familiarization	
05	**Seamanship, Rigging & Deck Operations**	
	Knots, splices, wire and rope care Maintenance of deck fittings, greasing, chipping, painting Use of bosun chair, staging, aloft work procedures Pilot ladder, accommodation ladder rigging and inspection Deck cranes, derricks, and lifting equipment safe operation Hatch cover operation & maintenance Watertight doors, ventilators, closing appliances	
06	**Mooring, Anchoring & Ship Handling Support**	
	- Mooring line types, care, inspection - Winch operation, brake testing, snap-back zones - Mooring configurations and station duties - Anchoring procedures, cable handling, anchor watches - Towing and tug handling awareness - Bow/stern thrusters fundamentals	
07	**Cargo Handling & Stowage Awareness**	
	- Basic cargo principles (dry bulk, containers, general cargo, tanker awareness) - Cargo securing manual & lashings - Ventilation, sweat and moisture control - Ballast operations introduction - Use of cargo gear and safety precautions - Cargo hazard identification (IMDG basics, MSDS interpretation) - Stability concepts relevant to cadets	

08	**LSA & FFA Operation, Care & Maintenance**	
	- **Lifesaving Appliances** - Lifeboat/rescue boat equipment, launching, recovery - Liferaft systems, HRUs - Immersion suits, lifejackets, survival techniques - LSA inspection routines & recordkeeping - **Firefighting Appliances** - SCBA use & daily/weekly testing - Portable & fixed fire-extinguishing systems - Fire patrols, fire control plan interpretation - Fire pump, hydrants, hoses, nozzles operation	
09	**Emergency Preparedness & Drills**	
	- Muster list, emergency signals, alarm response - Abandon ship, fire, flooding, blackout, man-overboard procedures - Search & rescue principles (IAMSAR basics) - Emergency communication and reporting - Role of cadets in emergency teams	
10	**Communication, Reporting & Professional Conduct**	
	- SMCP (Standard Marine Communication Phrases) - Bridge and engine-room communication practice - Cadet reporting to officers, documenting faults & maintenance - Cultural awareness & teamwork onboard - Ethical standards and professionalism at sea	
11	**Project Works**	
	Scale Drawings **Navigation** Safety Cargo Work Mooring	
12	**Training Record Book Completion & Assessment (Start–End Continuous)**	
	- Completion of all Department approved TRB tasks relevant to OOW competency - Supervisor verification, signature procedures - Steering and Watch keeping certificate by the Master - Mid-voyage and final assessment by Training Officer/Master - Submission of complete TRB for grading & certification	
	Total	**448**

Assessment & Evaluation		
a.	**Assessment Strategy**	Written Exam, Viva Voce, Projects, Training Record Book Evaluation
b.	**Marks Distribution:**	Written Exam: 50 Marks
		Project Works: 50 Marks
		Viva Voce: 100 Marks
		Training Record Book: 100 Marks
c.	**Makeup Procedures**	Make-up procedures may include resubmission of project work, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Training Record Book
b.	Industrial Training Record Book

Course Code:	Course Title:	Credits:
GED 4153	Research Methodology and Professional Ethics	03

Course Learning Objective:

Students must understand the concepts and guidelines of research methods in conducting their thesis or any research work. This course will provide them the insights for conducting research work. Furthermore, different qualitative and quantitative research techniques will help them craft their research work and achieve research objectives.

Students will be able to:

1. Understand fundamental concepts of research and its role in knowledge creation.
2. Design and implement effective research methodologies.
3. Apply appropriate data collection and analysis tools.
4. Develop academic writing and referencing skills.
5. Recognize and practice professional ethics in research and professional life.
6. Critically evaluate ethical issues in contemporary research.

Course Content:

S/N	Course Content (as Summary)	Hrs.
	Thesis proposal writing	
1	Introduction to Research: Meaning, characteristics, objectives, importance	**2**
2	Types of Research: Basic & applied, qualitative, quantitative, mixed methods	**2**
3	Research Process & Steps: Problem identification, literature review	**3**
4	Research Problem Formulation & Hypothesis Development	**2**
5	Research Design: Exploratory, descriptive, experimental, correlational	**3**
6	Sampling Techniques: Probability and non-probability sampling	**2**
7	Data Collection Methods I: Surveys, questionnaires, observation	**2**
8	Data Collection Methods II: FGD, structured, semi-structured & unstructured interviews	**3**
9	Data Analysis I: Coding, tabulation, descriptive & inferential statistics, SPSS/Excel	**3**
10	Data Analysis II: Qualitative analysis – thematic analysis, content analysis	**3**
11	Research Proposal Writing: Structure, objectives, methodology, references	**3**
12	Academic Writing: Plagiarism, referencing styles (APA, MLA, IEEE), Turnitin	**3**
13	Professional Ethics: Integrity, responsibility, confidentiality, authorship	**3**
14	Ethical Issues in Research: Human subjects, informed consent, fabrication, falsification	**3**
15	Professional Ethics in Industry & Academia: Code of conduct, IPR, patents	**3**
	Total	**42**

Note: Submission of an assignment on developing a thesis proposal is mandatory for continuous assessment.

Assessment & Evaluation		
	a. Assessment Strategy	Attendance, Assignment (Includes the compulsory thesis-proposal assignment), Final Exam.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Kothari, C.R. *Research Methodology: Methods and Techniques*. New Age International.
b.	Creswell, J.W. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Sage.
c.	Cooper, D.R., & Schindler, P.S. *Business Research Methods*. McGraw-Hill.
d.	Shamoo, A.E., & Resnik, D.B. *Responsible Conduct of Research*. Oxford University Press.
e.	Babbie, E. *The Practice of Social Research*. Cengage.

Course Code:	**Course Title:**	**Credits:**
NAV 4155	Advance Navigation	03

Course Learning Objective: Students will understand and gather proper knowledge, understanding, and proficiency to safely and effectively conduct navigation at the Advance level.

Course Learning Objective:

1. To gather advance level knowledge on Sailing, Great circle sailings, solar system and Celestial bodies, co-ordinates, celestial spheres and movements, time and Hour angle, nautical tables, Equinoctial system etc.
2. Emergency Preparedness and Contingency Plan.
3. Search and Rescue, Rendezvous with another vessel.
4. The students will be able to understand the celestial PZX triangle and using which the students will able to find out the ship's position in deep ocean as well as identify star and simultaneous observation and transferring of position line at the time of 2nd observation which will help to find out the celestial fix.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**The Earth & Basic Concepts**	**06**
	• Form and dimensions of the Earth: Understanding the Earth as an imperfect sphere, including its flattened shape (oblate spheroid) and the geoid model.	

	• Earth's orientation and movement: The Earth's axis, its rotational motion, and the roles of the equator and the poles. • Great circles and small circles: The difference between circles that divide the Earth into equal halves and those that do not. • Meridians and parallels: The network of north–south and east–west reference lines used for geographic positioning. • Latitude and longitude: The coordinate system used to identify precise locations on the Earth's surface. • Meridian convergency: How meridians angle toward each other as they move from the equator toward the poles. • True bearing and Earth geometry: How directions measured relative to true north relate to movement and orientation on the Earth's surface.	
2	**Nautical Almanac & Sailing**	**06**
	• Understanding various principles of using Nautical Almanac • Structure of the nautical almanac • Daily pages: GHA, declination, v and d corrections • Star pages: SHA, declination, magnitude • Sunrise/sunset/twilight tables • Moon and planet corrections • Interpolation methods • Knowing how to use Tables in the 'Nautical Almanac' and applies them to find position of the observer • Common features of Mercator and gnomonic chart, scale of latitude and longitude, measurement of distance, rhumb line. • Parallel sailing, Mercator sailing, Rhumb Line Sailing.	
3	**Spherical Astronomy and Sextant Navigation**	**06**
	• Principles of Celestial Navigation • Zenith, nadir, horizon system • Celestial equator and ecliptic • Declination, right ascension, hour angle • Apparent vs. mean sun • Rising and setting of heavenly bodies • Solar system, earth and moon, motion of planets • Rotation and motion of earth in the orbit • Mean sun ecliptic • First point of Aires, equinox and solstice • Sunrise, sunset, twilight.	

4	**Time Systems & Time Corrections**	**04**
	• Time, Greenwich and other standard time. • Zone time, meantime, apparent time • Sidereal time, equation of time, relationship between longitude and time • Determination of time from celestial observations • Sidereal time; GHA and SHA relations • Local hour angle of a heavenly body in time & arc. Greenwich hour angle of sun, moon, planets and Aires. • Chronometer errors, chronometer rate • Equation of time and its application	
5	**Sextant Theory & Instrumentation**	**04**
	• Structure of a sextant • Optical path and mirrors • Correction of sextant altitude • Index error and its correction • Dip correction (height of eye) • Refraction correction • Semi diameter and parallax • Sextant checks and care	
6	**Advanced Celestial Techniques**	**08**
	• Geographic position of heavenly body. A position circle and its practical application, position line, intercept. • Ex-meridian sights • Amplitude and azimuth calculations (compass checks) • Artificial horizon use • Phases of the moon and its relation with tide. • Celestial navigation at high latitudes • Using planets for accurate fixes • Low-altitude sights and associated corrections • Celestial lines in poor visibility (twilight optimization) • Principles of position fixing by measuring distance from two or more fixed. Hyperbolic lattice on navigational chart • Modern navigation systems, e.g., theoretical knowledge of G.P.S.	
7	**Emergency Preparedness and Contingency Plan**	**04**
	Contingency Plans for response to Emergency	
	Initial Action following Collision or Grounding or other emergencies	
	Action upon Man Overboard	

	Initial damage assessment and Damage control.	
	Procedures for abandoning ship	
	Preparing a contingency plan	
8	**Search and rescue**	**04**
	Various Search Patterns	
	Williamson turn and other turns	
	Assisting a Vesel in distress and post emergencies	
	Actions for emergencies in Port	
	Arrangements for towing and being towed	
	Recovery of persons from Sea	
	Rescuing persons from vessel in Distress.	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	The principles and practice of navigation written by A. Frost
b.	Practical navigation for 2nd mates written by A. Frost
c.	Practical navigation written by Capt. Subramaniam
d.	Principles of navigation written by Capt. T.K. Joseph & Capt. S.S.S Rewari
e.	IAMSAR vol 3

Course Code:	Course Title:	Credits:
SOC 4157	Cargo Operation and Stability	03

Course Learning Objective:

1. Students will learn different cargo and stability calculation, requirement and compliance
2. Will Learn Dry Docking and Grounding
3. Will Learn about bilging and damage stability
4. Will be familiar about stability related software, limitations and Errors.

Course Content:

S/N	Course Content (as Summary)	Hrs.
01	**Cargo care and maintenance**	**06**
	• Cause of sweating and necessary precautions for prevention of damage of cargo from sweating before, and after loading, during voyage. • Separation, stowage and dunnaging of bulk cargo, timber cargo, grain cargo, ro-ro cargo and other cargoes. • Knowledge about safety measures during loading and discharge of hazardous cargo, chemical, bulk oil, etc. • Calculation of space partially occupied by cargo and void space. • Determination of dimension of cargo from weight and weight from dimension. Making and use of cargo plan. • Ventilation system of cargo hold and tank. • Required precautionary measures before entry into cargo, ballast tank and void space. • Transportation of passenger and livestock. • Safe operation of loading and discharging of liquid cargo in bulk for tanker vessel.	
04	**Solid Bulk Cargo and stability**	**04**
	• Documentation and hazards • Loading, discharging procedures • Cares of cargo during loading, discharging and loaded passage • Cargo securing • Stability calculation and compliance	
03	**Grain Loading and Grain Stability Calculation**	**03**
	Cargo documentation and Graining carriage compliance for ship	
	Grain related Terms	

	Grain loading, securing & discharging procedures.	
	Care and maintenance of Cargo during loading, loaded voyage.	
	Procedure to understand grain stability Book let and calculation procedures for heeling moments.	
	How to check the compliance of stability requirement.	
04	**Container Loading and stability calculation**	**03**
	Different types of containers with full details	
	Bay plan and profile plan	
	Cargo documentation	
	Procedures of handling	
	Cargo loading, securing and discharging procedures.	
	Stress related problems and compensation procedures	
	Care of Cargo during loading, discharging and loaded voyage.	
	Container Lashing Gears and care about lashing, Cargo securing manual.	
	Compliance of stability requirement.	
	Handling of DG, reefer, OOG, flat rack, open door Container	
	Stack weight related problem and compliance requirement on the basis of different classification society.	
05	**Timber Cargo and stability**	**03**
	Documentation and hazards	
	Loading and discharging procedures	
	Cargo securing procedures and Cargo securing manual	
	Lashing gears.	
	Stability Calculation and Compliance	
06	**Vehicle and RoRo and stability**	**03**
	Documentation and Hazards	
	Loading and discharging procedures	
	Cargo securing procedures and Cargo securing manual	
	Lashing gears.	
	Stability Calculation and Compliance	
07	**DG cargo**	**03**
	Documentation	

