National Diploma in Technology

Curriculum

Nautical Studies & Technology

Institute of Technology
University of Moratuwa

August 2004

First Year Syllabi

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Second Year Syllabi

1. DCE 102 Engineering Mechanics and Strength of Materials

Code : DCE 102			Division: Mechanical Eng. & Civil Eng.		
Title : Engineering Mechanics and Strength of Materials					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
2x30	**2x15**	**2x15**	**2**	**2/2**	**2/2**
Method of Assessment : - 3 Hour Question Paper & Course Works					

General Objectives

On completion of this module, the students will be able to

- gain sufficient theoretical knowledge to deal with Statics and Dynamics of Mechanical Engineering components in machinery and
- apply the principles of strength of materials on simple objects under different load conditions.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1	**Engineering Mechanics** Introductory Topics	04	04
2	Energy	04	-
3	Friction and Friction Drives	12	06
4	Gears	02	
5	Dynamics	08	04
6	**Strength of Materials** Elasticity of Materials under Different Load Conditions	11	06
7	Sectional Properties	03	-
8	Shear Force and Bending Moment Diagrams for Beams	10	-
9	Torsion in Simple Practical Applications	04	06
10	Slope and Deflection of Beams	02	04
	Total	**30**	**30**

Summary Syllabus

Engineering Mechanics

1. Introductory Topics (04 hours)

- Review - Units and dimensions, statics of a rigid body
  - Scalar and vector quantities.
  - Force, couple and moment with graphical representation.
  - The principle of equilibrium
  - Necessary and sufficient conditions for the equilibrium
  - Free body diagrams
- Simple Machines
  - Load, effort, mechanical advantage, velocity ratio, and mechanical efficiency.
  - Introduction to simple machine, lifting machine and reversible machine, self-locking machine and compound machine.
  - Condition for the self-locking machine.
  - Law of a simple machine P = aW +b.
  - Maximum mechanical advantage and maximum mechanical efficiency

2. Energy – Work & Power (04 hours)

- Introduction, work, energy.
- Potential energy, Kinetic energy and strain energy.
- Kinetic energy of rotating body, rotating about a fixed axis.
- Power, efficiency law of conservation of energy theore

3. Friction (12 hours)

- Introduction, dry friction, fluid friction, semi lubricated friction.
  - Static friction, dynamic friction
  - Laws of dry friction, coefficient of static and kinetic friction
  - Rolling and slipping
- Screw friction
  - Introduction, pitch, thread angle, lead, no of starts.
  - Friction formulae for square and V-threads
  - Mechanical efficiency and the maximum efficiency.
  - Engineering applications, such as screw jack, nuts and bolts, turn buckles, presses and power screws.
- Simple clutches
  - Introduction, type of clutches
  - Simple clutch in uniform wear and uniform pressure conditions.
- Bearings
  - Introduction, frictional losses in thrust bearings
  - Flat pivot and collar bearings with uniform wear and uniform pressure.
- Belt drives
  - Introduction, frictional formulae for flat belt and ‘V’ belts drives
  - Power transmission, via belts, band brakes

4. Simple Gar Dives (02 hours)

- Introduction, spur gearing between parallel shafts, external and internal gearing
- Pitch, module, pitch circle diameter, dedendum circle, addendum circle

5. Dynamics (08 hours)

- Kinematics
  - Introduction, kinematics of a particle in linear motion with constant acceleration condition, graphical representation of velocity and acceleration.
  - Kinematics of a particle in curvilinear motion in polar co-ordinates.
- Kinetics
  - Introduction, rigid body in motion.
  - Newton' laws of motion, De Alembert's principle.
  - Newton's second law for system of particles.
  - Motion of a particle in a circular motion.
- Inertia
  - Introduction, mass moment of inertia, radius of gyration
  - Parallel axis theorem, perpendicular axis theorem.
  - Motion of a rotating body about a fixed axis, plane motion of a rigid body.

Strength of Materials

1. Elasticity of Materials under Different Load Conditions (11 hours)

- Review of fundamentals
  - The nature of rigidity, elasticity and plasticity of materials, Hooke's law, Linear elastic stress strain analysis.
- Composite members
  - Principles of elasticity in stress-strain analysis of composite bars under; direct tensile or compressive loads and thermal stresses.
- Shear stress and shear strain
  - Complementary and diagonal shear stresses.
  - Shear modulus.
  - Applications of shear – lap joints and butt joints (design & analysing)
- Volumetric stress and strain
  - Bulk Modulus, Poisson's Ratio and Relationship between the elastic moduli.

2. Sectional Properties (03 hours)

- First moment of area and second moment of area.
- Perpendicular axes theorem and parallel axes theorem.
- 2nd moment of area for different standard shapes and their combinations.

3. Shear Force and Bending Moment Diagrams for Beams (10 hours)

- Types of loads and supports.
- Shear force and bending moment.
- Relationship between load, shear force and bending moment.
- Shear force and bending moment diagrams for different conditions of loads and supports.
- Bending of beams.
- Bending formula for simple applications.

4. Torsion in Simple Practical Applications (04 hours)

- Torsional shear stresses in solid and hollow circular shafts.
- Applications of torsion, Transmission of power and Helical springs.
- Torsion formula for closed coil helical spring.

5. Slope and Deflection of Beams (02 hours)

- Slope and deflection of cantilevers and simple supported beams.

<u>List of Practicals : (30 hours)</u>

Engineering Mechanics (14 hours)

1. Rotating Beams Apparatus
2. Inclined Plane
3. Compound Pendulum
4. Worm and Wheel Drive
5. Belt and Rope Friction
6. Screw Jack

Strength of Materials (16 hours)

1. Tensile test - Stress strain relationship of mild steel
2. Beam Deflection - Determination of Young's Modulus of timber
3. Torsion test - Determination of Modulus of Rigidity of steel
4. Helical Springs - Deformation of a helical spring under axial tension

Recommended Text Books :

1. Engineering Mechanics – Dynamics; R S Hibbler
2. Engineering Mechanics – Statics; J L Meriam and L G Kraige
3. Applied Mechanics; H Hannah, M J Hillier
4. Applied Mechanics and Strength of Materials; R S Khurmi
5. Theory of Machines; R S Khurmi and J K Gupta
6. Strength of Materials; G H Ryder
7. Strength & Elasticity of materials and Theory of Structures; W H Brooks
8. Mechanics of Solids and Structures; P P Benham and F V Warnock
9. Strength of Materials; John Case and A H Chilver
10. Problems in Strength of Materials; W V Sirk

2. DEE 101 Electro Technology

Subject Code : DEE 101			Division : Electrical & Electronic Engineering Technology		
Title : Electro Technology					
Annual Workload			**Weekly Workload**		
Lectures	**Tutorials**	**Practicals**	**Lectures**	**Tutorials**	**Practicals**
60	**30**	**30**	**2**	**1**	**2/2**
Method of Assessment :- 3 Hour Question Paper & Course Works					

General Objectives

On the completion of this module the student will be able to:

- acquire the fundamental knowledge of Basic Electricity & Electronics
- develop a basis for specialist studies to undertaken in the 2nd Year.

No	Subject Outlines	Lecture (hr.)	Practical (hr.)
01	**Basic Electricity** Electric Circuits	04	05
02	Fundamental Laws of Electricity	06	05
03	Electric Power & Energy	06	05
04	Electrostatics	04	05
05	Electromagnetic Induction	04	-
06	Alternating Voltages and Currents	06	05
07	Electrical Installations	04	-
08	**Basic Electronics** Semi-Conductor Materials	04	-
09	Transistor and its Applications	08	05
10	Analogue and Digital Systems	08	-
11	Transducers	06	-
	Total	**60**	**30**

Summary Syllabus

Basic Electricity

1. Electric Circuits (04 hours)

- Electricity, DC and AC current
- Conductors, semi conductors and insulators
- Cells, temperature coefficient of resistance

2. Fundamental Laws of Electricity (06 hours)

- Coulomb, Ampere, Volt, Joule and watt
- Ohm's law, resistivity, conductivity and their units
- Series and parallel circuits, Kirchoff's laws
- Ideal source (voltage and current)
- DC distribution systems

3. Electric Power and Energy (06 hours)

- Energy conversion, heating effects of electricity, heat sink and fuses

4. Electrostatics (04 hours)

- Static electricity, Coulombs law, capacitor (parallel plate)
- Charge and voltage, parallel plate capacitor with composite dielectrics
- Parallel/series connected capacitance, Electric force, Electric flux density
- Potential gradient

5. Electromagnetic Induction (04 hours)

- Magnetic field, direction of the field, magnetic flux
- Right hand grip rule/cork screw rule
- Solenoid, toroid, induced emf, Flemming's right hand rule and Lenz's law
- Composite magnetic circuits, B-H curve, Hysterisis laws on magnetic circuits

6. Alternating Voltages and Currents (06 hours)

- Generation of an Alternating emf (single phase)
- Magnetic coil, frequency, speed and no. of pole pairs
- Average, peak and rms values of an ac current
- Rotating vector concept, sinusoidal AC quantities
- Single phase circuits, LRC circuits, phasor diagrams

7. Electrical Installation (04 hours)

- Wiring regulations, Domestic wiring installation ,two way switch, ring circuits, radial circuit of socket outlets

Basic Electronics

8. Semiconductor Materials (04 hours)

- Semiconductor categorization
- n-type and p-type semi conductors
- p-n junction, forward bias and reverse bias
- Diodes characteristics, half /full wave rectification
- Voltage clipping/clamping circuits
- Zener diode