	Segregation, handling of emergency	
	Familiarization with IMDG Code	
	DG related terms, familiarization and handling procedures of IMDG Code.	
	Loading, discharging procedures	
	Care during loading, loaded passage and discharging	
08	**Cargo gears , Heavy Lift and stability**	**03**
	• Use of rigging, derrick, winch and crane for loading and discharging of cargo to/from vessel. • Documentation for heavy lift, Loading and discharging procedures Care during loading, discharging and loaded voyage, Cargo securing procedures, Stability calculation and compliance	
09	**Group weights, Water draft, Air draft, Effect of density on the ship's draft, Importance of reserve buoyancy**	**04**
	• Displacement of ship from draught and freeboard and determining weight of cargo, ballast, etc using TPC (Tonnes per centimetre) scale. • Load line marks and their appropriate use. • Buoyancy and reserve buoyancy, measures to be taken in case of partial loss of reserve buoyancy.	
10	**The inherent ability of a ship to return to an upright position after being tilted sideways while at rest**	**04**
	• General knowledge about the definition of following terms, viz:- Centre of gravity, Stable, Unstable and Neutral equilibrium, Centre of Buoyancy, Metacentric height, Righting Lever, Righting moment. • Use of Hydrostatic and stability information provided to ship. Effect of addition and subtraction of weight or cargo. Hazards involved in partially filled tank. Safety of cargo hold.	
11	**Computer Based stability program**	**03**
	• Learn to operate computer-based stability program for container ship and RoRo/car Carrier. • Learn to operate computer-based stability program for normal cargo vessel and bulk Carrier. • Limitations and checking procedures for errors	
12	**Flooding and Damage stability**	**03**
	• Introduction to damage stability and regulations • Ship subdivision and watertight integrity • Flooding principles and permeability • Free surface effect in damaged conditions	

	• SOLAS requirements for damaged stability • Use of stability booklet and damage control plans • Basic emergency response and stability precautions	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Ship Stability – Martin A. Rohdes
b.	Ship Stability – Bryan Brrass and Dr. Deret
c.	Stability, Trim and cargo calculations on "Hind ship and oil Tanker - Capt. TK. Joseph and Capt. SSS Rewari
d.	Stability software

Course Code:	**Course Title:**	**Credits:**
NAV 4159	Ocean and Offshore Navigation	03

Course Learning Objective: Students will understand to solve the pole star observations, great circle sailings and uses of gnomonic chart. The students will be able to understand the celestial PZX triangle and using which the students will able to find out the ship"s position in deep ocean as well as identify star and simultaneous observation and transferring of position line at the time of 2nd observation which will help to find out the celestial fix.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Pole Star Observations**	**4.5**
	Describes the relationship between the altitude of Polaris and the observer's latitude	
	obtains the corrections, -1o, +ao, +a1, +a2, from Pole Star tables in the	

	'Nautical Almanac' and applies them to the altitude of Polaris to find the latitude of the observer	
	Finds the true azimuth of Polaris from the tables and the direction of the position line	
2	**Sailings (Great circle & composite great circle)**	**9**
	Calculate initial course, final course and distance of a great-circle track	
	Calculate position of vertex and Intermediate points	
	Demonstrate understanding of great circle sailing including composite great circle with limiting latitude for initial course, final course and total distance	
	Transfer a great circle from a gnomonic to a to a Mercator chart	
3	**Star Identification**	**4.5**
	Identifies certain major stellar constellations and navigational stars,	
	Star identification exercise	
4	**Position lines by celestial body**	**4.5**
	Longitude by chron, Intercept, Ex-meridian method to find the PL	
5	**Simultaneous observations**	**7.5**
	Applying different methods to find the position of the ship.	
	Polaris and one long by chron to find the position of the ship.	
6	**Staggered observations**	**3**
	Ship's position at the time of second observation.	
7	**The projection of the celestial sphere**	**9**
	Defines and evaluates the co-latitude, polar distance and zenith distance and uses them as the sides of the PZX triangle,	
	Rising and setting azimuth & amplitude	
	To measure the altitude or zenith distance	
	Circumpolar body and maximum azimuth finding	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	The principles and practice of navigation written by A. Frost
b.	Practical navifation for 2nd mates written by A. Frost
c.	Practical navigation written by Capt. Subramaniam
d.	Principles of navigation written by Capt. T.K. Joseph & Capt. S.S.S Rewari

Course Code:	Course Title:	Credits:
NAV 4161	Coastal Navigation	03

Course Learning Objective:

The objectives of this course are to:

a. **Development of Chart work and Coastal Navigation Skills:** Perform chart plotting exercises for DR, estimated, and fixed positions. Determine courses to steer to counteract current and tidal effects. Estimate distance, time, and speed for various navigational situations.

b. **Currents, Leeway, and Tidal Effects**: Interpret tidal stream atlases and current tables to assess their effect on a vessel's course and speed. Apply appropriate corrections for current, leeway, and set and drift in navigational calculations**.**

c. **Running Fix and Running Fix with Current:** Determine position using running fixes with and without the influence of current. Correct for tidal stream and current drift in plotting positions.

d. **Dipping and Rising Bearings of Lights:** Determine distance off by observing dipping and rising bearings of lights and use the information for position fixing.

e. **Position Fixing by Sextant and Visual Methods:** Find a position line using horizontal angles, vertical sextant angles, and transit lines.

f. **Bow Angle Methods:** Apply Double the Angle on the Bow and Selected Bow Angle methods for position fixing.

g. **Three-Point Bearings:** Obtain position lines using three-point bearings and use them effectively for coastal position fixing

h. **Position Lines by Astronomical and Chart-Based Observations:** Calculate Dead Reckoning (DR) and Estimated Positions (EP) using plane sailing formulas, considering compass course, errors, distance, speed, current, tide, and leeway. Apply Mercator sailing formulas to calculate course, distance, and final position between two points. Demonstrate knowledge of great circle sailing, including composite and limited latitude great circles, using gnomonic and Mercator charts for plotting and transfer.

i. **Tidal Calculations:** Calculate times and heights of high and low water at standard and secondary ports. Determine time for a desired height of tide and apply this knowledge in passage planning and under-keel clearance management.

j. **Comprehensive Passage Planning and Execution:** Prepare a complete passage plan between two ports using relevant charts, sailing directions, tide tables, and notices to mariners. Demonstrate competency in applying IMO Guidelines for Voyage Planning (Resolution A.893(21)).

k. **proficiency in chart work exercises:** enabling cadets to apply the learned theory in real-life navigational planning and execution.

Course Content:

S/N	Course Content (as Summary)	Hrs
01	**Position Fixing and Course–Speed Corrections under the Effect of Current**	**3**
	- Determine vessel position using Dead Reckoning (DR), Estimated Position (EP), and visual or electronic methods (e.g., bearings, distances, transits, or radar ranges). -Compute set and drift of current from known DR and fixed positions and assess its effect on the vessel's movement.	

	-Determine the course to steer (CTS) to counteract current, leeway, and tidal influences for safe navigation. -Calculate speed made good (SMG) and course made good (CMG) over the ground and compare with planned track. -Evaluate errors in navigation caused by inaccurate current data, leeway estimation, or compass deviation. -Demonstrate practical chart work exercises to integrate position fixing, current correction, and course/speed computation. Apply these techniques in coastal voyage planning and monitoring to maintain the intended track safely and efficiently.	
02	**Running Fix and Running Fix with Current**	**3**
	- Explain the principles of a running fix, including the use of successive bearings of a single object taken at known time intervals. -Plot a running fix accurately on a Mercator or coastal chart using two or more bearings of the same object and known ship's movement. -Determine the vessel's position (fix) by advancing or retiring the earlier line(s) of position (LOPs) according to the vessel's course and distance run. -Calculate the distance run between observations, using ship's speed and time interval to advance the earlier LOP. -Apply current correction to running fix plotting by constructing and analysing a current triangle to obtain set and drift. -Compute and plot a running fix with current, determining the Course Made Good (CMG) and Speed Made Good (SMG).	

	-Demonstrate the complete procedure for obtaining a running fix with and without current influence during practical chartwork exercises.	
03	**Dipping and Rising Bearings of Lights**	**6**
	- Explain the concept of dipping and rising bearings of lights as a means of determining a ship's position relative to a lighthouse or navigational light. -Define and use the term "geographical range" and "luminous range" and understand how they affect the visibility of lights at sea. -Calculate the distance at which a light will first appear to rise or finally dip, given the heights of the light and the observer's eye above sea level. -Apply the appropriate formulae to find the distance of visibility or range of a light using the Earth's curvature and dip correction. -Plot the rising and dipping bearings of a light on a coastal chart to obtain position lines. -Determine the ship's position by intersecting a rising or dipping bearing with another position line (e.g., a bearing of another object or a transit line). -Explain possible sources of error in observing rising and dipping bearings, including refraction, inaccurate height data, or visibility conditions. -Demonstrate practical understanding through chartwork exercises involving rising/dipping bearings combined with other navigational observations. -Relate the use of dipping and rising bearings to coastal navigation, particularly in fixing position when limited visual aids are available.	
04	**Position Fixing by Sextant and Visual Methods**	**4**
	- Explain the principles of visual and sextant-based position fixing used in coastal navigation. -Identify and describe various visual position lines — bearings, transits, horizontal angles, vertical sextant angles, and distance off by vertical angle.	

	-Determine a ship's position by plotting two or more visual position lines on a chart (e.g., bearings, transits, or sextant angles). -Find a position line by horizontal angle between two fixed objects and verify it graphically on a chart. -Find a position line by vertical sextant angle, given the height of an object above sea level, and calculate the corresponding distance off. -Combine visual bearings and sextant observations to establish an accurate fix and assess the reliability of the fix obtained. -Correct observed bearings for compass error and variation before plotting on the chart. -Demonstrate position fixing using visual and sextant methods in simulated and real navigation exercises.	
05	**Bow Angle Methods**	**3**
	-Explain the principle of bow angle methods, including "double the angle on the bow" and "selected bow angle" techniques, used for position fixing. -Determine the ship's position using observed bearings or bow angles of a fixed object at known time intervals. -Calculate distance off and estimated time to reach a fixed point by applying the bow angle formula and graphical methods. -Plot bow angle observations on a chart to obtain a running fix and verify its accuracy. -Assess limitations and sources of error in bow angle observations and apply appropriate corrections to improve accuracy.	
06	**Three-Point Bearings**	**4**
	- Explain the principle of the three-point bearing method and its use in coastal navigation for determining a vessel's position and course made good. -Record and plot three bearings accurately on a navigational chart to obtain a fix or check the vessel's position.	

	-Determine the ship's distance off and estimated time of passing abeam using measured angles between bearings. -Apply the three-point bearing formula to calculate course to steer, distance off, or the time interval between observed bearings.	
07	**Position Lines by Astronomical and Chart-Based Observations**	**7**
	-Explain the principle of position lines obtained from astronomical and terrestrial (chart-based) observations and their role in fixing the ship's position. -Identify different types of position lines, including those derived from celestial bodies, visual bearings, radar ranges, and horizontal or vertical sextant angles. -Use sextant observations (altitude of celestial bodies) to derive a line of position (LOP) and plot it accurately on a navigational chart. -Apply intercept methods (Marcq St. Hilaire method) to determine a position line from an observed celestial altitude.	
08	**Tidal Calculations**	**6**
	-Explain the causes and characteristics of tides, including tidal forces, tidal constituents, and the difference between spring and neap tides. -Define and interpret key tidal terms such as high water, low water, tidal range, mean sea level, mean high water springs (MHWS), and mean low water neaps (MLWN). -Use tide tables to extract tidal data for standard ports accurately, including the times and heights of high and low water. -Perform tidal height calculations at any given time using interpolation	

	methods between high and low water. Calculate tidal data for secondary ports using standard port data, applying time and height differences provided in tidal publications. -Demonstrate the use of Admiralty Tide Tables (ATT) and associated tidal curves and diagrams for both standard and secondary port predictions. -Determine under-keel clearance (UKC) and safe depth for navigation by considering predicted tide heights and charted depths.	
09	**Comprehensive Passage Planning and Execution**	**6**
	-Explain the concept and purpose of passage planning and its importance for safe and efficient navigation in compliance with IMO Resolution A.893(21). -Identify and describe the four stages of voyage planning — Appraisal, Planning, Execution, and Monitoring — and their interrelationship in safe navigation. -Collect and appraise relevant navigational information from sources such as charts, sailing directions, notices to mariners, weather forecasts, tide tables, and radio navigational warnings. -Prepare a detailed passage plan from berth to berth, incorporating waypoints, courses, distances, tidal streams, depths, hazards, traffic schemes, and port entry/exit procedures. -Select appropriate charts and publications (paper or electronic) and ensure all are corrected to the latest notices to mariners before planning and execution. -Apply tidal and current information to adjust courses and estimated times of arrival (ETA) at critical positions along the planned route.	

	-Set safety parameters such as under-keel clearance (UKC), safety depth, and cross-track error (XTE) limits within the plan to ensure vessel safety. -Integrate contingency measures into the passage plan, including alternate routes, abort points, and emergency anchorage positions. -Demonstrate the ability to use ECDIS and paper charts to plot, modify, and verify the route for accuracy and compliance with navigational and company requirements. -Monitor the vessel's progress along the planned route, evaluating deviations and applying corrections as necessary while maintaining situational awareness.	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Catalogue of British Admiralty Charts and other Hydrographic Publications
b.	British Admiralty Notices to Mariners
c.	BA Chart
d.	Deviation Table
e.	Symbols and Abbreviations used on Admiralty Paper Charts (NP 5011)
f.	Introduction to charts and their use- M.Chris & GR Hayes
g.	Seaman's guide to basic chart work
h.	Introduction to coastal navigation- a seaman's guide
i.	Chart Work for mariners- Capt S.K.Puri
j.	Marine Chart Work – D.A.Moore

Course Code:	Course Title:	Credits:
NAV 4163	Meteorology III	03

Course Learning Objective: Students to understand anti cyclones, pressure systems, ice and ice patrol, weather record, reporting system so that they can carry out navigational watch keeping duties on board by following meteorological predictions and features and apply the meteorological information for ship's routeing for safe navigation.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Anticyclones and Other Pressure Systems**	
1.1	Defines 'anticyclone'	**4**
	Draws a synoptic pattern of an anticyclone, for both northern and southern hemispheres, showing isobars and wind circulation	
	Identifies an anticyclone on a surface synoptic or prognostic chart	
	Describes the weather associated with anticyclones	
1.2	Describes a ridge of high pressure	**3**
	Draws a synoptic pattern for a ridge, showing isobars and wind directions	
	Describes a typical weather sequence during the passage of a ridge between depressions across the observer's position	
1.3	Describes a col or a void between a convergence of pressure systems	**3**
	Draws a synoptic pattern for a col or a void between a convergence of pressure systems, showing isobars and wind directions	
	Describes the weather associated with a col or a void between a convergence of pressure systems	
	Identifies ridges and cols or voids between the convergence of pressure systems on a surface synoptic or prognostic	
2	**Ice at Sea, Ice Patrol and Ocean Currents**	
2.1	Defines Sea ice, Icebergs, Glacier, Ice-shelf	**3**
	Describe classification of Icebergs	
	Describe Ice Patrol, Evaluate the accident of R.M.S. Titanic and its contribution	
2.2	Define Ocean current	**4**

	Describe causes of ocean currents- drift upwelling, gradient; warm and cold currents with example	
	Describe with figure explanation; general circulation of current in different sea regions	
2.3	Describes the services provided for shipping by Meteorological Offices	**3**
	Describes the appropriate weather bulletin and the contents of each of its sections	
	Describes the types of information received by facsimile machine	
	Describes the services provided for storm warnings	
3	**Recording and Reporting Weather Observations**	
3.1	Explains the need for meteorological codes	**3**
	Uses the Ship's Code and Decode Book to code a ship's full report	
	Uses the Ship's Code and Decode Book to decode a reduced report from a shore station	
3.2	Uses Beaufort letter abbreviations for present and past weather and total cloud amount	**3**
	Interprets a ship or shore station plot	
	Describe various types of weather reports (SYNOP Code, MAFOR Code, IAC)	
	Explain weather reporting system by bridge equipment (NAVTEX, INMARSAT, EGC, etc.)	
4	**Application of Meteorological Information**	
4.1	Understanding of reporting system, times of observation	**3**
	Understanding of meteorological services and warnings	
	Applies previous concepts to the interpretation of symbols and isobaric patterns on weather charts and facsimile charts	
4.2	Understanding of danger messages	**3**
	Describes information required in danger message according to SOLAS	
	Applies previous concepts to the interpretation of synoptic and prognostic charts to ascertain wind directions, areas of strong winds, cloud and precipitation areas, fog areas, ice, and areas of fine weather	
4.3	Explains how weather observations at a ship can be used to improve the	**3**

	forecast derived from synoptic and prognostic charts	
	Evaluates the weather forecast information received	
5	**Routeing of ships**	
5.1	Describes IMO references, definition, influencing factors (distance, ocean currents, winds and waves, ice, fog, temperature, etc.) for ships routeing	**3**
5.2	Define climatological routeing and weather routeing	**4**
	Describe weather routeings limitations and possibilities	
	Describe ship's performance curves; weather routeing by shipmaster, sample calculation	
	Knowledge and interpretation of weather related data from Routeing charts/Sailing directions/Ocean passages of the world and implement for Route planning and monitoring	
	Define shore based routeing	
	Describe advisability of weather routeing	
	Describe masters choice to deviate; choice of weather routeing from ship to shore	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Cornish, M., Ives. E. Reeds Maritime Meteorology (Reeds Professional). Revised edition. Adlard Coles, 2010 (ISBN-13: 978-1408112069)
b.	Subramanium, H. Marine Meteorology (Nutshell Series, Book 2). 5th edition (ASIN: B082XB2666)
c.	Meteorological Office. Marine Observer's Handbook, 11th ed. London, HMSO, 1995.(ISBN 0-11-400297-5)
d.	Meteorological Office. Meteorology for Mariners, 3rd ed. 8th impression

	(Met.0.895).London, HMSO, 1996. (ISBN 0-114-00367X)
e.	Atmosphere and Weather-Barry R.G. , Chorley R. J.
f.	Admiralty List of Radio Signals, Vol. 6 (NP283) and Diagrams relating to Weather Reporting and Forecast Areas (NP283(a)). Taunton, Hydrographer of the Navy

Course Code:	**Course Title:**	**Credits:**
CHS 4165	Advance Ship Knowledge	03

Course Learning Objective: The objective of this course is to understand the advance operations of all type of cargo Ships. Explain structural components and their purpose. Identify types of ships based on design and cargo requirements. Understand classification requirements and survey cycles. Apply corrosion control methods.

This course will provide fundamental different aspects all type of cargo operations. Students attending this course can build up cargo and shipboard operational skills, which they can utilize in their academic as well as professional life

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Ship Types & Classification**	**06**
	Types of ships • Tankers (Crude, Product, Chemical) • Bulk Carriers (Handymax, Panamax, Capesize) • Gas Carriers (LNG, LPG types) • Container Vessels (Feeder to Ultra Large) • Ro-Ro, PCC/PCTC vessels • Offshore vessels: AHTS, PSV, DSV • Specialized vessels (AHTS, DP vessels, dredgers, OSVs, cable layers) • Tonnage and measurements (GT, NT, DWT, TEU) Classification Societies • IACS, DNV, ClassNK, ABS, LR • Class rules & notations • Surveys (Annual, Intermediate, Special) • Statutory certificates (Load Line, Safety Construction, ISM, IOPP)	

2	**Ship construction & structural design**	**06**
	Structural Elements • Keel, frames, floors, beams, stringers, bulkheads • Double bottom, longitudinal framing, wing tanks, deck structures • Hull forms and structural components • Watertight bulkheads and subdivision • Structural reinforcements for tankers and bulkers • Watertight integrity & subdivision Materials & Corrosion • Mild steel, high tensile steel, composites • Corrosion mechanisms (pitting, galvanic, stress corrosion) • Corrosion types & prevention • Coatings, cathodic protection, sacrificial anodes	
3	**Ship Hydrodynamics & Resistance**	**03**
	Types of resistance (frictional, wave-making, eddy) Propulsion principles (propeller, thrusters, water jets) Cavitation and propeller design Fuel efficiency, EEDI, CII compliance	
4	**Ship Maintenance & Condition Monitoring**	**03**
	Planned Maintenance Systems (PMS) Predictive maintenance: vibration analysis, thermography Hull inspections, UTM surveys Machinery overhauls and troubleshooting	
5	**Dry-docking**	**06**
	Purpose and types of dry-docking	
	Docking plans	
	Types of blocks	
	Time period and budget for dry-docking	
	Safe dry-docking procedures	
	Lay period and list of repairs	
	Docking and undocking meetings	
	Vessel's stability	
	Incident, accident, risk assessment and emergency preparedness	
	Role of Classification society in dry-dock	
6	**Ship Building Technology**	**10**
	Type of ships: Commercial Vessel, Govt. Vessel, Research vessel -Their	

	functions and geometric property.	
	Ship design: GA, Lines plan, Stability, Longitudinal stability, Transverse Stability, Tank model test, speed, etc.	
	Detail Production Design: Shop drawings, nesting, modeling, part list, profile bending, material record, and Block division.	
	Fabrication of steel ships: Welding procedure, reading of production drawings, subassembly, assembly, block lifting, erection of blocks, outfitting etc.	
	Quality control: Inspection and test plan, NDT plan, tank test, dimension control etc.	
	Shipbuilding technology: Structural arrangement, Foundations of machineries, Definition of shipbuilding structural items and their construction; Structural strength, Load analysis, Material properties etc.	
	Installation of Ship machineries: Windlass, Capstan, Bollard, Anchor, Mast, gen set, Main Engine, Propeller, shaft, rudder, Steering gear, ventilation, motor, pumps, galley equipment, navigational equipment	
	Paint selection	
	Launching procedure	
	Sea Trial	
	Project management: Ship building project management.	
7	**Welding, riveting and precautions during work.**	**08**
	Basic knowledge of welding process.	
	Types of welding : Metal Arc welding, Tig welding,	
	Basic join types in shipbuilding (Butt, Fillet & Lap joint)	
	Preparations for welding.	
	Welding faults.	
	Precautions to be taken during welding.	
	Basic knowledge of riveting.	
	Inspection methods in shipbuilding	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Ship Construction notes - Kemp and Young
b.	Ship Construction for Engineers - Reid
c.	Ship Construction – Pursey
d.	Ship Construction – Eyres
e.	Ship Construction and Welding – Nisith R. Mandal

Course Code:	Course Title:	Credits:
NAV 4124	Ship handling and maneuvering sessional	1.5

Course Learning Objective:

1. Explain the basic principles of ship manoeuvrability
2. Assess and apply the effects of environmental forces
3. Plan and execute berthing and unberthing operations
4. Carry out emergency manoeuvres
5. Operate propulsion and steering systems effectively
6. Handle anchoring and anchorage procedures safely
7. Demonstrate ship handling in restricted waters
8. Use bridge equipment for effective manoeuvring
9. Evaluate the manoeuvring characteristics of their own vessel

Course Content:

S/N	Course Content (as Summary)	Hrs.
	The Effects of Various Deadweights, Draughts, Trim, Speed and Under-Keel Clearance on Turning Circles and Stopping Distances	**4**
	- outlines the provision and display of manoeuvring information	

	recommended in Assembly resolution A.601(15) - defines the terms: - advance - transfer - drift angle - tactical - diameter - track - reach - head - reach - side reach - compares the turning circles of a ship in the loaded and ballasted conditions - compares turning circles for differing speeds - explains the use of the Rate of Turn Indicator to assist turning of vessel - describes the accelerating turn - states that the size of the turning circle increases as the under-keel clearance reduces - describes how speed reduces during a turn under steady engine power - compares the stopping distances of a ship in the loaded and ballasted conditions - explains why a loaded ship carries her way longer than when in ballast - states that the stopping distance for a loaded ship may be up to three times the stopping distance when in ballast - states that in shallow water a ship will carry her way longer than in deep water - defines 'directional stability' - describes the steering behaviour of directionally stable and unstable ships	
	Effect of Wind and Current on Ship Handling	**2**
	- states that the effect of wind on a given ship depends upon: - the wind strength ■ the relative direction of the wind ■ the above-water area and profile ■ the draught and trim ■ the ship's fore-and-aft movement - describes the behaviour of a ship moving ahead with a wind from various directions - states that, as a ship is slowed, a speed is reached at which the wind	

	prevents maintaining course - describes the effect of wind when making large turns - describes the effect of wind on a ship making sternway - describes the effect of current on the motion of a ship - states that in rivers and narrow channels the current is usually stronger in the centre of a straight channel or at the outside of bends - describes how to make use of different current strengths when turning in a channel - describes how a current may be used to control lateral movement towards or away from a river berth - explains how to use an anchor to dredge down with a current - demonstr - ates the ability to manoeuvre the vessel in simple turning and anchoring manoueuvres in various conditions	
	Manoeuvres for the Rescue of a Person Overboard	**2**
	- distinguishes between "immediate action", "delayed action" and "person missing" situations - describes the single turn, Williamson turn and Scharnow turn manoeuvres - explains the situations in which each turn is appropriate - states that the standard manoeuvres are not guaranteed to return a ship into its wake because of the effects of particular ship characteristics and environmental conditions on the ship and the person in the water - lists the sequence of actions to take when a person is seen to fall overboard - lists the actions to take when a man-overboard report is received on the bridge	

	- demonstrates the ability to manoeuvre the vessel for the rescue of a person overboard	
	Squat, and Shallow-Water and Similar Effects	**3**
	states that shallow water as a depth of less than 2 x ship's draught states that shallow-water effects become more marked as depth decreases states that shallow-water effects as: -- increased directional stability -- a large increase in turning radius -- the ship carrying her way longer and responding slowly to changes in engine speed -- speed falling less during turns -- squat increasing -- trim changing, usually by the head for a full hull form states that 'squat' is defined as the reduction of under-keel clearance resulting from bodily sinkage and change of trim which occurs when a ship moves through the water states that squat is considerably reduced by a reduction of speed states that 'blockage factor' as the ratio of the cross-sectional area of the ship to the cross-sectional area of water in a channel states that squat and other shallow-water effects increase as the blockage factor increases states that excessive speed in shallow-water can ground a ship in water of sufficient depth to float it at slow speed states that approaching shoal patches or banks may give rise to an unexpected sheer states that reduced speed should be used in shallow water and narrow channels to reduce shallow-water effects and allow time to correct an unwanted sheer states that increased vibration may be experienced in shallow water	
	Proper Procedures for Anchoring and Mooring	**4**
	describes how anchors should be cleared away ready for use describes how the approach to an anchorage is made with regard to current and wind	

	states that anchors should be walked back clear of the hawse pipes when approaching the anchorage describes the use of anchor buoys describes the safety measures to be taken by the anchor party describes the method of letting go and the amount of cable to veer initially describes the marking of the cable and the reports to be made to the bridge explains how to determine when the ship is brought up states that the lights or shape for a vessel at anchor should be displayed as soon as the ship is brought up describes the procedures for anchoring in water too deep to let the anchor go on the brake describes the securing of anchors on the completion of anchoring describes the preparation for and procedure during heaving up	
	explains how to handle cable safely in a non-self-stowing locker explains how to secure anchors and seal spurling pipes for a sea passage lists the preparations to be made for berthing alongside describes the use of head ropes, stern ropes, breast ropes and springs describes the safety measures to be taken when handling mooring ropes and wires describes how to join two mooring ropes together describes typical mooring arrangements demonstrates how to put a stopper on a rope or wire rope demonstrates how to make a mooring rope or wire fast to bitts describes the use of self-tensioning winches states the importance of keeping mooring lines clear of the propeller and notifying the bridge when the propeller is not clear describes how to make fast tugs on towing hawsers or lashed up alongside describes the use of fenders during berthing and when secured in position describes methods of mooring to a buoy explains how to use a messenger to pass a wire or chain to a buoy explains how to set up and secure a ship wire describes the method of securing ropes and wires to a buoy describes the procedures for singling up and letting go from berths and	

	buoys explains how to slip a slip wire describes how to stow mooring ropes and wires for a sea passage explains how to rig and light the pilot ladder states what equipment should be at hand ready for use at the pilot ladder states that the rigging of the ladder and the embarkation and disembarkation of the pilot should be supervised by a responsible officer	
	The Effects of Various Deadweights, Draughts, Trim, Speed and Under-Keel Clearance on Turning Circles and Stopping Distances	**4**
	Effect of Wind and Current on Ship Handling	**2**
	Manoeuvres for the Rescue of a Person Overboard	**2**
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Wheel House Poster
b.	Ship Handling Theory and Practice – D J House
c.	Ship manoevring principles and Pilotage – Malcolm C. Armstrong
d.	Ship Handling for the Mariner – Daniel H. MacElrevey
e.	Marine Navigation (Vol 1 to IV) – Capt. A.W. Khan