9. Transistor and its Applications (08 hours)

- Transistors types, transistor characteristics
- Biasing & amplification

10. Analogue and Digital Systems (08 hours)

- Analogue circuits, digital circuits, set theory, combinational logics

11. Transducers (06 hours)

- Temperature, pressure and position transducers

List of Practicals: (30 hours)

1. Efficiency of energy conversion
2. Determination of RC – Time Constants
3. Study of simple AC circuits
4. Verification of Kirchoff's Laws
5. Familiarisation of electronic computers
6. Diode applications
7. Transistor characteristics

Recommended Texts :

1. Electrical Fundamentals; John Ryder, Prentice Hall International
2. Electrical Measurements & Measuring Instruments; E W Golding
3. Electronic Principles; Gray & Searle, Wily International Electrical Engineering
4. Electrical Engineering; G Hughes
5. Electrical Technology; H Cotton
6. Electronic Engineering; Schelling & Belove
7. Electronic Circuits; Milman & Haukias
8. Principles of Electronics; JE Holding & MR Garvin
9. Digital Systems; RJ Tocci, Prentice Hall International
10. Pulse & Digital Circuits; Milman & Taub, Mcgraw Hill
11. Electrical Technology; Schaum Series

3. DIS 101 English

Subject Code : DIS 101			Division: Interdisciplinary Studies		
Title : English					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	30	-	2	1	-
Method of Assessment :- Nine Assignments & 3 Hour question paper at the year end examination					

General Objectives

On Completion of this module the students will be able to

- Learn technical vocabulary and language necessary for scientific enquiry.
- Deal with concepts used in scientific discussion and writing in English.
- Develop an understanding of the English grammatical system at work.
- Produce language which look / sound natural.
- Develop writing skills.
- Get accustomed to various speech styles / situations and extract meaning.
- Achieve basic speaking skills needed to survive in speech situations.
- Achieve proficiency in social interaction.
- Develop presentation skills.
- Read and understand text.
- Read for specific information.
- Appreciate literary texts.

No.	Subject Outline	Lectures (hr.)	Practicals (hr.)
1	Core-Text - Basic English for Science	10	-
3	Listening	-	10
4	Speaking	10	20
5	Reading	15	-
6	Writing	25	-
	Total	**60**	**30**

* The first stage (foundation) of the course, which is the basic stage, is conducted prior to the commencement of the academic year & the 'foundation syllabus' is annexed.

Summary Syllabus

1. Technical vocabulary & concepts used in scientific discussion and writing in English.

(10 hours)

Core-Text - Basic English For Science (Peter Donovan - Oxford University Press)

- Giving simple instructions
- Reporting actions, observations & results, stating conclusions, accounting for results
- Understanding explanations, describing apparatus & experiments, interpreting results, describing attributes
- Describing experiment, stating results, describing & accounting for phenomenon
- Description of processes in detail

2.. Listening (10 hours)

- Listening activities
- Listening & Note-taking

4. Speaking (30 hours)

- Language of discussion
- Group discussions
- Basic Presentation skills
- Formal Presentations –individual / group

5. Reading (15 hours)

- Reading Comprehension
- Extracting contextual meaning of words
- Stated main ideas / implied main ideas
- Skimming and scanning a text to extract main idea / specific details
- Appreciating literary texts
- Reading & Note-taking

6. Writing (25 hours)

- Construction of sentences
- Paragraph writing – topic sentence / supporting details
- Simple compositions –narrative, descriptive, explanatory etc.
- Task-based assignments - report of experiment, description of process etc.
- Notices, invitations, notes, messages.
- Letter writing - Personal & Formal letters
- Report writing
- Job applications

Recommended Text Books :

1. Basic English for Science; Peter Donovan, OUP.
2. English for Physical Science; Allen & Widdowson, OUP.
3. Intermediate English Grammar; Raymond Murphy, Cambridge.
4. Advanced English Grammar; Raymond Murphy, Cambridge.

4. DIS 102 Introduction to Information Technology

Subject Code : DIS 102			Division : - Interdisciplinary Studies		
Title : Introduction to Information Technology					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
15	-	15	1/2	-	1/2
Method of Assessment: - Through Continues Assessment					

General Objective

On completion of this module the students will be able to:

- acquire a fundamental knowledge of computer systems and computer programming
- create professional quality spreadsheets and technical drawings.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Introduction to Computers	02	-
2.	Data Representation	01	-
3.	Secondary Storage Devices	01	-
4.	Categories of Software	01	-
5.	Spreadsheet Applications	-	02
6.	Use of CAD in Engineering	02	08
7.	Fundamentals of Computer Programming	05	05
8.	Introduction to PC Network and Internet	03	-
	Total	**15**	**15**

Note: The subject will be evaluated by assignments and not by a year-end examination.

Summary Syllabus

1. Introduction to Computers (02 hours)

- Types of computers
- Main Components of a Computer
  - Central Processing Unit
  - Main Memory
  - Input and Output Devices

2. Data Representation in the Computer (01 hour)

- Numerical Data Representation
- Character Representation
- Memory Capacity
- Information storage in the main memory.

3. Secondary Storage Devices (01 hour)

- Use of secondary storage devices.
- Hard Disks, Floppy Disks, Optical Disks and Magnetic Tapes

4. Categories of Software (01 hour)

- Hardware, Software and Firmware
- System Software and Application Software.
- Types of system software
- Packaged Software and Custom-Written Software

5. Spreadsheet Applications* (02 hours)

- Work sheet, work book, row number, column letter, cell and an active cell, reference area.
- Numbers, Label and Formulae.
- Copying data, moving data, inserting, deleting, moving columns and rows, formatting cells
- Functions.
- Macros.
- Multiple work sheets.
- Charts.

6. Use of CAD in Engineering* (10 hours)

- Components of the AutoCAD window.
- Giving commands
- Function keys
- Creating a new drawing.
- Basic entities
- Basic Editing
- Display Control
- Aids to construction
- Drawing limits
- Advanced Editing
- Object Snap
- Layers
- Polylines
- Blocks
- Hatching
- Simple three-dimensional views

7. Fundamentals of Computer Programming* (10 hours)

- Visual development environment
- Event driven programming
- Variables and variable types.
- Input and Output
- Sequence control structure, Selection control structure and Loop control structure.
- Arrays.
- Modular programming.

8. Introduction to PC Networks and Internet (03 hours)

- Introduction to a PC Network
- Types of networks
- Network based applications and advantages of networks.
- Hardware requirements and software requirements.
- Internet its resources.

List of Practicals: (15 hours)

* Topics covered are listed under items 5, 6 and 7

Recommended Text Books :

1. Developing Applications With Visual Basic, P R Reed JR,
2. Teach Yourself Visual Basic 6 in 21 Days, G Perry.
3. Using the World Wide Web D A Wall
4. AutoCAD For Architects and Engineers: A Practical Guide to Design, John M Albright.& Elizabeth H Schaeffer
5. An AutoCAD workbook, A Yarwood
6. Computer Networks - Second Edition, Tanenbaum, S Andrew
7. Microsoft Office 97 Professional Edition, M L Swanson
8. Information Technology; A practical course, Harriet.Hraper
9. Introducing Computers: Concepts, Systems and Applications.
10. Computer and Information Processing, D D Spencer

5. DIS 103 Mathematics

Subject Code: DIS 103			Division : Interdisciplinary Studies		
Title : Mathematics					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
90	30	-	3	1	-
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to:

- understand the basic concepts of mathematics
- develop rational thinking in formulating engineering problems
- use mathematical symbols and formulae
- apply mathematical knowledge in solving practical problems
- appreciate tidiness and orderliness

No.	Subject Outline	Lecture (hr.)	Tutorial (hr.)
1.	**Algebra and Differential Equations** Determinants and Matrices	15	05
2.	Ordinary Differential Equations	15	05
3.	Vector Algebra	08	03
4.	Complex Numbers	06	02
5.	**Calculus** Functions	04	01
6.	Application of Differentiation	06	02
7.	Application of Integration	04	01
8.	**Probability and Statistics** Probability	05	02
9.	Statistics	12	04
10.	**Numerical Methods** Numerical Methods	15	05
	Total	**90**	**30**

Summary Syllabus

Algebra and Differential Equations

1. Determinants and Matrices (15 hours)

- Determinants
- Types of matrices,
- Algebra of matrices,
- Adjoint
- Method of inversion,
- Solution of simultaneous equations,
- Echelon form,
- Gauss elimination method,
- Consistency

2. Ordinary Differential Equations (15 hours)

- Formulation,
- Solution of first order differential equations and second order differential equations with constant coefficients,
- Use of D-operators, simple applications

3. Vector Algebra (08 hours)

- Vector notations,
- Scalar and vector products,
- Triple products,
- 3-D geometrical applications

4. Complex Numbers (06 hours)

- Algebra of complex numbers,
- De Moivre's theorem,
- Argand diagram,
- Roots of complex numbers
- Algebraic equations

Calculus

5. Functions (04 hours)

- Exponential,
- Hyperbolic and logarithmic functions,
- Inverse functions and implicit functions.

6. Application of Differentiation (06 hours)

- Stationary points and curve sketching,
- Mean value theorem,
- L'Hospital's rule for limits,
- Leibnitz's theorem,
- Partial differentiation and error calculations,
- Taylor series in one or two variables.

7. Application of Integration (04 hours)

- Areas and volumes,
- Moments,
- Lengths of arcs,
- Radius of curvature.