Course Code:	Course Title:	Credits:
ECD 4126	ECDIS Sessional	1.5

Course Learning Objective: The primary objectives of this course are to:

1. **Familiarize cadets with the ECDIS learning environment**, including workstation layout, software interface, user manuals, and system boot-up and shut-down procedures.
2. **Introduce the concept, purpose, and value of ECDIS** in modern marine navigation, including integration with GPS, radar, AIS, ENC/SENC, and its role in route planning and real-time monitoring.
3. **Train cadets in the interpretation and use of electronic chart layers**, such as base, standard, and all-display settings, and demonstrate how to safely extract and apply chart information during navigation.
4. **Develop cadet understanding of safety settings and alarms**, including how to configure parameters like safety depth, safety contour, cross track error limits, and response to ECDIS-generated alerts.
5. **Enable cadets to create and modify route plans** using both graphical and tabular input methods, including waypoints, curved tracks, wheel-over points, safety checks, and alarm reviews.
6. **Introduce ECDIS integration with navigational targets**, including radar overlays, AIS target displays, ARPA tracking, and use of LOPs for position fixing on electronic charts.
7. **Provide instruction on chart management**, including procurement, installation, and manual, semi-automatic, and automatic chart corrections using digital sources and updates.
8. **Promote navigational safety awareness**, including system limitations, sensor dependency, and the need to avoid over-reliance on electronic systems through critical thinking and backup navigational practices.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Introduction & familiarization**	**1**
	Familiarization with ECDIS learning environment	
	Work station power-up and ECDIS software start and stop,	
	Use the projector to show how you will demonstrate ECDIS functions,	
	Explain how to get information from the ECDIS User Manuals,	
	Briefly tour classroom and lab used for ECDIS navigation training to see navigation and control equipment.	
2	**Purpose of ECDIS**	**2**
	ECDIS definition,	
	Explain the value of ECDIS to navigation:	
	Own ship position with respect to route, shipping lanes, acquired targets, depth contours, soundings, and predicted tides and currents,	
	Electronic navigational chart (ENC) and system ENC (SENC),	
	Standard display and display base	
	Display of information other than ENC data	
	Electronic chart area, Information area, Task panels, other menu options,	
	Automatic presentation, such as scale, display category, day/night, etc.,	
	Modes, such as true motion and North-up.	
	over-reliance on electronic systems	
3	**Work station start, stop & layout**	**1**
	The trainee analyzes and assesses the proper functioning of ECDIS during the booting-up process and normal operation.	
4	**Vessel position**	**5**
	Sensors: Explain the performance limits of devices for position, course over ground, heading, speed, depth, radar, and AIS.	
	Chart information: Select the task panel and apply the functions suitable for position monitoring, route monitoring, route creation and editing, trial maneuver, creating and accessing user-defined layers	
	Obtain information on charted objects	
	Demonstrate how the presentation of navigation marks is changed according to Own Ship position	

	Demonstrate errors of interpretation by the incorrect selection of display categories	
	Chart scaling	
	Information layers (Base, Standard and Standard and all)	
	System & position alarms	
5	**Safety Settings and Alarms**	**5**
	setting of the own ship's safety data	
	Describe route monitoring alarms	
	Identify depth-related information	
	Set the safety values for route monitoring (Look ahead, Cross tracks)	
	Set the limits pertaining to safe water (Safety contour, Safety Depth, Shallow contour, Deep Contour)	
	Identify and respond to alarms for primary and secondary positioning systems	
	Identify and respond to chart related alarms	
	Identify and respond to ECDIS alarms from autopilot in Track Control	
6	**ECDIS Route Planning (by table and by Chart)**	**5**
	Construct a route plan by inputting waypoint data alphanumerically into a route-planning table	
	Adjust the route plan by editing, adding and deleting waypoints inside the table	
	Construct a route by inputting waypoints directly on the ECDIS display	
	Adjust the route by graphically editing waypoints	
	Obtain track courses and distances from the chart	
	predicting the ship's position for some time interval	
	Approve an existing route for planning, safety review and monitoring	
	Retrieve a stored route plan	
	Modify the setting of XTE in a previously saved rout	
	Assess a route plan based on a safety check	
7	**ECDIS Targets, Charts & System**	**4**
	ARPA tracked target overlay	
	Describe what the connection of an Automatic Identification System (AIS)	

	to ECDIS enables	
	Radar overlay (RIB) functions	
	reading all chart symbols and abbreviations	
	Use LOP to fix position on Electronic Chart	
8	**Procuring & installing chart data and Chart Correction**	**3**
	Review chart data structure, terminology, and installation procedures.	
	performing semi-automatic updating of electronic charts, using the data obtained on electronic media in the electronic chart format;	
	performing automatic updating of electronic charts, using update files obtained via electronic data communication lines.	
	Total	**32**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	ECDIS User Manual
b.	NP133C - Admiralty ENC and ECDIS Maintenance Record
c.	NP5012-Guide to ENC Symbols used in ECDIS
d.	NP232 -Admiralty Guide to ECDIS Implementation, Policy and Procedures
e.	IMO Model Course 1.27 - Operational Use of ECDIS
f.	The Electronic Chart - Fundamentals, Functions Data and Other Essentials- published by STC Publishing
g.	ECDIS Passage Planning and Watch keeping- Published by Witherby- I S B N 9781917408559

Course Code:	Course Title:	Credits:
CAP 4228	Thesis / 2 Elective Courses	06

Course Learning Objective: By the end of this course, students will be able to:

1. Identify a research problem through critical review of literature and establish clear objectives.
2. Design and implement appropriate research methodology with due consideration of ethics.
3. Collect and analyze data using suitable quantitative and/or qualitative techniques.
4. Develop academic writing skills to produce a well-structured, original thesis.
5. Effectively present and defend research findings through oral and written communication.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	Orientation & Supervisor Allocation, Topic Selection	
2	Literature Review and Problem Identification	
3	Formulation of Research Objectives, Questions, and Hypotheses	
4	Preparation of Research Proposal and Proposal Defense	
5	Research Design & Methodology (sampling, instruments, ethics)	
6	Data Collection (field work, FGD, surveys, structured/semi-structured interviews)	
7	Data Analysis (Quantitative: SPSS/Excel, Qualitative: Thematic analysis)	
8	Drafting of Thesis (Intro, Methodology, Results, Discussion)	
9	Final Thesis Writing, Referencing, Plagiarism Check	
10	Submission and Viva Voce (Defense)	
	Total	**42**

Note

a. The thesis proposal and title must be submitted within the first 3 months of the 7th semester and require approval from the Bangladesh Maritime University (BMU).
b. The final thesis must be submitted before the commencement of the 8th semester final examination.
c. The thesis defense will be conducted after the 8th semester final examination.

d. Students with a consolidated GPA of 3.5 and above up to the 4th semester are eligible and must conduct the thesis.
e. Students with a consolidated GPA below 3.5 may apply for the thesis option, subject to approval based on the submission of a satisfactory research proposal and title.
f. Students who opt for the non-thesis degree must complete an additional 2 courses (total 6 credits).

Assessment & Evaluation		
	a. Assessment Strategy	Thesis Report Evaluation, Presentation, Viva-voce
	b. Marks Distribution:	Thesis Report: 60 Marks
		Presentation: 30 Marks
		Viva-voce: 10 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Research Design: Qualitative, Quantitative, and Mixed Methods Approaches — John W. Creswell & J. David Creswell
b.	Qualitative Inquiry & Research Design: Choosing Among Five Approaches — John W. Creswell & Cheryl N. Poth
c.	The Craft of Research — Wayne C. Booth, Gregory G. Colomb & Joseph M. Williams
d.	Designing Social Inquiry: Scientific Inference in Qualitative Research — Gary King, Robert Keohane & Sidney Verba
e.	Research Methodology and Scientific Writing — C. George Thomas (International Edition)

Course Code:	Course Title:	Credits:
GED 4267	Ocean Science	03

Course Learning Objective: The primary objectives of this course are to:

1. **Introduce fundamental concepts** of oceanography, including geological, physical, chemical, and biological aspects of the ocean environment.
2. **Explore the origin, structure, and dynamic processes** of the Earth and its oceans, including tectonics, sea-floor spreading, and coastal landforms.
3. **Examine the ecological and environmental divisions** of the marine environment and understand biodiversity patterns, adaptations, and the food web.
4. **Analyze physical and biological interactions** within the oceans, such as currents, tides, waves, and primary productivity.
5. **Understand the Bay of Bengal ecosystem**, including its estuaries, fisheries potential, aquaculture trends, and socio-economic importance.
6. **Promote sustainable ocean use** through governance frameworks, pollution control, and integrated management practices like Marine Spatial Planning.
7. **Enable critical thinking** on the role of oceans in global environmental systems and human interaction with the marine environment, emphasizing sustainability and blue economy concepts.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Fundamental of Ocean Sciences**	**5**
	Brief history of marine Geology and geological time scale	
	Origin of the Earth and Ocean: The age of the Earth and the geological time,	
	scale; structure of the Earth's interior and its composition; features of the Ocean;	
	Continental drift and sea floor spreading; Plate tectonics-the types of plate	
	boundaries-rifting and subduction zones; the trenches.	
	The sea floor and continental margins: the ocean basins- origin and morphology	
	Coastal Landform: Cliff, Sand dunes. Shores, Beaches, Tidal flat, Mud flat, lagoons.	

2	**Divisions of the marine environment**	**7**
	General concepts, the open water, coastal water, the floor of the sea	
	Coastal habits: beaches, dunes & shingle, Islands, coral reef, salt marshes, sea grass and seaweeds.	
	Major ecological divisions of marine habit	
	Factors controlling the adaptation and distribution of marine organisms	
	Food chain, food webs and ecological balance in marine environment	
	general conditions, distribution of life in the oceans, Man-Ocean relation.	
	Basic marine life styles, ocean acidification, marine climatic Zone, EL-Nino, La-Nina	
3	**Oceanic Circulation and Current Systems**	**4**
	Ocean Currents: Causes, types, mean current in Atlantic, Pacific and Indian Ocean.	
	Ocean Tide: Causes and effects. Global distribution, Implication.	
	Waves: causes, characteristics of wave actions, wave energy.	
4	**Concepts of Biodiversity**	**4**
	Definition, types, patterns, factors causing loss of biodiversity	
	Mangroves, Marsh Plants, Seagrasses	
	Ecosystem: concept of ecosystem, types, components of ecosystem,	
	Structure and function of an ecosystem, Major ecosystems, Patterns of the marine environment.	
5	**Fisheries Oceanography**	**6**
	The ocean as a biological environment: Zonation of the marine environment;	
	primary productivity, determination of primary production,	
	factors influencing phytoplankton production, primary productivity and fisheries production.	
	Major marine ecological groups: phytoplankton, zooplankton, benthos, nekton and macrophytes; their characteristics, biology and distributions;	
	Large marine ecosystems: definition and classification, productivity, and Important for sustainable fisheries	
6	**Physical Oceanography of the Bay of Bengal and Fisheris**	**8**
	Continental shelf: Bottom topography, bathymetric changes, sediment	

	dispersal.	
	major fisheries, fishing grounds and fishing in the Bay of Bengal.	
	Present status of brakish water aquaculture of Bangladesh and globe, Scope, trends and potential of coastal aquaculture in Bangladesh,	
	Social and economic importance of coastal aquaculture in Bangladesh.	
	Importance of sustainable fishing industry for the contribution of Blue Economy of Bangladesh	
7	**Sustainable Ocean Governance**	**8**
	Principles and Concepts of Sustainable Ocean Governance,	
	Integrated Coastal Zone Management,	
	Ecosystem Based Management and Zoning,	
	Precautionary and Polluter Pays Principles	
	Marine Spatial Planning (MSP) System as a tool for Sustainable Ocean Governance	
	Control of Marine Pollution:	
	Land Based Sources of Marine Pollution,	
	Vessel Based Sources of Marine Pollution,	
	Dumping and Other Sources of Marine Pollution	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Marine Ecology, by RV. Tait
b.	Fundamental of Ecology, by EP Odum
c.	An Introduction to Marine Science, by PS Meadows and JI Campbell
d.	The Ocean, by HU. Sverdrup and *etal*.k

e.	Sea Life, A complete Guide to the Marine Environment, By G. Waller.
f.	Seibold, E, & Berger, W. H: The sea Floor, An Introduction to Marine Geology (3rdEd).Erickson &Timbthy (2002); Marine Geology
g.	The Ocean Basins: Their Structure and Evolution (second edition), Open University,ISBN 0750639840
h.	The Sea Floor ---- An Introduction to Marine Geology (third edition), E. Seibold and W.ll. Berger. ISBN 3540601910.
i.	The Oceans, by HU Svedrup, MW Johnson and RH Flemming. Prentice-Hall, 1942.
j.	Marine Geology, P. H. Kuenen.
k.	Fisheries Biology, Assessment and Management, M. King
l.	Bangladesh Fisheries, M. Shafi.
m.	Primary productivity in aquatic environment, edited by CR Goldman, 1974
n.	Environmental Water Pollution and Control. Anmol Pub. New Delhi
o.	Water Pollution, by AK Tripallhi, Astish Pub. New Delhi. 1990.
p.	Integrated management of coastal zone, by John R. Clark. FAO, 1992
q.	Biodiversity: An introduction, by K.J. Gaston and J.I. Spicer. Blackwell Science, UK, 1998.

Course Code:	**Course Title:**	**Credits:**
GED 4269	Maritime History and Bangladesh Studies	03

Course Learning Objective: The objective of this course is to introduce the students with the key concepts like socio-economic, geo-political, institutional, social organizational, context of origin, maritime history and development of Bangladesh. Socio-political and geo-strategic importance of Bay of Bengal will also be introduced here.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Introduction to Bangladesh Studies**	
	Scope & Subject matter of Bangladesh studies	**1**
	Topography of Bangladesh	**1**
	Drainage system of Bangladesh and its contribution to trade	**1**

	Natural resources of Bangladesh	**1**
	Demographics and ethnic composition	**1**
2	**Historical Evolution of Bangladesh**	
	Ancient Bengal: Maurya, Gupta, and Pala periods	**0.5**
	Medieval period: The Sultanate and Mughal Bengal	**0.5**
	British Colonial Rule: Economic exploitation, Indigo revolt	**1**
	Partition of Bengal (1905, 1947)	**1**
3	**Struggle for Independence**	
	Language Movement (1948–1952)	**1**
	Rise of Bengali nationalism; 6-Point Movement	**1**
	1960 Elections: Results & Consequences	**1**
	Socio-political and economic background of Liberation War of 1971 - Key events like operation searchlight, operation jackpot, crack platoon and outcomes	**1**
4	**Constitution, administrative and judicial system of Bangladesh**	
	Features of Bangladesh Constitution, amendments & fundamental rights	**1**
	Forms of government, Functions of parliament, prime minister and president	**1**
	Administrative system: Local & Urban and Bureaucracy as a system of administration	**1**
	Judicial system of Bangladesh	**1**
5	**Civic Rights & Responsibilities**	
	Fundamental Rights of Bangladeshi Citizens	**1**
	Seafarers' right & responsibilities under Marchant Shipping Ordinance, 1983, MLC 2006, Civic rights vs responsibilities	**1**
6	**Economy of Bangladesh**	
	GDP growth and sectoral contribution, poverty, unemployment, inflation	**1**
	Agricultural Development and the contribution of agricultural sector to the national economy and society of Bangladesh;	**1**
	An overview of agricultural policies of Bangladesh	**1**
	The Process of Industrialization in Bangladesh, the evolution of industrial growth in Bangladesh	**1**
	Sector wise development of industries; the role of private and public	**1**

	partnership in industrial development	
	An overview of industrial policies of Bangladesh	**1**
	An overview of service sector of Bangladesh: contribution to GDP, opportunities and challenges	**1**
7	**Bangladesh in International Trade**	
	Historical evolution of Bangladesh's Trade, - Major export sectors and import compositions with trends	**1**
	Remittances, Seafarers' contribution to economy: Direct & Indirect - Balance of trade & Balance of payments	**1**
8	**Culture, Tradition and Heritage of Bangladesh**	
	The contribution of Private Sector in the economy of Bangladesh, The opportunities and Challenges of private sector development	**1**
	The role of Foreign Investors and Development Partners in Private Sector Development	**1**
9	**Rural Development**	
	The notion and evolution of Rural development; BARD as a Model of Rural Development	**1**
	Challenges and Constraints of Rural Development; The Role of NGOs, Go and Development Partners in Rural Development	**1**
10	**Maritime History of Bangladesh**	
	History of Chattogram Port from 7th century to present. Mongla, Payra ports and deep-sea ports	**1**
	Evolution of port administration, structural changes and development	**1**
	Port Infrastructure Index and Bangladeshi ports, Opportunities and challenges	**1**
11	**Maritime Administration**	
	Overview of Maritime Administration of Bangladesh, Maritime Human Resource Development: Officers & Ratings, Role of DoS & MoS, IMO Guidelines	**1**
12	**Maritime Sectors of Bangladesh**	
	Ship Recycling of Bangladesh: Opportunities & challenges, Hongkong Convention, 2009 and green industry certification	**1**
	Ship Building of Bangladesh: Opportunities & challenges	**1**

13	**Maritime Sovereignty, Blue Economy and Maritime security of Bangladesh**	
	Maritime zones: Territorial Sea, EEZ, and Continental Shelf, UNCLOS and Bangladesh's maritime boundary settlement	**1**
	Bay of Bengal: Geo-strategic importance and regional economic & security dynamics	**1**
	Concept and scope of the Blue Economy, Fisheries, oil & gas	**1**
	Maritime piracy and naval security, Role of Bangladesh Navy and Coast Guard	**1**
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Bangladesh Maritime History – Ghulam M. Suhrawardi
b.	Bangladesh Studies- Md. Hasebur Rahman, Assistant Professor, Department of Business Administration, Pabna University of Science & Technology
c.	Bangladesh Studies (second edition), Author (Not found), Brothers Publication
d.	A History of Bangladesh, Willem Van Schendel, Professor, University of Amsterdam
e.	Bangladesh economic reviews, Finance division, Ministry of Finance
f.	The constitution of Bangladesh
g.	Bangladesh Economic Survey and regular updates by Bangladesh Bank, Ministry of Finance, Bangladesh Bureau of Statistics, World Bank, Asian Development Bank, IMF, WTO etc.
	Web site of Ministry of Shipping: www.mos.gov.bd; Department of Shipping:

Course Code:	Course Title:	Credits:
GED 4271	Marine Engineering and Control System	03

Course Learning Objective: The course will enable the student to understand the principles and operation of diesel engine and various machineries of the engine room and on deck including the electrical installation on board the ship.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Engine Structure**	
	General Knowledge of Bedplate, A-frame, Entablature	
2	**Ship's Engine**	
	Difference between 2-stroke Engine and 4-stroke Engine, cycle diagram of 2-stroke & 4-stroke Engine.	
3	**General Knowledge about major components of Main Engine & Auxiliary Engine (Diesel Generator)**	
	And their functions like cylinder head, Piston, Liner, Jacket, Exhaust Valve, Fuel injector, Indicator cock and Air starting valve.	
4	**Auxiliary Boiler**	
	Function of Aux-boiler	
	Difference between Fire tube & Water tube boiler	
	Composite boiler working principle	
	Necessity of Boiler water treatment	
	purpose of Incinerator on board ship	
5	**Pump**	
	Definition of pump	
	types of pumps	
	working principle of centrifugal pump	
6	**Steering Gear**	
	Types of steering gear unit	
	difference between Ram type & Rotary vane type steering unit	
	Regulation related to steering unit as per SOLAS	

7	**Fresh Water Generator**	
	Use of FWG and working principle of Freshwater Generator	
	Necessity of chemical dosing in fresh water on board ship	
8	**Refrigeration & Air conditioning unit**	
	Major components	
	refrigerants	
	working principle of Refrigeration unit	
9	**Safety & Critical Items**	
	General discussion on Oily Water Separator (OWS)	
	Oil Mist Detector (OMD) unit	
	Emergency Bilge injection valve	
	Emergency Fire pump	
10	**Electricity & Electrical Equipments**	
	Difference between AC & DC	
	Earth Fault	
	Bus bar	
	Switch board safety	
	Motor function	
	Diesel Generator function & related safety items	
11	**Control System**	
	Close loop control system	
	Open loop control system	
	Advantages & disadvantages of both systems	
	Main Engine Jacket cooling water temperature control system	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	*Marine Control Technology* — Elstan A. Fernandez (7th Edition)
b.	*Applied Marine Control and Automation* — Jagabandhu Majumder, Elstan A. Fernandez & Mahesh Patil
c.	*Instrumentation and Control Made Easy (Vol. 8: Marine)* — Elstan A. Fernandez, Lakshman S. Yadav
d.	*Instrumentation and Control Made Easy (Vol. 4: Marine Process Control)* — Jagabandhu Majumder & Elstan A. Fernandez
e.	*Automation, Control Engineering & Safety Devices – A Maritime Guide* — Elstan A. Fernandez
f.	*Control of Ships and Underwater Vehicles: Design for Underactuated and Nonlinear Marine Systems* — Khac Duc Do & Jie Pan
g.	*Dynamics and Control of Mechanical Systems in Offshore Engineering* — Wei He, Shuzhi Sam Ge & Bernard Voon Ee How
h.	*Dynamics and Control of Mechanical Systems in Offshore Engineering* — Wei He, Shuzhi Sam Ge & Bernard Voon Ee How
i.	*Marine Control Engineering and Automation* — Walnes Rego

Course Code:	**Course Title:**	**Credits:**
OPM 4273	Ship operations and management	03

Course Learning Objective: By the end of this course, students will be able to:

a. Understand the principles and practices of ship operations, including crew, technical, commercial, and operational management.
b. Plan and manage voyages effectively, incorporating cargo operations, fuel strategies, and cost-performance optimization.
c. Implement safety, security, and environmental management systems in compliance with international regulations.
d. Apply leadership, human resource, and team management skills for efficient shipboard operations.
e. Analyze and adopt emerging trends and best practices in digitalization, automation, and smart shipping.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	Introduction to Ship Operations & Management: Shipping industry overview, types of ships	**3**
2	Shipboard Organization: Master, officers, crew hierarchy, ISM Code framework	**3**
3	Crew Management: Recruitment, training, certification, welfare, multicultural issues	**3**
4	Technical Management: Ship maintenance, repair, dry-docking, PMS (Planned Maintenance System)	**3**
5	Commercial Management: Chartering, voyage & time charter, laytime/demurrage, insurance & claims	**4**
6	Operational Management: Voyage planning, cargo handling, bunkering, fuel strategies & optimization, cost & performance monitoring	**4**
7	Safety & Security Management: ISM & ISPS Code, risk assessment, emergency response	**4**
8	Port & Terminal Operations: Berthing, pilotage, port formalities, turnaround time	**3**
9	Environmental Management: MARPOL compliance, ballast water, scrubbers, emissions	**3**
10	Human Resource & Leadership Aspects: Motivation, teamwork, conflict resolution onboard	**3**
11	Digitalization in Ship Management: Smart shipping, automation, data-driven operations	**3**
12	Case Studies & Industry Best Practices in Ship Operations and Management	**3**
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Alderton, P. M. Reeds Sea Transport: Operation and Economics. 9th Edition, Adlard Coles Nautical, 2020.
b.	Stopford, M. Maritime Economics. 4th Edition, Routledge, 2009.
c.	Branch, A. E., & Robarts, M. Elements of Shipping: Ships, Operations and Management. 6th Edition, Routledge, 2014.
d.	Talley, W. K. Maritime Transportation: Safety Management and Risk Analysis. CRC Press, 2013
e.	Cheng, V. & Notteboom, T. Port Management and Operations. Routledge, 2019.
f.	Harland, D., et al. Ship Management and Operation: Theory and Practice. Springer, 2016.
g.	IMO Publications – ISM Code Guidelines, ISPS Code, MARPOL Annexes, Ballast Water Management Convention.
	Stopford, M. & Pallis, A. Maritime Logistics: A Guide to Contemporary Shipping and Port Management. Kogan Page, 2018.

Course Code:	Course Title:	Credits:
OPM 4275	Port operations and management	03

Course Learning Objective: By the end of this course, students will be able to:

1. Understand the structure, functions, and governance of ports and terminals.
2. Plan and manage port operations effectively, including cargo handling, berthing, and terminal logistics.
3. Apply safety, security, and environmental management practices in port operations.
4. Analyze port productivity, performance indicators, and commercial management strategies.
5. Evaluate and adopt modern technologies, digitalization, and best practices for efficient port management.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	Introduction to Port Operations & Management: Overview of ports, types, functions, role in supply chain	3
2	Port Organization & Governance: Port authorities, stakeholders, legal and regulatory framework	3
3	Port Planning & Infrastructure: Layout, equipment, berthing, storage facilities	3
4	Terminal Operations: Container, bulk, liquid, RO-RO terminals; cargo handling and stowage	4
5	Cargo Management & Documentation: Bills of lading, manifests, customs clearance	3
6	Port Safety & Security Management: ISPS Code, emergency preparedness, risk assessment	4
7	Environmental Management in Ports: MARPOL compliance, ballast water, pollution control, green ports	3
8	Port Productivity & Performance: Key performance indicators, turnaround time, berth planning	3
9	Port Operations & Logistics: Intermodal transport, hinterland connectivity, supply chain integration	3

10	Port Commercial Management: Tariff policies, port charges, revenue management	3
11	Digitalization & Automation in Ports: Smart ports, terminal operating systems (TOS), IoT applications	3
12	Case Studies & Best Practices: Efficient port operations, benchmarking, innovative solutions	3
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Alderton, P. M. *Reeds Port Operations and Management*. 8th Edition, Adlard Coles Nautical, 2019.
b.	Notteboom, T., & Rodrigue, J-P. *Port Economics, Management and Policy*. Routledge, 2020.
c.	Talley, W. K. *Port Management and Operations*. CRC Press, 2013.
d.	Stopford, M., & Pallis, A. *Maritime Logistics: A Guide to Contemporary Shipping and Port Management*. Kogan Page, 2018.
e.	Branch, A. E., & Robarts, M. *Elements of Shipping: Ships, Operations and Management*. Routledge, 2014.
f.	IMO Publications – *ISM Code Guidelines*, *ISPS Code*, *MARPOL Annexes*, *Ballast Water Management Convention*.
g.	Cheng, V. *Port Management and Operations: Principles and Practices*. Routledge, 2019.
	Heaver, T. D., Meersman, H., & Van de Voorde, E. *Port Management and Policy: Recent Trends in Port Development*. Routledge, 2017.