Probability and Statistics

8. Probability (05 hours)

- Elementary probability theory,
- Conditional probability and Bayer's theorem.

9. Statistics (15 hours)

- Classification, tabulation and presentation of data,
- Measures of location and dispersion,
- Discrete and continuous probability distributions: Binomial, Poisons and Normal with simple applications.

Numerical Methods

10. Numerical Methods (15 hours)

- Solution of equations in one variable
- Successive substitution method
- Method of false position
- Simple iterative method
- Newton-Raphson method
- Solution of simultaneous linear equations; Jacobi method, Gauss – Seidal method
- Finite differences and interpolation,
- Numerical differentiation,
- Numerical integration: Trapezoidal and Simpson's rules,

<u>Recommended Text Books</u> :

1. Advanced Calculus; Murray R Spiegel, Schaum's Outline Series
2. College Algebra; Murray R Spiegel, Schaum's Outline Series
3. Fourier Series; Murray R Spiegel, Schaum's Outline Series
4. Laplase Transforms; Murray R Spiegel, Schaum's Outline Series
5. Probability and Statistics; Murray R Spiegel , Schaum's Outline Series
6. 1st Year College Mathematics; Frank Ayres, Schaum's Outline Series
7. Calculus; Frank Ayres, Schaum's Outline Series
8. Differential Equations; Frank Ayres, Schaum's Outline Series
9. Matrices; Frank Ayres, Schaum's Outline Series
10. Engineering Mathematics; K A Stroud, Macmillan
11. Introduction to University Mathematics; J L Smyrl, Hodder and Stoughton
12. Intermediate Mathematics; Blakey, Oxford Press

6. DNS 101 Cargo Work & Seamanship 1

Subject Code : DNS 101			Division : Mech. Eng. Tech. & Maritime Studies		
Title :Cargo Work & Seamanship 1					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	30	2	-	1
Method of Assessment :- 3 Hour Question Paper					

General Objectives :

On completion of this module, the students will be able to:

- identify deck equipment used in the application of deck seamanship
- recognize the safety handling and their purpose.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1	General Description of Cargo	06	-
2	Securing Cargoes	04	-
3	Cargo Handling Equipments & Safety	12	-
4	How Cargoes are Stowed and Separation	12	-
5	Basic Knowledge of Dangerous Cargoes	10	-
6	Knowledge of Ropes, Wires, Derricks, Cranes, Tackles.	10	30
7	Anchors, Anchoring/Mooring and Basic Maneuvering of Ships	06	-
	Total	**60**	**30**

Summary Syllabus

1. General Description of Cargoes (06 hours)

- Container Cargo
  - Arrangement of containers on a ship.
  - Brief description of the sequence of operations during discharging and loading at a terminal.
  - planning a container stow
  - Methods of securing containers on deck.
  - Types and sizes of container in use.
- Bulk Cargo
- Liquid / Gas Cargo
- General Cargo
- Reefer Cargo
- IMDG

2. Securing Cargoes (04 hours)

- Need for solid slow and security of all cargoes.
- Cargo liable to slide during rolling, such as steel rails, would be stowed fore and aft.
- Methods of blocking, lashing, shoring and tombing cargo
- Methods of securing cargo resulting from part discharge before making a sea passage.
- Methods of securing heavy loads and heavy lifts.
- Methods of stowing and securing vehicles and trailers.
- Ship's cargo securing arrangements manual.

3. Cargo Handling Equipments & Safety (12 hours)

- Cargo Handling Equipment
  - The care and maintenance of :
    standing rigging
    topping lifts, cargo runners, guys and preventers
    cargo blocks and topping lift blocks
    derrick heel fittings
  - Rigging of derricks for loading and discharging cargo :
    using married falls (union purchase), by single swinging derrick
  - Setting up guys and preventers for working with married falls.
  - Ship's rigging plan and limitations and effect of angles between runners.
  - How to change the rig from single runners to gun tackles.
  - How to top and lower derricks safely.
  - Means of securing derricks for sea.
  - Use of slings, snotters, canvas slings, trays, pallets, nets, chain slings, cant hooks, bale hooks and vehicle slings. s.
  - Advantages and disadvantages of ship's cranes and derricks for handling cargo
  - Precautions to be taken when fork-lift trucks or similar devices are used in the tween decks or holds.
- Cargo Handling Safety
  - Inspection of cargo gear and awareness of test certifications and registration.
  - Safe working load.
  - Inspection of ropes, wires, blocks and loose gear
  - When to replace a cargo runner
  - Openning and closing of hatch covers, and safety precautions.
  - Explains that unattended portable lights are potential fire hazards.

4. Cargoes are Stowed and Separation (12 hours)

- Cargo Care
  - Inspection and Preparation of Holds
- Segregation and Separation of Cargoes

5. Basic Knowledge of Dangerous Cargoes (10 hours)

- Classification of dangerous goods in the International Maritime Dangerous Goods (IMDG) Code.
- Properties, characteristics and physical state of the different substances, materials and articles covered by the 9 classes of the IMDG Code.
- Labeling and placarding of dangerous goods as required by the IMDG Code and DGs in limited quantities, eg. Schedule 18
- Actions to be taken in case of Emergency

6. Knowledge of Ropes, Wires, Derricks, Cranes, Tackles (10 hours)

- Blocks, hooks & shackles.
- Ropes and wires, compare natural and manmade fibre.
- Safe working load, proof load and breaking stress.
- Rigging and use of tackles.
- Rigging of derricks, hauling/lifting stresses, precautions while using derricks.
- Compare the derricks with cranes.

7. Anchors, Anchoring/Mooring and Basic Maneuvering of Ships (06 hours)

- The types of anchors, cables & joining links including the stowage.
- General principles of anchoring.
- Mooring ropes and configuration of m/ropes in safe mooring alongside.
- Ships maneuvering giving a simple examples.

<u>List of Practicals: (30 hours)</u>

1. Ropes, Rope Work, Types of ropes, Structure of ropes.
2. Knots and Splicing
3. Method of tying ropes, Ropes and Tackles rigging
4. Anchoring maneuvering
5. Safety & emergency
6. Lunching and handling of survival craft, Practical equipment and all appliances
7. Rope tackles rigging, Rigging of stages, Bousum chair, Manipulating gen-lines
8. Use of mooring rope & stoppers
9. Demonstration ability to make the knots, bend and hitches commonly used at sea and know examples of their use.

Recommended Text Books :

1. International Safety Guide for Oil Tankers & Terminals, 4th ed.; ICS/OCIMF. London, Witherby & Co. Ltd., 1996.
2. Shipboard Operations; H I Lavery, 2nd ed. London, Heinemann, 1990.
3. Tanker Operations – A Handbook for the Ship's Officer; G S Morton, 3rd ed. 1992.
4. Cargowork; L G Taylor, 12th ed. Glasgow, Brown, Son & Ferguson Ltd. 1992.
5. Stowage: The Properties and Stowage of Cargoes; R E Thomas, 3rd ed. Glasgow, Brown, Son & Ferguson, 1996.
6. Code of Safe Working Practices for Merchant Seamen, London;l The Stationery Office Publications Centre, 1998.
7. International Maritime Dangerous Goods Code; (IMDG Code) (1990 edition)
8. Code of Safe Practice for Solid Bulk Cargoes; (BC Code), (IMO Sales No. 260)
9. International Convention for the Prevention of Pollution from Ships 1973/78; (MARPOL), (IMO Sales No. 525)
10. Merchant Ship Construction; D A Taylor, 2nd ed. London, Butterworth, 1985.
11. International Safety Guide for Oil Tankers and Terminals (ISGOTT); Witherby (4th ed.) London, , 1995.
12. Code of Safe Working Practices for Merchant Seamen, London; The Stationery Office Publications Centre, 1998.
13. . Seamanship; G Danton, 11th Ed.1996.

7. DNS 102 General Ship Knowledge

Subject Code : DNS 102			Division: Mech. Eng. Tech. & Maritime Studies		
Title : General Ship Knowledge					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	-	2	-	-
Method of Assessment :- 3 Hrs Question Paper					

General Objectives

On completion of this module the Student should be able to:

- identify the general arrangement of a Ship
- perform preliminary calculation of stability of a ship

No	Subject Outline	Lecture (hr.)	Practical (hr.)
1	Ship Dimensions & Form	08	-
2	Rudder, Propellers & Steering Gear	04	-
3	Load Line & Draught Marks	02	-
4	Basic Terminology and Displacement Buoyancy	04	-
5	Buoyancy	02	-
6	Representation of Hullform	02	-
7	Form Coefficient	04	-
8	Hydrostatic Particulars	04	-
9	Estimation of Hydrostatics Particulars	10	-
10	Fresh Water Allowance	04	-
11	Initial Stability	06	-
12	Movement of the Centre of Gravity	10	-
	Total	**60**	**00**

Summary Syllabus

1. Ship Dimensions & Form (08 hours)

- Ship types:
  - general cargo, tankers, ,bulk carriers, combination carriers
  - container, ro-ro
  - passenger
  - Elevation of a general cargo ship, showing holds, engine-room, peak tanks, double-bottom tanks, hatchways and position of bulkheads.
  - Elevation of a typical crude oil carrier, showing bulkheads, cofferdams, pump-room, bunker and peak tanks, cargo tanks and permanent ballast tanks.
  - Defines and illustrates dimensional specifi9cation and terminology

2. Rudder, Propellers & Steering Gear (04 hours)

- Action of rudder in steering a ship.
- Outline description of steering gear.

3. Load Line & Draught Marks (02hours)

- Deck line and marked.
- Define free board.
- Demonstrate how to read draughts.
- Define free board

4. Basic Terminology and Displacement (04 hours)

- Volume and displacement
- 'Light displacement' and 'load displacement'.
- 'Dead weight'.
- Deadweight scale

5. Buoyancy (02 hours)

- Buoyancy and center of buoyancy.
- Reserve buoyancy.
- importance of reserve buoyancy.
- purpose of load lines.

6. Representation of Hullform (02 hours)

- Importance of hullform representation
- Waterlines, Buttock lines, Offset tables etc.
- Body sections and Waterplane Sections
- Drawings of ship hull representation
- Profile plan, Body plan and Waterline plan
- Example Lines Plan of a ship

7. Form Coefficient (02 hours)

- Waterplane area coefficient(C_w), midship area coefficient (C_m), Block coefficient (C_b)and prismatic coefficient(C_p).
- Displacement from given C_b and dimensions.

8. Hydrostatic Particulars (04 hours)

- Definitions and explain how to calculate
- Waterplane areas,
- Longitudinal center of floatation LCF,
- Tonnes per centimeter immersion TPC,
- Height to vertical center of buoyancy KB,
- Distance to the longitudinal center of buoyancy LCB,

9. Estimation of Hydrostatics Particulars (10 hours)

- Simpson's first Rule, Simpson's Second Rule and Simpson's 3rd Rule
- Use of Simpson's first Rule to calculate area and LCF of a waterplane – Working

10. Fresh Water Allowance (04 hours)

- Fresh water allowances.
- States that the additional draught is called the fresh water allowance (FWA).
- Problems involving FWA and TPC
- TPC for dock water.

11. Initial Stability (06 hours)

- Assumption on Initial Stability
- Defines the transverse metacentre (M)
- Indicates G, B, Z and M.
- Stable, Unstable and Neutral Equilibrium condition of a ship
- For small angles of heel (θ), GZ = GM x Sin θ..

12. Movement of the Centre of Gravity (10 hours)

- Effect on center of gravity of the ships due to mass movement
  - Vertically
  - Transversely
  - Diagonally
- Angle of heel due to movement of center of gravity of the ship
- Effect of suspended masses to the center of gravity of the ship
- Angle of heel due to suspended mass
- Discharging given masses at stated positions.
- Change in KG during a passage

<u>Recommended Text Books</u>

1. Mechant Ship Construction; D A Taylor, 2nd ed. London, Butterworth, 1985.
2. Ship Construction for Marine Students; E A Stokoe, Reed Publication Ltd.
3. Ship Stability for Masters and Mates; Derrett, 4th ed. London Stanford Maritime, 1984.
4. Naval Architecture for Marine Engineers; E A Stokoe, Vol. 4, Reed Publication Ltd.
5. Merchant Ship Stability; Butterworth.

8. DNS 103 Marine Operation I

Code : DNS 103			Division: Mechanical Eng. & Maritime Studies		
Title : Marine Operation I					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	30	2	-	1
Method of Assessment : - 3 Hour Question Paper					

General Objectives

On completion of this module, the students will be able to:

- gain knowledge of the International regulations for Preventions collisions at Sea (COLREG 1972)
- apply them when in charge of navigational watch.
- acquire a knowledge of communication – Morse Code, Flags, SOLAS, MARPOL and emergency procedures.

No	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Ship Personnel Duties and Responsibilities	04	-
2.	Knowledge of Ships Navigation Lights, Sound Signals and ROR	32	30
3.	Personnel Conduct and Health.	05	-
4.	Basic Knowledge on IMO Conventions.	14	-
5.	Precautions Before Entering Enclosed or Contaminated Spaces (2 hours)	05	-
	Total	**60**	**30**

Summary Syllabus

1. Ship Personnel Duties and Responsibilities (04 hours)

- Duties & responsibilities of navigating officer.

2. Knowledge of Ships Navigation Lights, Sound Signals and ROR (32 hours)

- Arrangement of navigation lights in a ship.
- Other Visual aids to navigation - light houses, beacons, buoys.
- Radio telephone procedures
- Other methods of communication/signaling

3. Personnel Conduct and Health (05 hours)

- Need of Hygiene & general safety on board a ship.
- Importance of Accidental prevention.

4. Basic Knowledge on IMO Conventions (14 hours)

- Basic knowledge of …….26 Annex 1 MARPOL 73/78
  - Key points in typical ship board oil pollution emergency plan SOPEP
  - LSA and arrangements required by CH III of SOLAS.
  - Basic requirements of Fire Fighting Appliances as per SOLAS

5. Precautions Before Entering Enclosed or Contaminated Spaces (05 hours)

- List of potentially dangerous spaces
- Authorization before entry
- Minimum oxygen content should be 21% by volume
- Defines TLV, TWA and STEL
- Permit-to-enter system
- Protective clothing and equipment

List of Practicals : (30 hours)

1. Light signals
2. Flag signals
3. Mouse code

Recommended Text Books :

1. International Safety Guide for Oil Tankers & Terminals, 4th ed. ICS/OCIMF. London, Witherby & Co. Ltd., 1996.
2. Shipboard Operations; H I Lavery, 2nd ed. London, Heinemann, 1990.
3. Tanker Operations – A Handbook for the Ship's Officer; G S Morton, 3rd ed. 1992.
4. Manual of Seamanship, Ministry of Deffence, Directorate of Naval Warfare
5. The Boatswain's Manual; Capt. A G W. Miller
6. Collision Avoidance Rules; A N Cockcroft and J N F Lameijer
7. A Seaman's Guide to the Rules of the Road.
8. International Code of Signals- IMO

9. DNS 104 Meteorology I

Subject Code : DNS 104			Division : Mech. Eng. Tech. & Maritime Studies		
Title : Meteorology I					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
2 x 30	-	-	2 x 1	-	-
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module, the students should be able to;

- consider the physical properties of the atmosphere and its phenomena
- apply the knowledge to understand the typical weather at sea and concerning the society

No	Subject Outline	Lecture (hr.)	Practical (hr.)
1	Ship borne Meteorological Instruments	06	-
2	Atmosphere, its Composition and Physical Properties	04	-
3	Atmospheric Pressure	04	-
4	Wind	08	-
5	Cloud and Precipitation	04	-
6	Visibility	06	-
7	The Wind and Pressure Systems Over the Oceans	10	-
8	Structure of Depressions	12	-
9	Weather Services for Shipping	06	-
	Total	**60**	**00**

Summary Syllabus

1. Ship borne Meteorological Instruments (06 hours)

- Basic principle and operation of mercurial barometer, aneroid barometer.
- Thermometer, hygrometer and wind sensors.

2. Atmosphere, its Composition and Physical Properties (04 hours)

- Composition of the earth's atmosphere, vertical temperature profile, Troposphere, tropopause, stratosphere, stratopause, mesosphere, mesopause, and thermosphere
- Solar radiation, insolation,
- Properties of water vapour in the atmosphere, evaporation, condensation, latent heat of vaporization, saturated air, dew point, absolute humidity, relative humidity vapour pressure.

3. Atmospheric Pressure (04 hours)

- Properties of the atmospheric pressure, units.

4. Wind (08 hours)

- The beaufort scale of wind force, pressure gradient force, Coriolis (geostrophic) force.
- Surface wind circulation around high and low pressure centres
- Buys-Ballot's law
- Strength of the wind from the appearance of the sea surface using the beaufort wind scale
- Geostrophic wind scale

5. Cloud and Precipitation (04 hours)

- Formation of clouds
- Condensation nuclei
- Constituents of clouds, ice crystals, super-cooled water droplets water droplets or combination of these
- Basic cloud types
- Precipitation, rain, drizzle, hail, snow, sleet

6. Visibility (06 hours)

- Factors that govern visibility.
- Fog, mist, haze
- Sea smoke and typical areas where sea smoke may be encountered
- Methods of estimating the visibility at sea, by day and by night and the difficulties involved

7. The Wind and Pressure Systems Over the Oceans (10 hours)

- Circulation cells on a rotating earth, mean surface pressure and wind distribution over the earth's surface.
- Characteristics and location of the doldrums, inter tropical convergence zone, trade winds, sub tropical oceanic highs, westerlies and polar easterlies.
- Monsoon regime
- Weather associated with the January and July monsoons of the Indian Ocean, China Sea, north coast of Australia and west coast of Africa.
- Land and Sea Breeze
- Anabatic and katabatic winds, local winds

8. Structure of Depressions (12 hours)

- Air mass, source region
- Warm front, cold front, depressions, stages in the life cycle of a polar front depression
- Weather experienced in cold fronts and warm fronts and frontal depressions and when a cold front meets a warm front and vice versa, weather maps associated with fronts

9. Weather Services for Shipping (06 hours)

- Functions and objectives of the World Meteorological Organization
- Sources of weather information available to shipping, the information flow between merchant ships and Meteorological offices
- Weather bulletin and the contents of each of its section, types of information received by facsimile machine, services provided for storm warnings

Recommended Text Books

1. Maritime Meteorology, 2nd ed. 1997 Thomas Reed Publications.
2. Meteorological Office, Marine Observer's Handbook, 11th ed. London, HMSO, 1995.
3. Meteorological Office, Meteorology for Mariners, 3rd ed. 8th impression , London, 1996.
4. Elementary Meteorology, HMSO.