Course Code:	Course Title:	Credits:
OPM 4277	Ship chartering and brokering	03

Course Learning Objective: By the end of this course, students will be able to:

1. Understand the principles and practices of ship chartering and the role of shipbrokers in the shipping market.
2. Analyze and apply different types of charter parties, laytime, demurrage, and contractual clauses.
3. Perform voyage estimation and calculation, including fuel, port charges, and revenue optimization.
4. Apply commercial management strategies to optimize voyage performance and fuel usage.
5. Utilize digital tools, market intelligence, and case studies to support decision-making in ship chartering and brokering.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	Introduction to Ship Chartering: Overview of chartering, role in shipping, types of charters	**3**
2	Types of Charter Parties: Voyage charter, time charter, bareboat charter, contract clauses	**4**
3	Shipbroking: Role, functions, shipbrokers' duties, market intermediaries	**3**
4	Freight Market and Chartering Economics: Freight rates, supply & demand, voyage calculation	**4**
5	Laytime and Demurrage: Calculation, exceptions, charter party clauses	**3**
6	Bills of Lading & Documentation: Charter party documents, bills of lading, cargo documentation	**3**
7	Negotiation & Fixture Process: Steps, communication, terms, confirmation	**3**
8	Contractual Aspects: Legal framework, standard charter forms (GENCON, NYPE, Baltime, etc.)	**4**
9	Voyage Estimation & Calculation: Voyage costs, fuel consumption, port charges, revenue estimation	**3**
10	Commercial Management in Chartering: Voyage optimization, bunker strategies, fuel management	**3**

11	Digitalization & Market Analysis: Shipping indices, digital platforms, market intelligence	**3**
12	Case Studies & Industry Best Practices in Chartering and Brokering	**3**
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Cheng, V. Shipbroking and Chartering Practice. Routledge, 2018.
b.	Plomaritou, E., & Papadopoulos, A., Shipbroking and Chartering Practice (8th Edition), Routledge – Informa Law, 2018
c.	Clarksons Research Services – Shipping Market Reports, Chartering Indices, and Fixtures Analysis.
d.	BIMCO Publications – Standard Charter Forms, Voyage Estimation Guidelines, Bunker Adjustment Factor (BAF).

Course Code:	**Course Title:**	**Credits:**
OPM 4279	Maritime insurance and risk management	03

Course Learning Objective: By the end of this course, students will be able to:

1. Understand the principles, types, and functions of maritime insurance in shipping operations.
2. Analyze Hull & Machinery (H&M), Protection & Indemnity (P&I), and cargo insurance policies, coverage, and claims.
3. Apply risk management techniques to identify, assess, and mitigate maritime risks.
4. Evaluate legal and contractual frameworks governing maritime insurance and dispute resolution.

5. Utilize digital tools, case studies, and practical scenarios to manage insurance and risk effectively.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	Introduction to Maritime Insurance: Principles, history, types of insurance in shipping	**3**
2	Hull & Machinery (H&M) Insurance: Coverage, policies, terms, valuation, premiums	**4**
3	Protection & Indemnity (P&I) Clubs: Structure, liabilities, membership, claims	**4**
4	Cargo Insurance: Types, coverage, Institute Cargo Clauses, risk mitigation	**4**
5	Charterer's Liability and Freight Insurance: Coverage, risks, exceptions	**3**
6	Marine Risk Management: Identification, assessment, mitigation strategies	**4**
7	Voyage & Hull Risk Assessment: Voyage estimation, weather, piracy, operational hazards	**3**
8	Claims Handling & Settlement: Procedures, documentation, dispute resolution	**3**
9	Legal Framework: Marine insurance law, conventions, contracts, role of brokers	**3**
10	Case Studies & Practical Applications: Risk scenarios, claims analysis, insurance strategy	**3**
11	Digitalization in Maritime Insurance: Insurtech, databases, risk modeling software	**3**
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Adams, S. & Bucknall, J. Marine Insurance: Law and Practice. 3rd Edition, Informa Law, 2018.
b.	Merkin, R. Marine Insurance: Principles and Practice. 2nd Edition, Routledge, 2016.
c.	Fenton, J. Maritime Insurance and Risk Management. LLP Professional Publishing, 2015.
d.	Clarke, M. Lloyd's Maritime and Commercial Law Quarterly – Selected Articles on Marine Insurance. Lloyd's, annual issues.
e.	BIMCO Publications – Standard Clauses and Guidelines for H&M, P&I, Cargo, and Charterer's Liability.

Course Code:	**Course Title:**	**Credits:**
OPM 4281	Maritime Economics	03

Course Learning Objective: This course introduces students to the economic principles, theories, and applications in the maritime sector. The students will explore shipping economics, port management, international trade, policy frameworks, environmental impacts, and emerging trends like digitalization and sustainability.

By the end of the course, students will be able to:

a. Understand and apply economic concepts to the maritime transport industry.
b. Analyze global shipping markets, including freight rates, demand, and supply.
c. Assess the role of ports and maritime infrastructure in global trade.
d. Examine the impact of trade policies, environmental regulations, and technological innovations on shipping.
e. Understand the economic, social, and environmental sustainability challenges facing maritime transport.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Introduction to Economics**	
	Definition of Economics: Scarcity and choice, Microeconomics vs. Macroeconomics, Importance of studying economics, Scope of economics	**1**
	Demand and Supply: Law of demand, Law of supply, Market equilibrium	**1**
	Market Structures: Perfect Competition, Monopoly, Oligopoly, and Monopolistic Competition	**1**
	Production & Costs: Factors of production: Land, labor, capital, entrepreneurship, Short-run and long-run costs, Economies of scale and scope	**1**
2	**Introduction to Maritime Economics**	
	Overview of Maritime Economics, Definition and scope of maritime economics, Importance of shipping in the global economy, Factors of production	**1**
3	**Demand for sea transport & the supply of shipping services**	
	Definition, Determinants of demand for sea transports	**1**
	Distance and the concept of Tonne-miles, Elasticity of demand	**1**
	Definition, Determinants of supply of sea transports	**1**
	The concept of elasticity of supply	**1**
4	**Shipping Cost analysis and economies of scale**	
	An outline of basic cost concepts, The behavior of total costs and output in the short run, The concept of marginal, or incremental cost	**1**
	The conventional analysis of vessel operating costs: Capital Cost, Direct Operating Cost and Voyage Cost, Cost of running ships	**1**
	Long-run vessel costs: economies of scale and optimal ship size	**1**
	Freight Rates and Cost Structures: Components of freight rates: operating costs, capital costs, fixed vs. variable costs, factors influencing freight rates: fuel prices, distance, port charges, vessel types, how freight rates fluctuate in response to market conditions	**1**
5	**The Shipping Market**	
	Overview of the four shipping markets and how they interact, Key players: Shipowners, operators, brokers, financiers, shipyards	**1**

	Freight Market, Sale & Purchase Market, Demolition Market & New Building Market: Definition, Characteristics & their Interdependence	**1**
6	**Competitive shipping markets of Tankers**	
	Definition of the tankers, Market Characteristics	**1**
	Seaborne trade in crude oil and oil products: Distinction between crude oil & oil products, Determining the equilibrium freight rate	**1**
7	**The Liner Trades**	
	Definition of a liner shipping service, The principles of liner service economics	**1**
	Ship types serving in the liner trades, Pricing of liner services	**1**
8	**Ports, sea canals and waterways**	
	Definition of ports and harbors, the function of ports, port costs and ships' time, Ship cost & port cost: Total cost,	**1**
	Sea canals, inland waterways and land bridges costs	**1**
9	**Shipping and international trade**	
	Introduction, The growth and pattern of world trade, Trade and economic growth	**1**
	Economic models of trade flows: Absolute advantage, comparative advantage	**1**
	The product life cycle theory, Heckscher-Ohlin model, Leontief Paradox	**1**
	Free trade vs protectionism, methods of protection	**1**
10	**The balance of payments and exchange rates**	
	Introduction, definition of balance of payments, The structure of the balance of payments	**1**
	Exchange rates and the balance of payments	**1**
	Dealing with a balance of payments deficit: fixed exchange rates	**1**
	Dealing with a balance of payments deficit: floating exchange rates	**1**
	Exchange rates and shipping	**1**
11	**Financing ships and shipping companies**	**11**
	Ship finance and shipping economics, How ships have been financed in the past, The world financial system and types of finance	
	Financing ships with equity, Financing ships with debt, Finance for new	

	buildings, Leasing ships.	
12	**The economics of shipbuilding and scrapping**	**12**
	Role of the merchant shipbuilding and scrapping industries, Regional structure of world shipbuilding, Shipbuilding market cycles	
	The economic principles of the shipbuilding production process, shipbuilding costs and competitiveness	
	The ship breaking industry, Hongkong Convention & Green shipping	
13	**Maritime Regulation and Policy**	
	International Maritime Law: Key conventions: SOLAS, MARPOL, UNCLOS, and the role of the International Maritime Organization (IMO),	**1**
	The regulatory framework for maritime transport: Safety, environmental protection, and pollution control, Flag state, port state, and coastal state responsibilities	**1**
14	**Risk Management in Shipping**	
	Identifying and mitigating financial, operational, and market risks	**1**
	Hedging in the shipping industry: Risk management tools and derivatives	**1**
	Crisis management and strategic planning in the maritime sector	**1**
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	**Stopford, Martin** – *Maritime Economics* (3rd Edition)
b.	***Hoar, John***- *The Economics of Sea Transport and International Trade*
c.	***Talley, K. Wayne-*** *Port Economics*
d.	**Emad Elbeltagi-** *The shipping economics*
e.	**Ma, Shou-** *Economics of Maritime Business*

Course Code:	Course Title:	Credits:
OPM 4283	Marine survey and accident investigation	03

Course Learning Objective:

This course aims to provide comprehensive understanding about various Survey on board ship including accident investigation.

Course Content:

S/N	Course Content (as Summary)	Hrs
01	**Introducing to Marine Survey**	
	Details Marine surveying involves the inspection and assessment of marine vessels and their cargo to determine their condition, safety and value. Surveyors evaluate the structure, machinery, and equipment to ensure compliance with standards, assess damage, and provide expert opinions for purposes like insurance, sales, or legal proceedings The profession can also include conducting various technical surveys, such as hull surveys, load line surveys, and stability tests.	**2 link to syed sir**
	Details **Key aspects of marine surveying** **Inspections**: Marine surveyors conduct thorough inspections of vessels—from small craft to large commercial ships—and their equipment, including navigation, safety, and engine systems. **Damage assessment**: A major role is to inspect and report on damage to a vessel or its cargo, often for insurance claims or salvage purposes. **Valuation**: Surveyors can provide appraisals of a vessel's market value, which is crucial for sales or financial transactions. **Compliance**: They verify that vessels and their equipment meet various standards, specifications, and regulatory requirements, often for legal or classification purposes. **Expert witness**: Due to their detailed knowledge, surveyors can act as expert witnesses in legal hearings related to accidents or fraud.	**1**

02	**Relationship between Surveyors and their Clients**	
	The relationship between surveyors and clients is built on trust, clear communication, and mutual understanding of project goals. Successful relationships depend on surveyors managing client expectations, providing transparent updates, and aligning their technical expertise with the client's specific objectives to ensure project success and build long-term loyalty.	**3**
03	**Business Skills for Surveyors**	
	Essential business skills for surveyors include communication, project management, and problem-solving, which are crucial for client relations, project delivery, and business growth. Other key skills are client management, time management, teamwork, and professional attitude, alongside financial literacy, negotiation, and presentation skills.	**3**
04	**Laws and Conventions Relating to Marine survey**	
	Laws and conventions relating to marine surveys include international treaties like the **SOLAS** Convention, which sets safety standards, and national regulations, such as the "Marine Order 503" in Australia, that govern survey processes for domestic vessels. These frameworks, enforced by organizations like the IMO and flag state authorities, dictate the requirements for surveys to ensure a ship's safety, compliance, and environmental protection.	**1**
	International conventions • SOLAS (International Convention for the Safety of Life at Sea): Sets minimum safety standards for the construction, equipment, and operation of merchant ships, which are verified through surveys. • MARPOL While not a standalone convention, the various protocols under MARPOL concern the prevention of pollution from ships, and surveys ensure compliance with these rules. • Harmonized System of Survey and Certification (HSSC): A system that standardizes the survey and certification processes of ships to ensure consistent implementation of international conventions like SOLAS and MARPOL.	**2**
05	**Surveyors' role in Incident and accident investigation**	
	Surveyors play a crucial role in incident and accident investigations by assessing the scene, determining the cause and extent of damage, and	**2**