10. DNS 105 Navigation I

Code : DNS 105			Division: Mechanical Eng. Tech. & Maritime Studies		
Title : Navigation I					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
4 x 30	-	2 x 30	4	-	2
Method of Assessment : - 3 Hours Question Paper					

General Objectives

On completion of this module, students will be able to ;

- understand the fundamentals of navigation
- handle correctly the basic equipment used for navigation
- determine and plot the position of a ship

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	The Earth	12	-
2.	Parallel and Plain Sailing	18	-
3.	Navigational Charts	06	-
4.	The Magnetic Compass	03	-
5.	The Gyro Compass	06	-
6.	The Depth Recorder (Echo sounding machine)	02	-
7.	Distance and Speed Recorder (Ships log)	02	-
8.	Tides	12	02
9.	The Celestial Sphere	24	-
10.	Solar Time	12	03
11.	Obtaining a Position Line from the Observation of a Heavenly Body	09	15
12.	Navigational Charts & Publications and Notices to Mariners	04	-
13.	The Marine Sextant	08	-
14.	The Chronometer	01	-
15.	Finding the Error of the Compass	01	-
	Plotting the Ship's Position – Practical Chart Work	-	40
	Total	**120**	**60**

Summary Syllabus

1. The Earth (12 hours)

- Introduction to navigation and properties of the earth.
- Datums.
- Coordinates of the earth.
- Position and direction on the earth's surface.

2. Parallel and Plain Sailing (18 hours)

- Rhumb line track and the great circle track.
- Rhumb line formulae and short distance sailing.
- Day's work, Practical problems.
- The traverse table.

3. Navigational Charts (06 hours)

- Mercator Chart
  - Cylindrical projection.
  - Scale and graduation.
  - Meridianal parts and D.M.P.
  - Advantages and disadvantages.
  - Three methods of constructing a mercator chart of a given area.
- Gnomonic Chart
  - Gnomonic projection and where used.
  - Transfer from gnomonic chart to mercator chart.
- Advantages and disadvantages

4. The Magnetic Compass (03 hours)

- Introduction to magnetism.
- Terrestrial magnetism.
- The magnetic compass
  - Deviation
  - Variation
- Ship magnetism and its correction.
  - Permanent magnetism
  - Induced magnetism
  - Sub permanent magnetism
  - Swinging ship and deviation table
- Total Compass Error (T.C.E.)

5. The Gyro Compass (06 hours)

- Theory of the gyro compass
  - Rigidity and precession.
  - Apparent motion of a free gyro, drift and tilt
- Undamped gyro.
- Damping.
- Speed error.

6. The Depth Recorder (Echo sounding machine) (02 hours)

- Basic principle.
- Outline of operation.
- Fittings.

7. Distance and Speed Recorder (Ships log) (02 hours)

- Introduction to measurement of speed and distance.
- Pressure type recorder
  - Description.
  - Operation.
- Impeller type recorder
  - Description.
  - Operation.
- Electromagnetic recorder
  - Description.
  - Operation.

8. Tides (12 hours)

- Introduction to tides and tidal streams.
- Gravitational forces.
- Tide raising forces.
- Effect of earth's rotation.
- Tide tables
- Calculation of High water and Low water times standard ports.
- Calculation of High water Low water times at secondary ports.
- Calculation of heights at intermediate times and time for intermediate heights.

9. The Celestial Sphere (24 hours)

- Co-ordinates of the celestial sphere.
- Apparent motion of the celestial hemisphere.
- Apparent path and coordinates.
- Position of heavenly bodies in the celestial sphere.
- Altitude and zenith distance.
- Corrections to sextant altitude: Index error, Dip, Refraction, Semi-diameter, Parallax
- The hour angle; G.H.A.,L.H.A , S.H.A.
- The nautical tables.

10. Solar Time (12 hours)

- Introduction to time keeping.
- Apparent solar day.
- Mean solar day.
- Mean time; GMT, LMT
- Standard time.
- Zone time.

11. Obtaining a Position Line from the Observation of a Heavenly Body (09 hours)

- The PZX triangle in the celestial hemisphere.
- Marc St Helier (intercept) method.
- Haversine formulae and applications.
- Plotting on the navigational charts.
- Other methods of obtaining a celestial position line; Longitude by chronometer, Meridian passage., Ex-meridian passage, Polaris.

12. Navigational Charts & Publications and Notices to Mariners (04 hours)

- Information on charts.
- Catalogue of charts.
- Correction of charts and publications.
- Use of publications.

13. The Marine Sextant (08 hours)

- Introduction to the marine sextant.
- The optical principles.
- Adjustable errors: Error of perpendicularity, Side error, Index error.
- Practical handling.

14. The Chronometer (01 hour)

- Mechanism of the chronometer.
- Care and maintenance.
- Chronometer error.

15. Finding the Error of the Compass (01 hour)

- Bearing amplitude.
- Azimuth.

List of Practicals: (60 hours)

1. Tide (02 hours)
2. Solar Time (03 hours)
3. Obtaining a Position Line from the Observation of a Heavenly Body (15 hours)
4. Plotting the Ship's Position – Practical Chart Work (40 hours)
   - Marking ship's position on the chart and measurement of distance
   - D.R., E.P., Fix and observed position
   - Plotting the ship's track on the chart
   - Terrestrial position line
   - Demonstrate how to use two or more position lines obtained above (6.4) and plot the ship's position at that time Transferred position line (running fix)

Recommended Text Books :

1. Munro's Navigation; Capt. G E Earl and Capt. F L Main
2. Reed's Ocean Navigator (3rd Edition); John F Kemp
3. Home Trade Navigation Guide; Capt. Alexander Simpson
4. Basic Principles of Marine Navigation; D A Moore
5. Principles of Navigation; Capt. P M Sharma
6. Practical Navigation Book I; Capt. H Subramanium
7. Nicholls's Concise Guide Volume 1
8. Marine Electronic Navigation; S F Appleyard
9. Admiralty Manual of Navigation – Vol 1, 2 & 3
10. Nicholls' Concise Guide Volume II

11. DIS 201 English

Subject Code: DIS 201			Division : Interdisciplinary Studies		
Title : English					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	-	2	-	-
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to:

- further develop the language skills of speech, reading, listening and writing with special emphasis on professional and social interaction.

No.	Subject Outline	Lectures (hr.)	Practicals (hr.)
1.	Speech		-
2.	Listening		-
3.	Reading		-
4.	Writing		-
5.	Grammar		-
	Total	**60**	**00**

Summary Syllabus

1. Speech

Oral communication for social interaction
Presentations on academic and general topics with the aid of computers

2. Listening

Further develop listening skills in relation to note-taking mainly
Comprehension of recorded lessons including lectures, speeches dialogues etc,

3. Reading

Further develop the ability of reading comprehension.
A variety of texts including books, magazines, newspapers notices will be presented.
Learn to skim and scan to extract specific information.
To read for research purposes.

4. Writing

Master the skills of correct usage of language skills needed for composition of sentences, paragraphs, essays etc
Taking down notes, writing reports and other activities related to academic work.
Writing business letters, job applications, memos etc. Related to professional activities

5. Grammar

Reinforce competency in grammar related to the above skills

12. DNS 201 Cargo Work & Seamanship II

Subject Code : DNS 201		Division : Mech. Eng. Tech. & Maritime Studies			
Title :Cargo Work & Seamanship II					
Annual Workload			Weekly Workload		
Lectures	Tutorial	Practicals	Lectures	Tutorials	Practicals
90	-	180	3	-	6
Method of Assessment :- 3 Hour Question Paper					

General Objectives :

On completion of this module, the students will be able to:

- identify deck equipment used in the application of deck seamanship
- recognize the safety handling and their purpose.

	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Cargo Care	09	-
2.	Oil Tanker Pumping and Piping Arrangements	04	-
3.	Precautions before Entering Enclosed and Contaminated Spaces	02	-
4.	Cargo Calculations and Cargo Plans	05	-
5.	Principles in Keeping a Navigational Watch	10	-
6.	Effective Bridge Teamwork Procedures	08	-
7.	The Use of Routeing	04	-
8.	Emergencies at Sea and in Port	21	-
9.	Search and Rescue	02	-
10.	Use of International Code of Signals	10	-
11.	Ship Maneuvering and Handling	13	-
12.	Revision	02	-
	Hands-On Practicals in Boat Yard	-	180
	Total	**90**	**180**

Summary Syllabus

1. Cargo Care (09 hours)

Inspection and preparation of holds
- Cleaning , dunnaging and general preparation for dry cargoes.
- Detecting damage or deficiencies to cargo.
- Detecting damages to cargo holds, hatch coamings and covers, access ladders to cargo spaces

Segregation and separation of cargoes.
Protecting of cargoes from damage from other cargoes.
Methods of separation and port marking to avoid over carriage.
Ventilation and control of sweat.
Refrigerated cargo.
Dangerous, hazardous and harmful cargoes.
Cargo handling equipment and safety.
Deep tank cargoes.

2. Oil Tanker Pumping and Piping Arrangements (04 hours)

General arrangement of oil tankers.

3. Precautions before Entering Enclosed or Contaminated Spaces (02 hours)

Collapse due to lack of Oxygen.
Dangers of toxic gases.
Correct procedure of measurement using correct instruments.

4. Cargo Calculations and Cargo Plans (05 hours)

Stowage factor.
Broken stowage.
Deck loading- load density.

5. Principles in Keeping a Navigational Watch (10 hours)

Keeping a effective deck watch in port under normal circumstances.
Rigging and lighting of gangways.
Fencing of openings.
Provision of safe walkways on deck.
Safety of cargo operations.
Keeping a safe deck watch in port when carrying hazardous cargo.

6. Effective Bridge Teamwork Procedures (08 hours)

All ship's personal who have bridge navigational watch duties are part of a bridge team.
Working together of the bridge team including Pilots.
Communications with the engine room and other operating areas of the vessel.
Clear method of master taking over the watch from OOW.
Duties should be clearly assigned.
Proper understanding of duties.
Effective co-ordination of activities and communications during emergencies.
Importance of well understood bridge plan.

7. The Use of Routeing (04 hours.)

8. Emergencies at Sea and in Port (21 hours)

Contingency plans for response to emergencies.
Precautions of the protection and safety of passengers in emergency situations.
Initial action following collision or grounding
Precautions to be taken when beaching a vessel
Actions to be taken on stranding.
Actions to be taken following a collision.
Means of limiting damage and salving the ship following a fire or explosion.
Procedure for abandoning ship.
Use of auxiliary steering gear.
Rescuing persons from the sea, assisting a ship in distress, and port emergencies
Rescue of persons from a vessel in distress or from a wreck
Action to be taken when emergencies arise in port
Measures for assisting a vessel in distress

9. Search and Rescue (02 hours)

The use of MERSAR

10. Use of International Code of Signals (10 hrs)

11. Ship Maneuvering and Handling (13 hours)

The effects of various deadweights,drafts, trim,speed and UKC on turning circles and Stopping distances.
Effect of wind and current on ship handling.
Manoeuvres for the rescue of a man overboard.
Squat and shallow water and similar effects.
Proper procedures for anchoring and mooring.

12. Revision (02 hours)

<u>List of Practicals</u>: (180 hours)

1. Boat Handling
2. Rowing
3. Boat Handling with Engine
4. Anchoring and Maneuvering
5. Practicals in Man Over Board (Boat Handling)
6. Operation of Survival Equipment
7. Use of Emergency Boat at Sea (Practicals Carried at River)
8. Life Boat and Contents (Survival Craft)
9. Demonstration of the Ability to Check the Equipment in the Life Craft.
10. Launching Life Boat (Survival Craft)
11. Radio Communication

<u>Recommended Text Books :</u>

14. International Safety Guide for Oil Tankers & Terminals; 4th ed. ICS/OCIMF. London, Witherby & Co. Ltd., 1996.
15. Shipboard Operations; H I Lavery, 2nd ed. London, Heinemann, 1990.

16. Tanker Operations – A Handbook for the Ship's Officer; G S Morton, 3rd ed. 1992.
17. Cargo work,; L G Taylor, 12th ed. Glasgow, Brown, Son & Ferguson Ltd. 1992.
18. Stowage : The Properties and Stowage of Cargoes; R E Thomas, 3rd ed. Glasgow, Brown, Son & Ferguson, 1996.
19. Code of Safe Working Practices for Merchant Seamen, London, The Stationery Office Publications Centre, 1998.
20. International Maritime Dangerous Goods Code (IMDG Code) (1990 edition)
21. Code of Safe Practice for Solid Bulk Cargoes (BC Code), (IMO Sales No. 260)
22. International Convention for the Prevention of Pollution from Ships 1973/78 (MARPOL), (IMO Sales No. 525)
23. Merchant Ship Construction; D A Taylor, 2nd ed. London, Butterworth, 1985.
24. International Safety Guide for Oil Tankers and Terminals (ISGOTT); Witherby 4th ed. London, 1995.
25. Code of Safe Working Practices for Merchant Seamen, London, The Stationery Office Publications Centre, 1998.
26. Seamanship; G Danton.. 11th Ed/1996
27. Behaviour and handling of ships; H H Hooyer., Cornell maritime press.
28. ICS Bridge procedure guide
29. ICS Perils at sea and salvage
30. MERSAR manual (IMO)
31. Ship handlers guide – The nautical institute
32. Bridge team management, a practical guide - The nautical institute
33. ICS Ship's routeing guide
34. The Mariner's handbook – NP100
35. Squat and interaction manoeuvring – The nautical institute.

13. DNS 202 Electronic Navigation Systems

Subject Code: DNS 202			Division: Mech. Eng. Tech. & Maritime Studies		
Title: Electronic Navigation Systems					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	-	2	-	-
Method of Assessment: - 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to demonstrate level of knowledge related to Electronic Navigation Aids onboard and using them to the maximum capacity for safe navigation of the vessel.

No.	Subject Outline	Lecture (hr.)	IMO Module Page Ref
1	Radar	20	1.3.1,70
2	Electronic Systems of Position Fixing	14	1.1.3,50,51
3	Echo Sounders and Speed Measurement	08	1.1.3,51,52
4	Magnetic and Gyro Compass	04	1.1.3,53,54
5	Radio Direction Finder	08	NA
6	GMDSS	03	NA
7	Navtex Messages	01	1.1.7,61,62
8	ECDIS	02	1.1.2,47
	Total	**60**	

Summary Syllabus

1. Radar (20 hours)

Radar fundamentals, principles and components
Setting up and Monitoring of Targets and Critical Echoes
Use of Range and Bearings
RAMARK and RACON. ARPA Principles
Radar plotting
Radar plotting and Exercises
Radar errors
Simple block diagram of a Radar
Cathode ray tube
Comparison of a radar picture to a navigational chart

2. Electronic Systems of Position Fixing (14 hours)

Hyperbola and use of Hyperbola in Navigational Aids
Principles of Loran, Decca and Omega Navigator
History of Satellite Navigation and Satellite Navigator Systems
Practical use of Satellite Navigator
Global Positioning Satellite and its use onboard
Differential GPS

3. Echo Sounders and Speed Measurement (08 hours)

Echo sounder and it's use.
Errors in an Echo Sounder.
Doppler effect and Doppler Log
Use of Doppler log onboard
Block diagram of a echo sounder

4. Magnetic and Gyro Compass (04 hours)

Free Gyroscope and how its principle used in a gyro
Gyro Compass,its use and gyro errors
Magnetic compass and its principle and use onboard

5. Radio Direction Finder (08 hours)

Radio Direction Finder and Principles
Single and Double loop Aerial
Goniometry, Automatic DF, use of DF and Errors
Simple block diagram of a DF
How DF errors are corrected
Extinction of DF

6. GMDSS (03 hours)

GMDSS and its use including a diagram to show how it covers the world
Other communication facilities available onboard

7. Navtex Messages (01 hours)

Use of navtex messages

8. ECDIS (02 hours)

Usefulness of the ECDIS
How ECDIS is connected in a integrated bridge system
Charts used in a ECDIS and how are they corrected

Recommended Text Books

1. Ship borne Radar; Capt H Subramanium
2. Radar and electronic navigation; G J Sonnenberg
3. Also Internet for latest navigational equipments

14. DNS 203 Marine Operation II

Subject Code : DNS 203			Division: Mech. Eng. Tech. & Maritime Studies		
Title : Marine Operation II					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	60	2	-	2
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to demonstrate level of knowledge on matters relating to administering a vessel with due regard to Authorities, Rules and Regulations, that are applicable for Trading in international waters.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1.	Clearing a Ship in Port (Arr and Dep)	2.5	-
2.	Principles of Chartering and Chartering of Ships	3.0	-
3.	Marine Insurance	3.0	-
4.	Registration of Ships	2.5	-
5.	Shipping Business	3.0	-
6.	National Maritime Law	3.0	-
7.	International Bodies in Shipping	3.0	-
8.	National Shipping Bodies	3.0	-
9.	Costing and Budgeting onboard	3.0	-
10.	Port Administration	2.5	-
11.	Shipping Administration	3.0	-
12.	Shipping Developments	3.0	-
13.	Developments in Maritime Transportation	3.0	-
14.	Tariffs and Trade	2.5	-
15.	Ship to Ship Communications	3.0	-
16.	IMO Standard Vocabulary	3.0	-
17.	International Code of Signals	3.0	-
18.	Use of Flow charts etc Onboard	2.5	-
19.	Use of Computers Onboard	2.5	-
20.	Salvage	3.0	-
21.	Carriage of Goods by Sea	3.0	-
	Hand-on Practicals in Seamanship Work Shop	-	60
	Total	**60**	**60**

Summary Syllabus

1. **Clearing a Ship in Port (2.5 hours)**

   Procedures involved in clearing a ship in a port at arrival and departure

2. **Principles of Chartering and Chartering of Ships (03 hours)**

   Chartering terms
   Principles of chartering
   Chartering of ships

3. **Marine Insurance (03 hours)**

   Purpose of Marine Insurance
   Procedures

4. **Registration of Ships (2.5 hours)**

   Purpose of registration of ships
   Procedure

5. **Shipping Business (03 hours)**

   Stakeholders in the shipping business
   Functions performed by different parties

6. **National Maritime Law (03 hours)**

   Authorities involved in formulating and implementing National Maritime laws
   National Maritime laws and their purposes

7. **International bodies in Shipping (03 hours)**

   International bodies in Shipping
   Functions of International bodies in Shipping

8. **National Shipping Bodies (03 hours)**

   National Shipping Bodies
   Functions of National Shipping Bodies

9. **Costing and budgeting onboard (03 hours)**

   Elements of costing and budgeting onboard

10. **Port Administration (2.5 hours)**

    Functions and duties involved in Port Administration

11. **Shipping Administration (03 hours)**

    Functions involved in Shipping Administration

12. **Shipping Developments (03 hours)**

    Current and future Shipping Developments

13. **Developments in Maritime Transportation (03 hours)**

    Developments in Maritime transportation
    Its effect on Sri Lanka and its Seamen

14. **Tariffs and Trade (2.5 hours)**

    General Agreements on Tariffs and Trade

15. Ship to Ship Communications (03 hours)

Ship to Ship Communications

16. IMO Standard Vocabulary (03 hours)

IMO Standard Vocabulary

17. International Code of Signals (03 hours)

International Code of Signals

18. Use of Flow Charts etc onboard (2.5 hours)

Use of Flow charts etc onboard

19. Use of Computers onboard (2.5 hours)

Use of Computers onboard including simulation

20. Salvage (03 hours)

Salvage operations and procedures

21. Carriage of Goods by Sea (03 hours)

Carriage of Goods by Sea

List of Practicals: (60 hrs)

- Light Signals
- Flag Signals
- Morse Code Signals
- Fog Signal etc.
- Fog Sounds

Recommended Text Books:

List to be added

15. DNS 204 Meteorology II

Subject Code : DNS 204			Division: Mech. Eng. Tech. & Maritime Studies		
Title : Meteorology II					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	-	2	-	-
Method of Assessment :- 3 Hour Question Paper					

General Objective-

On completion of this module the student will be able to:

- Acquire a sufficient knowledge to understand weather and its effect on the ships and also use meteorological equipments available onboard.