	providing detailed, unbiased reports. They act as neutral experts to help settle insurance claims, document evidence for legal proceedings, and recommend preventative measures.	
	Key roles of surveyors in investigations • Scene assessment and documentation: Surveyors document the site of an accident, which can include everything from a vehicle to a building or ship, using tools like total stations, drones, and 3D laser scanners. • Cause and extent determination: They investigate to establish the root cause and the full nature and extent of the damage. For example, in a car accident, they check if the damage patterns are consistent with the described events. • Neutrality and accuracy: Surveyors maintain impartiality, which is critical for ensuring fairness to both the policyholder and the insurance company. They must declare any conflicts of interest. • Detailed reporting: They create comprehensive reports that become the foundation for insurance claims, including the cause, extent of loss, and a cost estimate for repairs or settlements. • Insurance claim settlement: They help simplify the claims process by verifying that the damage is covered under the policy and estimating repair costs. They may also advise on immediate payment where liability is clear. • Evidence for legal proceedings: They can act as expert witnesses in subsequent legal hearings. • Damage prevention: Surveyors can provide recommendations to prevent future incidents, such as advice on safety or security procedures.	**2**
06	**Naval Architecture for Marine Surveyors**	**2**
	Naval architecture is the engineering discipline of designing, building, and maintaining marine vessels and structures, and it is critical for marine surveyors who inspect these assets. Surveyors use their understanding of naval architecture principles like stability, structural integrity, and safety	**3**

	regulations to assess a vessel's condition, ensure compliance with standards, and evaluate the impact of any modifications, repairs, or damage. This knowledge helps surveyors verify that a vessel is safe, seaworthy, and meets the necessary requirements.	
07	**Marine Engineering and Systems for Surveying**	
	Marine engineering focuses on the design, operation, and maintenance of ships' and offshore structures' systems, while marine surveying involves the inspection and assessment of vessels and their machinery to ensure safety, compliance, and seaworthiness. Marine engineers and surveyors use their knowledge of systems like propulsion, electrical, and auxiliary machinery, but surveyors are specifically trained to conduct technical inspections for purposes like damage assessment, pre-purchase checks, and compliance with maritime standards.	**3**
08	**Hull and structural survey**	
	A hull and structural survey is a comprehensive inspection of a ship's hull and its supporting structures to assess structural integrity, detect damage, and ensure compliance with regulations. These surveys are crucial for maintaining safety and compliance through various stages of a ship's life, including initial construction, periodic checks, damage assessments, and special requirements like those mandated by SOLAS or classification societies. The survey focuses specifically on the physical structure, including the hull, decks, bulkheads, and their associated components, and is used for purposes such as condition assessment, repair planning, and loss investigation	**3**
09	**Safety and security survey**	
	A marine safety and security survey is a comprehensive assessment of a maritime system to ensure the safety of life, property, and the environment, and to protect against threats. It involves inspecting vessels and facilities, reviewing security plans, and assessing risk to ensure compliance with international regulations like those from the IMO and national laws. These surveys also help in identifying vulnerabilities, implementing security measures, and informing policy decisions.	
10	**Cargo Survey**	**3**

	A cargo survey is an inspection and verification of goods before or after transport to ensure their quality, quantity, and condition are as expected. A cargo surveyor assesses the cargo's condition, verifies its weight, checks for damage, and confirms it meets all necessary standards and regulations. The process typically involves pre-inspection, on-site quality and quantity checks, sampling, and documentation to create a detailed report of findings, which is crucial for insurance claims and dispute resolution.	
11	**Marine environmental survey**	**3**
	A marine environmental survey is a study that assesses the health of marine ecosystems by collecting and analyzing data on biodiversity, water quality, seabed topography, and pollution levels. These surveys provide crucial information for understanding the impacts of human activities, informing conservation efforts, guiding sustainable development projects like offshore wind farms, and meeting regulatory requirements. Common methods include habitat mapping, Sediment and water sampling and using remote sensing technologies likeSide scan sonar or ROV.	
12	**International Safety management survey**	**3**
	An international safety management (ISM) survey is a systematic process to verify a ship's compliance with the ISM code, which sets standards for the safe operation of ships and pollution prevention. These surveys, conducted by flag states or recognized organizations like DNV, assess a company's safety management system (SMS) and are essential for obtaining a Document of Compliance and a Safety Management Certificate. They involve both office and shipboard audits to ensure that safety procedures are effectively implemented and maintained, with the ultimate goal of improving safety at sea and protecting the environment.	
13	**Marine warranty survey**	
	A marine warranty survey is an independent, third-party inspection of high-risk marine operations to verify that they meet safety and regulatory standards, as specified by the insurer. The survey ensures that all necessary precautions are taken to minimize risks and prevent loss of life, property, and the environment before an operation proceeds and insurance coverage is valid. The process typically includes reviewing plans, verifying	**1**

	equipment, and providing on-site oversight during the operation itself.	
14	**Marine offshore drilling unit survey**	
	A marine offshore drilling unit survey is a comprehensive inspection of a mobile offshore drilling unit (MODU) to assess its structural integrity, safety, and operational readiness. These surveys cover a wide range of aspects, including structural and equipment checks, emergency response capabilities, and compliance with international standards like the IMO MODU Code. Surveys can also include Offshore Vessel Inspection database inspections, which focus on a vessel's safety and environmental performance, or specific surveys for units in lay-up or during reactivation.	**1**
		1
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Reference Books/Study Materials

1. Marine Surveyors Handbook by Ghulam Suhrawardy
2. Marine Survey Handbook by BK Chowdhury

Course Code:	**Course Title:**	**Credits:**
OPM 4285	Advanced cargo operation (Oil and Chemical Tanker)	03

Course Learning Objective After successful completion of this course, the students will have sufficient knowledge on:

a. Oil & Chemical tanker designs, systems, and equipment;
b. Pump theory and characteristics, including types of cargo pumps and their safe operation;

c. Tanker safety culture and implementation of safety management system.
d. Ability to perform cargo measurements and calculations.
e. Development and application of cargo-related operation, Plans, procedures and checklists.
f. Ability to calibrate and use monitoring and gas-detection, Systems, instruments and equipment.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Oil Tanker**	
	Design and characteristics of an oil tanker	**3**
	Knowledge of oil tanker design, system and equipment, including: -General arrangement and construction -Pumping arrangement and equipment -Tank arrangement, pipeline system and tank venting arrangement -gauging systems and alarms -Cargo heating system -Tank cleaning, gas-freeing and inerting systems -Ballast system -Cargo area venting and accommodation ventilation -Slop arrangements -Vapor recovery systems -Cargo-related electrical and electronic control system -Environmental protection equipment, including Oil Discharge Monitoring Equipment (ODME) -Tank coating -Tank temperature and pressure control systems -Fire Fighting systems	
	Knowledge of pump theory and characteristics, including types of cargo pumps and their safe operation Proficiency in tanker safety culture and implementation of safety management system. Knowledge and understanding of monitoring safety systems, including	**03**

	emergency shutdown	
	Knowledge and understanding of oil cargo-related operations, including: -Loading and unloading plans and operation -Ballasting and de-ballasting -Tank cleaning operations -Inerting -Gas-freeing -Ship to shore transfer -Load on top -Crude oil washing	**05**
	Development and application of cargo related operation plans, procedures and checklists Ability to calibrate and use monitoring and gas-detection systems, instruments and equipment Ability to manage and supervise personnel with cargo related responsibilities Knowledge and understanding of the physical and chemical properties of oil cargoes. Knowledge and understanding of oil tanker emergency procedures, including: -Ship emergency response plans -Cargo operations emergency shutdown Understanding the information contained in a Safety data Sheet (SDS)	**04**
	Knowledge and understanding of the hazards and control measures associated with oil tanker cargo operations, including: -Toxicity -Flammability and explosion -Health hazards -Inert gas composition -Electrostatic hazards -Knowledge and understanding of dangers of non-compliance with relevant rules/regulations	**05**

	Knowledge and understanding of safe working practices, including risk assessment and personal shipboard safety relevant to oil tankers: -Precautions to be taken when entering enclosed spaces, including correct use of different types of breathing apparatus -Precautions to be taken before and during repair and maintenance work -Precautions for hot and cold work -Precaution for electrical safety -Use of appropriate Personal Protective Equipment (PPE)	**02**
	Understanding of procedures to prevent pollution of the atmosphere and the environment Knowledge and understanding of relevant provisions of the International Convention for the Prevention of Pollution from ships (MARPOL), as amended, and other relevant IMO instruments, industry guidelines and port regulations as commonly applied.	**02**
	Chemical Tanker	
	Knowledge and understanding of basic chemistry and physics and the relevant definitions related to the safe carriage of Chemicals in bulk in ships, including: -The chemical structure of cargoes. -Liquid and vapor densities -Flashpoint, Upper and Lower explosive limits, auto ignition temperature -Compatibility, reactivity and positive segregation of Chemicals in different tanks	**05**
	Design and characteristics of a Chemical tanker	**06**
	Knowledge of Chemical tanker design, systems and equipment, including: -Types of Chemical tankers and cargo tank construction -General arrangement and construction -Cargo containment systems, including materials of construction and insulation -Cargo handling equipment and instrumentation, including: ----Cargo pumps and pumping arrangements ----Cargo pipelines and valves	

	----Expansion devices ---Flame screens ----Temperature monitoring systems ----Cargo tank level gauging systems ---Tank pressure monitoring and control systems -Tank atmosphere control systems (inter gas, nitrogen) including storage, generation and distribution systems -Gas detecting system -Ballast system -Cargo Emergency Shut Down system (ESD) -Knowledge of pump theory and characteristics, including types of cargo pump and their safe operation	
	Proficiency to apply safe preparations, procedures and checklists for all cargo operations, including: -LOADING: -Tank inspection -Loading -De-ballasting -Sampling SEA PASSAGE: -Monitoring At sea Passage. UNLOADING: -Unloading -Ballasting -Stripping and cleaning systems -Systems to make the tank liquid-free SHIP TO SHIP TRANSFER	**05**
	Precaution to prevent hazards Occupational health and safety precaution	**02**

	Responds to emergencies Precautions to prevent pollution	
	Total	**42**

Assessment & Evaluation		
	a. Assessment Strategy	As per Part D, Paragraph 26.
	b. Marks Distribution:	Continuous Assessment: 40 Marks
		Summative: 60 Marks
	c. Makeup Procedures	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	ISGOTT
b.	Tanker safety guide
c.	Chemical tanker Design and Cargo Containment
d.	Occupational health and Safety and Pollution Prevention
e.	Tank-cleaning Guideline

Course Code:	**Course Title:**	**Credits:**
NAV 4240	GMDSS Sessional	**1.5**

Course Learning Objective: After completion of the semester students will able to operate GMDSS equipment (MF/HF, VHF radios, Inmarsat systems, EPIRB, SART, NAVTEX, DSC controllers).

1. Handle routine and distress, urgency, and safety communications.
2. Maintain communication logs and follow IMO procedures.
3. Understand GMDSS sea areas, satellite coverage, and equipment fit.
4. Conduct drills simulating real emergency scenarios.

Course Content:

S/N	Course Content (as Summary)	Hrs.
1	**Introduction & GMDSS Overview**	**06**
	Structure and purpose of GMDSS.	
	Sea areas (A1–A4), equipment carriage requirements.	
	SafetyNET, NAVTEX overview.	
	Radio Communication	
	Type of Communication Distress, Urgent, Safety, Routine	
	Radio Watch	
2	**VHF Radio with DSC**	**03**
	Operation, channel usage, routine and distress DSC calls.	
	Test calls and acknowledging DSC alerts.	
	Hands-on VHF equipment.	
3	**MF/HF Radio with DSC**	**03**
	Operation on medium and high frequencies.	
	DSC distress, urgency, safety calls.	
	Voice procedures and radiotelephony.	
4	**Inmarsat Systems (C, B, Fleet)**	**04**
	The principles and features of the maritime mobile service	
	The principles and features of the maritime mobile-satellite service.	
	Practical use of Inmarsat-C terminal: sending/receiving EGC, emails, safety messages.	
	Polling, logging in/out, distress alerts.	
5	**NBDP**	**03**
	General principles of Narrow Band Direct Printing (NBDP)	
	Telex Over Radio (TOR) systems.	
	Use maritime NBDP and TOR equipment in practice	
6	**NAVTEX Receiver**	**03**
	Reading and interpreting navigation and weather warnings. Operation, tuning, message filtering.	
7	**EPIRBs, SARTs and GMDSS W/T**	**04**
	Hands-on training: activation, testing, re-setting.	

	Battery care, registration procedures.	
8	**Power Supply & Antennas**	**03**
	Understanding battery arrangements and maintenance. Practical checks on power sources.	
9	**Distress & Safety Communication Drills**	**03**
	End-to-end distress procedure simulation. Bridge team coordination.	
10	**Log keeping & Documentation**	**04**
	Correct log entries during exercises. Use of radio logs and GMDSS logs.	
11	**Integrated Operation & Troubleshooting**	**03**
	Combining multiple GMDSS systems during drills. Identifying and correcting common faults.	
12	**Practical Assessment & Revision**	**03**
	Oral examination, practical test. Feedback on individual performance.	
	Total	**32**

Assessment & Evaluation		
a.	**Assessment Strategy**	As per Part D, Paragraph 26.
b.	**Marks Distribution:**	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
c.	**Makeup Procedures**	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	GMDSS Manual – IMO
b.	GMDSS: A User's Handbook – Denise Bréhaut
c.	GMDSS for Navigators- John Seaton
d.	Reeds VHF/DSC Handbook – Sue Fletcher
e.	ITU Radio Regulations

f.	ALRS VOL 5

Course Code:	**Course Title:**	**Credits:**
NAV 4232	Radar and ARPA sessional	**1.5**

Course Learning Objective:

1. To provide Officers of the Watch with the knowledge and skills to safely operate and interpret RADAR and ARPA systems.
2. To ensure competence in collision avoidance using radar plotting, CPA/TCPA analysis, and COLREGS application.
3. To develop proficiency in radar-assisted navigation and blind pilotage under normal and restricted visibility.
4. To apply operational decision-making through practical simulations and understand system limitations and failures.