No	Subject Outline	Lecture (hr.)	IMO Module Page Ref
1	Weather Codes	06	1. 1.7,61
2	Visual Storm Signals	03	1. 1.7,61
3	Sea Surface Currents in the Arabian Sea and the Bay of Bengal	03	1.1.2,50
4	Cyclostrophic Force	03	NA
5	Comparison Between a TRS and a Temperate Latitude Depression	03	NA
6	Stability of Air	03	NA
7	Ice at Sea	04	NA
8	The International Ice Patrol	03	NA
9	Air Masses and Fronts	06	1. 1.7,60
10	Frontal Depressions	04	1. 1.7,60
11	Ocean Currents	04	1.1.2,50
12	Thunderstorms	03	1. 1.7,60,61
13	More Local Winds	03	1.1.7,60,61
14	Optical Phenomena	03	NA
15	The Facsimile Recorder	03	1. 1.7,60,61
16	Routeing of Ships	06	1.2.3,69
	Total	**60**	

Summary Syllabus

1. Weather Codes (06 hours)

The ships weather codes (FM 13 – VII)
Land station reports (FM 12- VII) or the SYNOP code
MAJOR Code (FM 61-IV)
The international Analysis code (Fleet)(FM 46-IV)
Important points when making weather reports
Examples of coding and decoding weather reports.

2. Visual Storm Signals (03 hours)

General idea and description of various storm signals used in different ports and their meaning.

3. Sea surface Currents in the Arabian Sea and the Bay of Bengal (03 hours)

General idea of the three distinct phases - during northeast monsoon, late northeast monsoon and the southwest monsoon.

4. Cyclostrophic Force (03 hours)

General idea of

- why winds in a TRS move spirally inwards
- why there is no wind at the eye of a TRS
- why maximum wind speed occurs in the eye wall
- how Buy's Ballots law was derived.

5. Comparison between a TRS and a Temperate Latitude Depression (03 hours)

Compare and explain a TRS and a temperate latitude depression

6. Stability of Air (03 hours)

Absolute stability of air
Absolute instability air
Conditional stability air
Neutral equilibrium of air

7. Ice at Sea (04 hours)

General idea, Sea ice, ice bergs, glacier origin and ice shelf origin
Their description, difference, movement, diminution and visibility.
Probable indications of a ice berg in the vicinity, class of ice bergs by international ice patrols, ice terms in use, ice limits

8. The International Ice Patrol (03 hours)

Brief history, membership, functions, aims, objects, ice reports

9. Air Masses and Fronts (06 hours)

Definition of an air mass
Factors affecting its properties
Class of air masses
Definition of a front, how a front is detected by weathermen, warm and cold fronts

10. Frontal Depressions (04 hours)

Detailed description of formation of a frontal depression
Weather patterns associated with a frontal depression such as a warm front, warm sector, cold front, occlusions warm and cold

11. Ocean Currents (04 hours)

Causes of ocean currents like drift, upwelling, and gradient, warm and cold current with examples
General circulation of currents in different oceans and seas.

12. Thunderstorms(03 hours)

General idea and description
Favorable conditions for formation
Precautions against lightning that is associated with thunderstorms and associated weather in thunderstorms.

13. More Local Winds (03 hours)

Tornado and waterspout, bora, gregale, harmattan, levanter, mistral, pampero, roaring forties, scirocco, shamal, southerly buster, Sumatra

14. Optical Phenomena (03 hours)

Corona,halo, rainbow,st. elmo's fire,mirage inferior and superior

15. The Facsimile Recorder (03 hours)

General description, advantages, coverage
Types of charts and different equipments.

16. Routing of Ships (06 hours)

Definition, advantages, influencing factors like distance, ocean currents, wind, waves, ice, fog, temperature
The difference between climatological and weather routing
How routing became possible
Routing organizations and their use
Masters responsibility and his choice

<u>Recommended Text Books :</u>

1. Marine Meteorology Book 2; Capt. H Subramaniam
2. Any publication approved; WMO
3. Admiralty pilot volumes

16. DNS 205 Navigation II (Celestial)

Code : DNS 205			Division: Mechanical Eng. Tech. & Maritime Studies		
Title : Navigation II (Celestial)					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	90	2	-	3
Method of Assessment : - 03 Hour Question Paper					

General Objectives

On completion of this module students will be able to ;

- understand the fundamentals of navigation.
- handle correctly and use the sextant and chronometer.
- determine and plot the position of the ship, by the use of position lines obtained from heavenly bodies.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1	Solar System	08	-
2	Celestial Sphere & Nautical Astronomy	18	-
3	Marine Sextant	09	06
4	Time & Equation of Time	04	06
5	Latitude by Meridian Altitude	04	09
6	Pole Star Observation	04	09
7	Celestial Position Line and Position Fixing – Marc St. Hellier Method	07	49
8	Circumpolar Bodies – Upper and Lower Meridian Passage	03	02
9	Finding the Error of the Compass – Amplitude and Bearing of Celestial Bodies	02	05
10	Rising and Setting Sun	01	04
	Total	**60**	**90**

Summary Syllabus

1. The Solar System (08 hours)

Composition and dimensions.
Earth's orbital motion and Kepler's laws of planetary motion.
The ecliptic and coordinates.
Day and night and seasons.

2. The Celestial Sphere (18 hours)

Revision of First year syllabus - coordinates and positions of heavenly bodies.
Figure drawing
'd' and 'v' correction.
Eclipses:
Earth moon system
Relative motion of planets

3. The Marine Sextant (9 hours)

Revise the optical and geometric principles.
Horizontal and vertical sextant angles.
Practical handling of the sextant:

- Checking and correcting errors.
- Observation of altitude, horizontal and vertical sextant angles.

4. Time and Equation of Time (4 hours)

Apparent solar day.
Mean solar day.
L.M.T., G.M.T., Scandart time and Zone time.
Apparent time, Mean time and caution of time.
Calculations – Practicals.

5. Latitude by Meridian Altitude (4 hours)

Culmination of heavenly bodies.
Calculation of the observer's latitude.
Solve problems.

6. Pole Star Observation (4 hours)

Position of pole star and its significance.
Different corrections – a^0, a^1, a^2.
Calculate the observer's latitude and direction of P/L

7. Celestial Position Line and Position Fixing (07 hours)

PZX triangle in the celestial hemisphere.
Marc St. Hellier (Intercept) method to obtain a P/L.
Haversine formulae.
Calculate intercept and bearing of heavenly bodies.
Plotting on the chart.

8. Circumpolar Bodies - Upper and lower meridian passage (03 hours)

Culmination – Upper and lower meridians.
Method for obtaining observer's latitude and the declination of a heavenly body.
Proof.

9. Finding the error of the compass by bearing amplitude (sun) method or by bearings of heavenly bodies. (02 hours)

Methods used:
- Bearing amplitude
- Bearings of heavenly bodies.

Amplitude.
Calculations using Norie's tables.
Solve problems.
Use of the Haversine formulae.

10. Rising and Setting of the Sun (01 hour)

Theoretical and visible sunrise / sunset.
Twilight:
- Civil twilight.
- Nautical twilight.
- Astronomical twilight.

<u>List of Praticals:</u> (90 hours)

1. Marine Sextant
2. Time & Equation of Time
3. Latitude by Meridian Altitude
4. Pole Star Observation
5. Celestial Position Line and position fixing – Marc St. Hellier Method
6. Circumpolar bodies – upper and lower meridian passage
7. Finding the error of the compass – Amplitude and bearing of celestial bodies
8. Rising and setting sun

<u>Recommended Text Books</u> :

11. Munro's Navigation;Capt. G E Earl and Capt. F L Main
12. Reed's Ocean Navigator (3rd Edition); John F Kemp
13. Home Trade Navigation Guide; Capt. Alexander Simpson
14. Basic Principles of Marine Navigation; D A Moore
15. Principles of Navigation; Capt. P M Sharma
16. Practical Navigation Book I; Capt. H Subramanium
17. Nicholls's Concise Guide Volume 1
18. Marine Electronic Navigation; S F Appleyard
19. Admiralty Manual of Navigation – Vol 1, 2 & 3
20. Nicholls' Concise Guide Volume II
21. Principles Navigation for Second Mates;T G Jones

17. DNS 206 Navigation II (Coastal)

Code : DNS 206			Division: Mechanical Eng. Tech. & Maritime Studies		
Title : Navigation II (Coastal)					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
30	-	90	1	-	3
Method of Assessment : - 3 Hour Question Paper					

General Objectives

On completion of this module students will be able to;

- understand the fundamentals of terrestrial navigation.
- plan and conduct a passage and determine the position of the ship using terrestrial objects.

No.	Subject Outline	Lecture (hr.)	Practical (hr.)
1	Chart Symbols, Abbreviations, Lights, Beacons and IALA System of Buoyage	19	-
2	Passage Planning.	04	-
3	Tides.	04	16
4	Great Circle Sailing – Initial Course, Final Course and Distance.	01	07
5	Mercator Sailing.	-	06
6	Keeping a Ship's Log.	02	01
7	Practical Chart Work Exercises.	-	60
	Total	**30**	**90**

Summary Syllabus

1. Chart Symbols, Abbreviations, Lights, Beacons and IALA System of Buoyage (19 hrs)

Identifying and reading information on charts:

- Abbreviations.
- Symbols.
- Colours.

Lights:

- List of lights and index chart.
- Different ranges.
- Types, characteristics and details of lights.
- Colours.

Lateral and IALA system of buoyage:

- Shapes, colours and top marks and purpose.
- Cardinal system, day marks, colours and lights.

2. Passage Planning (04 hours)

Introduction to passage planning.
Components and segments of passage planning.
Various publications and bridge note book.
Pilot, relationship and responsibility.
Chart exercises – Planning passages.

3. Tides (04 hours)

Revision of First year syllabus.
Definitions.
Secondary ports tide calculations.
Practical problems – Standard and secondary ports.

4. Great Circle Sailing (01 hour)

G.C. track and the PZX triangle of the celestial hemisphere.
Use of haversine formulae to calculate initial and final course and the distance.
The vertex and the composite track.

5. Keeping a Ship's Log (02 hours)

Log books maintained in a vessel.
Ship's log book and compilation.

List of Practicals: (90 hours)

1. Chart Work Exercises
   - Revision of plotting problems of First year.
   - Position fixing by different methods and plotting the ships track.
   - Allowance for ocean currents and total streams and lee way.
   - Tidal tables on the chart.
   - Raising and dipping lights.
   - Horizontal sextant angles and vertical sextant angles.
   - Clearing marks.
2. Tides
3. Great circle sailing – Initial course, final course and distance
4. Mercator Sailings
   - Meridianal parts and D.M.P.
   - Mercator sailing triangle and formulae.
   - Calculate course and distance.
   - Calculate arrived position.
5. Keeping a ship's log

Recommended Text Books :

1. Munro's Navigation; Capt. G E Earl and Capt. F L Main
2. Home Trade Navigation Guide; Capt. Alexander Simpson
3. Basic Principles of Marine Navigation; D A Moore
4. Marine Chart Work (Second Edition); D A Moore
5. Principles of Navigation; Capt. P M Sharma
6. Practical Navigation Book I; Capt. H Subramanium
7. Nicholls' Concise Guide Volume I
8. Marine Electronic Navigation; S F Appleyard
9. Admiralty Manual of Navigation – Vol 1, 2 & 3
10. Nicholls' Concise Guide Volume II

18. DNS 207 Ship Construction

Subject Code : DMR 206			Division: Mech. Eng. Tech. & Maritime Studies		
Title : Ship Construction					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	-	2	-	-
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to demonstrate level of knowledge related to;

- the constructional details of different types of ship.
- purpose, function and details of major and minor structural items.
- procedures, rules and regulations governing construction and maintenance of ships.

	Subject Outline	Lecture (hr.)	Practical (hr.)
1	Shipyard Practice	02	
2	Ship Stresses	04	
3	Ship Building Materials	02	
4	Welding and Cutting Processes	04	
5	Hull Structure	08	
6	Bow and Stern	06	
7	Minor Structural Items	04	
8	Fittings	04	
9	Ships Carrying Special Cargoes	04	
10	Rudder and Propeller	04	
11	Corrosion and its Prevention	06	
12	Organisations and Regulations	04	
13	Load Lines and Draught Marks	04	
14	Surveys and Maintenance	04	
	Total	**60**	

Summary Syllabus.

1. Shipyard Practice (02 hours)

Drawing office
Lines drawing
Fabrication
Assembly
Launching

2. Ship Stresses (08 hours)

Forces and moments acting
Sagging and hogging effects
Racking
Panting and pounding
Localized loading
Measurement and analysis of stresses

3. Ship Building Materials (02 hours)

Materials used in ship construction
Standard rolled steel sections

4. Welding and Cutting Processes (04 hours)

Welding processes
Testing of welds
Cutting processes

5. Hull Structure (08 hours)

Keel and bottom construction
Framing systems
Shell and deck plating
Bulkheads
Bilge keels

6. Bow and Stern (06 hours)

Constructional details of forward end and after end structure
Functions of various items

7. Minor Structural Items (04 hours)

Shaft tunnel
Deep tanks
Watertight doors

8. Ships Carrying Special Cargoes (04 hours)

Oil tankers
Bulk carriers
Liquefied gas carriers
Container ships

9. Fittings (06 hours)

Hatches and hatch covers
Mooring and anchoring arrangements
Masts, derricks and deck cranes
Sounding pipes, air pipes
Carriage of containers on deck

10. Rudder and Propeller (04 hours)

Action of rudder
Rudder types
Constructional details of rudders
Principle of propulsion
Propeller types
Constructional details of propellers
Stern tube and tail shafts

11. Corrosion and its Prevention (06 hours)

Corrosion
Corrosion control
Paint systems

12. Organisations and Regulations (04 hours)

Classification societies
IMO
Other organizations and authorities involved in shipping

13. Load Lines and Draught Marks (04 hours)

Freeboard, load line marks
Draughts
Tonnage

14. Surveys and Maintenance (04 hours)

Surveys
Examinations in dry dock

List of Practicals :

Nil

Recommended Text Books :

1. Merchant Ship Construction; D A Taylor
2. Ship Construction; D J Eyres
3. Ship Construction Sketches and notes; J F Kemp and P Young
4. Reed's Ship Construction for Marine Students; Stokoe and Embleton
5. Ship Design and Construction; A M D'Arcangelo
6. Merchant Ship Construction; H J Pursey

19. DNS 208 Ship Stability

Subject Code : DNS 208			Division: Mech. Eng. Tech. & Maritime Studies		
Title : Ship Stability					
Annual Workload			Weekly Workload		
Lectures	Tutorials	Practicals	Lectures	Tutorials	Practicals
60	-	-	2	-	-
Method of Assessment :- 3 Hour Question Paper					

General Objectives

On completion of this module the students will be able to demonstrate level of knowledge related to calculation of ship particulars and assessment of complete stability of ships at a given loading condition.

	Subject Outline	Lecture (hr.)	Practical (hr.)
1	Stability of Ships at Large Angles of Heel	16	-
2	Effect of Slack Tanks and Free Surface Correction	08	-
3	Trim and Longitudinal Stability	16	-
4	Inclining Experiment	09	-
5	Damage Stability	11	-
	Total	**60**	**00**

Summary Syllabus

1. Stability of Ships at Large Angles of Heel (16 hours)

Definition of righting moment and righting lever.
Cross curves of stability and estimation of GZ from Cross curves
$GZ = KN - KG \sin \theta$
Particulars of GZ curve, maximum GZ, Range and angle at stability vanishes
Effect of movement of centre of gravity on GZ curve
Estimation of GZ curve for different heights of centre of gravity.
Effect of freeboard and Beam on the Righting Lever of a ship

2. Effect of Slack Tanks and Free Surface Correction (08 hours)

Centre of gravity of a liquid in fully fill tank and partially filled tank.
Movement of centre of gravity of a partially filled tank
Effect upon GM due to change oscillation of centre of gravity of liquid
Free surface correction and estimation of free surface correction
Effect of longitudinal subdivision to reduce the free surface correction.

3. Trim and Longitudinal Stability (16 hours)

Movement of centre of gravity of a ship on longitudinal plane and trimming effect.
Longitudinal Metacentric height and its definition
Moment to Change trim by 1cm (MCTC) and its definition
Trimming Moment and estimation of Trim due to mass movement on longitudinal plane
Trim due mass loading
Trimming moment based on LCG and LCB
Estimation fwd and aft draft at trim condition
Estimation of a loading condition of a ship including KG, LCG, FSC, GM , Trim, Drafts fwd and Aft.
Use of Deadweight scale
Use trimming table and trimming curves

4. Inclining Experiment (09 hours)

Purpose of the experiment
Method of conducting the experiment
Estimation of lightship displacement, KG and LCG
Precautions to be taken during the experiment

5. Damage Stability (11 hours)

Importance of survivability of ships
Critical opening that could lead to flooding
Cross flooding arrangements
Action to be taken during flooding

Recommended Text Books :

1. Mechant Ship Construction; D A Taylor, 2nd ed. London, Butterworth, 1985.
2. Ship Construction for Marine Students; E A Stokoe, Reed Publication Ltd.
3. Ship Stability for Masters and Mates, Derrett, 4th ed. London Stanford Maritime, 1984.
4. Naval Architecture for Marine Engineers; E A Stokoe, Vol. 4, Reed Publication Ltd.
5. Merchant Ship Stability, Butterworth.