Course Content:

S/N	**Course Content (as Summary)**	**Hrs.**
1	**Knowledge of the fundamentals of radar and automatic radar plotting aids (ARPA)**	**2**
1.1	Demonstrates the Ability to operate and to interpret and analyze information obtained from radar, including the following: - factors affecting performance and accuracy - setting up and maintaining displays - detection of misrepresentation of information, false echoes, sea return, etc., racons and SARTs use including - range and bearing; course and speed of other ships; time and distance of closest approach of crossing, meeting overtaking ships - identification of critical echoes; detecting course and speed changes of other ships; effect of changes in own ship's course or speed or both - application of the International Regulations for Preventing Collisions at sea 1972 as amened - plotting techniques and relative- and true- motion concepts	

	- Parallel indexing		
1.2	Demonstrate the Ability to operate and to interpret and analyze information obtained from ARPA, including: - system performance and accuracy, tracking capabilities and limitations, and processing delays - use of operational warnings and system tests (PM test) - methods of target acquisition and their limitations - true and relative vectors, graphic representation of target information and danger areas - deriving and analyzing information, critical echoes, exclusion areas and trial man oeuvres.		
2	**Blind Navigation in Restricted visibility**		**1**
	Demonstrate sufficient knowledge and application of blind pilotage techniques (during restricted visibility)		
3	**RADAR plotting**		**4**
	Understanding OAW triangle		
	Use radar plotting sheets for: - Relative motion plots - Plotting multiple targets		
	Determine: - Course and speed of other vessels - Closest Point of Approach (CPA) - Time to Closest Point of Approach (TCPA)		
	Apply radar plotting in compliance with COLREGs (Rules 5–8, 19)		
	Practical demonstration		
4	**RADAR fundamentals**		**2**
	Practical Element	**Description**	
	Radar power-up and self-check	Start-up procedure, warm-up time, and fault indication	
	Control settings	Tuning, gain, clutter (rain/sea),	

		brilliance, range scales	
	Setting and interpreting range rings and bearings	Using variable range markers (VRM) and electronic bearing lines (EBL)	
	Adjusting display modes	Head-up, North-up, Course-up modes and performance in each	
	Radar orientation and display offset	Use of true/relative motion, centered/decentered display	
	Interpretation of radar echoes	Identifying landmasses, buoys, targets, rain clutter, false echoes	
	Parallel indexing	Using fixed bearings and VRMs to monitor safe passage near hazards	
5	**Target tracking (manual and automatic)**		**2**
	Practical Element	**Description**	
	Manual radar plotting	Target plotting on plotting sheets (6-point method)	
	CPA/TCPA calculations	Determining risk of collision and closest point of approach	
	Use of plotting symbols and target trails	Differentiating real from ghost or multiple echoes	
	Target acquisition on ARPA	Manual and automatic target selection	
	Vector modes	True vs. relative vectors	
	Vector time setting	Interpreting motion over time (e.g., 6 min vector length)	
6	**Title: RADAR Plotting using plotting sheet (OAW triangle)**		**4**
	Practical Element	**Description**	
	Establishing radar contact	Identifying and marking the radar echo of the target vessel (Another vessel) on plotting sheet/chart.	
	Marking own ship position (O)	Plotting regular positions of the own ship using radar and/or DR position every 3–6 minutes.	

	Marking target positions (A)	Marking successive radar bearings and ranges of the target ship (A1, A2, A3, etc.) at equal intervals.	
	Plotting water track (W)	Using log speed and course to draw the water track vector (OW) from own ship's fixed position.	
	Constructing relative motion line (AW)	Drawing vector from A to W shows the relative motion of the target ship; indicates collision risk.	
	Determining CPA and TCPA	Using plotting lines to find Closest Point of Approach and Time to CPA; key to safe decision-making.	
	Applying course/speed alteration	Trying alternative course/speed changes and re-plotting to see the effect on the collision situation.	
	Deriving true course and speed of target	Using triangle OAW to calculate true motion (speed and course) of another vessel from radar plots.	
	Interpreting maneuver effect	Assessing how changes in own ship's vector (OW) shift the triangle, altering CPA/TCPA.	
	Collision avoidance decisions	Applying Rule 8 and COLREGs with support of plotted vectors to determine safe and timely maneuver.	
7	**Collison Avoidance (COLREG Application)**		**2**
	Practical Element	**Description**	
	Risk assessment using radar/ARPA	Based on COLREG Rule 7: Risk of Collision	
	Correct maneuver based on aspect and CPA	Rule 8: Action to Avoid Collision	
	Use of radar for restricted visibility navigation (blind pilotage)	Rule 19 application and limitations	

	Maintaining a radar watch	Continuous observation and logging of radar contacts	
	Decision making and execution	Choosing safest alteration (course/speed) based on ARPA info	
8	**ARPA System operations**		**2**
	Practical Element	**Description**	
	Setting up ARPA	Stabilization, gyro input, speed log input, heading sensors	
	Target acquisition and tracking	Number of targets tracked, acquisition range, time delay	
	Vector presentation	Use of true/relative vectors, trail history	
	Alarm functions	CPA/TCPA alarms, lost target alarm, acquisition failure	
	Target data interpretation	Bearing, range, course, speed, CPA, TCPA, target number	
	Understanding system limitations	Loss of target, acquisition errors, input sensor failure	
9	**Performance and limitations**		**2**
	Practical Element	**Description**	
	Echo distortion and blind sectors	Identification and cause of false targets or target loss	
	Radar shadowing and clutter	Use of clutter suppression tools (sea/rain clutter)	
	Effect of sea state and weather	Interpretation of echo quality and range performance	
	Sensor failure response	Action when gyro, log or GPS input is lost	
	Own ship maneuver effect	Delay in ARPA tracking update after course/speed change	
10	**RADAR Assisted Navigation**		**2**
	Practical Element	**Description**	
	Radar fixes using visual or radar-	Position fixing using radar ranges	

	conspicuous objects	and bearings	
	Parallel indexing	Monitoring cross-track error on approach or in TSS	
	Landfall identification	Confirming landfall using radar echo vs. charted objects	
	Radar overlay on ECDIS (if available)	Integration of radar data on electronic charts	
11	**Simulator Scenarios (Bridge Team/ Single Officer)**		**3**
	Practical Element	**Description**	
	Collision avoidance in open sea	Multi-target encounter, rule compliance	
	Navigation in restricted visibility	Heavy traffic with limited visuals	
	Close-quarters maneuvering	Use of radar in narrow channels or port approaches	
	ARPA tracking with sensor failure	Decision making under degraded radar conditions	
	Emergency radar-only navigation	Chart/radio/GPS failure simulation (radar as primary tool)	
		Total	**32**

Assessment & Evaluation		
a.	**Assessment Strategy**	As per Part D, Paragraph 26.
b.	**Marks Distribution:**	Continuous Assessment: 40 Marks
		Viva-voce (Oral): 60 Marks
c.	**Makeup Procedures**	Make-up procedures may include supplementary exams, extra assignments, or other approved evaluation tasks.

Learning Materials	
a.	Practical Demonstration: Use of RADAR, ARPA and COLREG in simulated scenarios
b.	Oral Examination: Test understanding, reasoning, and situational decision-making
c.	Written Tests: Short answers, calculations, MCQs, scenario-based analysis

d.	CBT / Assignments: Interpretation of equipment manuals, performance standards, and logs
e.	Observation (Checklists): Assessor-monitored equipment handling and decision-making
f.	Projects/Case Studies: Analysis of past incidents or simulated voyage planning using RADAR and ARPA
g.	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), 1978, as amended (ISBN: 978-92-801-1528-4)
h.	International Convention for the Safety of Life at Sea (SOLAS), Consolidated Edition, 2009 (IMO Sales No: IE110E, ISBN: 978-9280115055)
i.	International Maritime Organization (IMO), *Model Course 1.07: Radar Navigation at Operational Level*, 2000 Edition, London: IMO Publishing (IMO Sales No: T107E, ISBN: 9789280160840)
j.	International Maritime Organization (IMO), *Model Course 1.08: Radar, ARPA, Bridge Teamwork and Search and Rescue*, 2000 Edition, London: IMO Publishing (IMO Sales No: T108E, ISBN: 9789280160857)
k.	International Maritime Organization (IMO), *Performance Standards for Radar Equipment*, IMO Resolution MSC.192(79), adopted in 2004
l.	International Maritime Organization (IMO), *Performance Standards for Automatic Radar Plotting Aids (ARPA)*, IMO Resolution A.823(19), adopted in 1995
m.	Lownsborough, R. and Calcutt, D., *Electronic Aids to Navigation: Radar and ARPA*, 1st ed. London: Edward Arnold, 1993 (ISBN: 0-340-59258-3)
n.	Cockroft, A.N. and Lameijer, J.N.F., *A Guide to the Collision Avoidance Rules*, 6th ed. Oxford: Butterworth-Heinemann, 2004 (ISBN: 0-7506-6179-8)
o.	Weems & Plath. *Radar for Mariners*, 2nd ed. by David Burch. New York: McGraw-Hill, 2005 (ISBN: 9780071452178)
p.	NP 100 – *The Mariner's Handbook*, 6th ed. Taunton (UK): Hydrographer of the Navy, 1989
q.	Admiralty NP314 – *Radar and ARPA Manual*, latest ed. UK Hydrographic Office
r.	American Practical Navigator (Bowditch), *Publication No. 9*, National Geospatial-Intelligence Agency, 2017 edition
s.	Nadeem, Anwar. *Navigation Advanced Mates/Masters*, Latest ed. Lahore: M. Nadeem & Sons, 2019 (ISBN: 978-969-8855-00-7)

Part D: Grading and Evaluation

25. Grading

a.	**Grading Scale**	**As per latest Exam Regulations of Bangladesh Maritime University.**
b.	**Grades**	
c.	**GPA AND CGPA**	
d.	**Course withdrawal**	
e.	**Incomplete Courses**	
f.	**Retakes**	
g.	**Grade improvement**	
h.	**Dropout**	

26. Evaluation

a. Distribution of Marks: In a course/subject carrying 100 marks, 40% of the marks will be allocated for Semester-based Continuous Assessment (CA). A student's continuous assessment will be based on Class Attendance, Class Participation / Observation / Quizzes / CTs / Homework / Home Assignment / Mid-Term Examination, etc. The remaining 60% of the marks will be reserved for the written examination of the Semester Final Examination. The marks distribution will be as follows:

Continuous Assessment (40%)	Class attendance	05%
	Class Participation/Observation	05%
	Assignment/Term paper	05%
	Quizzes/Class Test	10%
	Mid-term Examination (Written)	15%
Final Examination (60%)	Semester Final Examination	60%
	Total	100%

The marks obtained by a student in Continuous Assessment must be sent to the Education Department by the concerned department before the commencement of the Semester Final Examination. The allotted time for the written examination of each subject in the Semester Final Examination is 03 (three) hours. For the distribution of the 40 marks in Continuous Assessment in each semester, the subject matters that a teacher will consider must be communicated to every student on the first day of the semester. Out of the total 40% marks allocated for a candidate's continuous assessment, 5% marks will be allocated for Class Attendance. Basis for Class Attendance Evaluation will be as follows:

Attendance Percentage	Marks
90% and above	100%
85% to 89%	90%
80% to 84%	80%
75% to 79%	70%
70% to 74%	60%
65% to 69%	50%
60% to 64%	40%
Below 59%	0%

b. Continuous Assessment (CA):

i. **Class Participation / Observation:** Subject-specific teachers will assign marks to a student based on their participation in classroom activities during lectures in their respective classrooms and will duly submit the assigned marks to the Course Co-ordinator. Subsequently, the Co-ordinator, in consultation with the Department/Institute/Affiliated Institution Head, will finalize the marks obtained by the student for Class Participation/Observation based on the average of the marks submitted by the teachers and considering the student's participation in unassigned curricular and co-curricular activities of the program. A maximum of 5% marks will be allocated for Class Participation/Observation.

ii. **ii. Term Paper / Assignment Paper:** At the beginning of each Term/Semester, the class teacher, in discussion with the Course Co-ordinator, will select suitable individual or group-based topics for the Term Paper/Assignment Paper and provide them to the students. Students will submit a written report on the chosen topic by the stipulated date

and present the report using Power Point before a panel nominated by the Department/Institute/Affiliated Institution Head. The panel will divide the marks allotted for the Term Paper/Assignment Paper into two equal parts and assign marks to the students based on the written report and the presentation. A maximum of 5% marks will be allocated for Term Paper/Assignment Paper assessment.

iii. **Quiz / Class Test:** The minimum number of Quizzes/Class Tests to be conducted for each course will be n+1, where 'n' denotes the credit hours of that course. The Course Teacher will conduct the Quiz/Class Test. The Course Teacher will announce the results of the Quiz/Class Test in the concerned classroom within 10 (ten) days after conducting the test and show the examined answer scripts to the students. In this case, the average mark of all Quizzes/Class Tests given by a student will be considered as their obtained mark for the Quiz/Class Test. A maximum of 10% marks will be allocated for Quiz/Class Test.

iv. **Mid Term Examination:** The Mid-Term Examination for each Term/Semester will be held under the supervision of the Department/Institute/Affiliated Institution Head according to the schedule provided in the Academic Calendar. Generally, the class teacher will prepare the question paper and examine the answer scripts for this examination. However, the Department/Institute/Affiliated Institution Head reserves the right to moderate (scrutiny) the question paper prepared by the class teacher and scrutinize the examined answer scripts. A maximum of 15% marks will be allocated for the Mid-Term Examination.

v. **Final Term/Semester Examination:** The Final Term/Semester Examination will be conducted according to the guidelines of the latest Exam Regulations of Bangladesh Maritime University.

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