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**MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY  
(MIST)**



**SYLLABUS OF  
NAVAL ARCHITECTURE AND MARINE ENGINEERING**

**DEPARTMENT OF NAVAL ARCHITECTURE AND MARINE ENGINEERING (NAME)  
NOVEMBER 2014  
(Revised on November 2014, Applicable for NAME-4& onwards(Jan 2016))**

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## 4.1 Term Wise Distribution of Courses for B. Sc. Engg. (NAME) degree

Level-1 Term-I

Course No.	Course Title	Contact hours	Credit hours
<b>Theoretical Courses</b>			
Chem 121	Chemistry-1	3	3
Hum 131	English	2	2
Math 151	Differential Calculus and Integral Calculus	3	3
NAME 107	Basic Naval Architecture	2	2
NAME 109	Basic Marine Engineering	2	2
Phy 121	Structure of Matter, Electricity, Magnetism and Modern Physics	3	3
<b>Seasonal Courses</b>			
NAME 150	Engineering Drawing	3	1.5
Chem 122	Chemistry Sessional-1	3	1.5
Shop 180	Foundry and Welding Shop Sessional	1.5	0.75
Shop 190	Machine Shop Sessional	1.5	0.75
<b>Total (5T + 4S)</b>		<b>24.00</b>	<b>19.50</b>

Level-1 Term-II

Course No.	Course Title	Contact hours	Credit hours
<b>Theoretical Courses</b>			
Phy 123	Waves and Oscillations, Geometrical Optics and Wave Mechanics	3	3
Math 153	Ordinary Differential Equation and Partial Differential Equation	3	3
ME 177	Basic Thermal Engineering	3	3
NAME 157	Hydrostatics and Stability	3	3
EECE 181	Electrical Engineering Principles	3	3
<b>Seasonal Courses</b>			
NAME 158	Ship Design Studio 1	3	1.5
ME 178	Basic Thermal Engineering Sessional	3	1.5
Phy 124	Physics Sessional	3	1.5
Hum 132	English Sessional	1.5	0.75
<b>Total (5T + 3S)</b>		<b>25.5</b>	<b>20.25</b>

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Level-2 Term-I

Course No.	Course Title	Contact hours	Credit hours
<b>Theoretical Courses</b>			
Math 251	Vector Analysis and Coordinate Geometry	3	3
NAME 205	Shipbuilding Materials	3	3
NAME 213	Fluid Mechanics	3	3
NAME 219	Engineering Mechanics	3	3
NAME 229	Marine Engines and Fuels	3	3
<b>Sessional Courses</b>			
NAME 206	Shipbuilding Materials Sessional	1.5	0.75
NAME 208	Ship Design Studio - II	3	1.5
NAME 214	Fluid Mechanics Seasonal	3	1.5
NAME 226	Computer Aided Design (CAD)-1	3.0	1.5
<b>Total (5T + 4S)</b>		<b>25.5</b>	<b>20.25</b>

Level-2 Term- II

Course No.	Course Title	Contact hours	Credit hours
<b>Theoretical Courses</b>			
Hum 223	Economics	3	3
NAME 227	Mechanics of Structure	3	3
NAME 253	Marine Hydrodynamics	3	3
Math 253	Statistics, Laplace transform and Matrices	3	3
EECE 281	Electrical and Electronic Technology for Marine Application (Syllabus According to NAME)	3	3
<b>Seasonal Courses</b>			
NAME 228	Mechanics of Structure Seasonal	1.5	0.75
NAME 254	Marine Hydrodynamics Seasonal	3	1.5
NAME 258	Ship Design Studio -III	3	1.5
EECE 282	Electrical and Electronic Technology for Marine Engineering Seasonal	3	1.5
<b>Total (5T + 4S)</b>		<b>25.50</b>	<b>20.25</b>

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**Level-3 Term-I**

Course No.	Course Title	Contact hours	Credit hours
<b>Theoretical Courses</b>			
Hum 313	Principles of Accounting	3	3
NAME 301	Ship Structure	3	3
NAME 307	Design of Marine Vehicles	3	3
NAME 353	Resistance and Propulsion of Ships	3	3
<b>Optional Courses (any one **)</b>			
NAME 315	Port and Harbor Engineering	3	3
NAME 321	Finite Element Method for Ship Structure	3	3
NAME 389	Marine Production and Planning	3	3
<b>Seasonal Courses</b>			
NAME 300	Ship Design Project and Presentation	3	1.5
NAME 302	Ship Structure Sessional	1.5	0.75
NAME 308	Ship Design Studio IV	3	1.5
NAME 354	Resistance and Propulsion of Ships Seasonal	3	1.5
<b>Total (5T + 4S)</b>		<b>25.50</b>	<b>20.25</b>

**Level-3 Term-II**

Course No.	Course Title	Contact hours	Credit hours
<b>Theoretical Courses</b>			
Math 351	Fourier Analysis, Harmonic Function and Complex Variable	3	3
NAME 305	Shipbuilding Technology	3	3
NAME 359	Marine Engineering 1	3	3
NAME 369	Heat Transfer	3	3
<b>Optional courses (any one**)</b>			
NAME 357	Design of Special Ships	3	3
NAME 367	Economic and Social Aspects of Marine Transportation System	3	3
NAME 373	Computational Fluid Dynamics (CFD)	3	3
<b>Seasonal Courses</b>			
NAME 300	Ship Design Project and Presentation	3	1.5
NAME 360	Marine Engineering Seasonal 1	3	1.5
NAME 374	Numerical Analysis Seasonal	1.5	0.75
<b>Training course/Internship *</b>			
NAME 350	Shipyards Practice/Industrial Training (4 Weeks)	4 Weeks	1.5
<b>Total (5T + 3S+ Training course)</b>		<b>22.5 + 4 Weeks</b>	<b>20.25</b>

\* 04 Weeks Industrial/Shipyards Training course

**Level-4 Term-I**

Course No.	Course Title	Contact hours	Credit hours
<b>Theoretical Courses</b>			
IPE 479	Engineering Management	3	3
NAME 403	Dynamics of Marine Vehicles	3	3
NAME 409	Marine Engineering II	3	3
<b>Optional courses (any two**)</b>			
NAME 425	Shipbuilding Practice in Bangladesh	3	3
NAME 431	Ship Hull Vibration	3	3
NAME 435	Computer Aided Ship Production	3	3
NAME 437	Inland Water Transportation System	3	3
NAME 445	Dredger and Dredging Technology	3	3
NAME 481	Optimization Method in Ship Design	3	3
<b>Seasonal Courses</b>			
NAME 400	Project and Thesis	6	3
NAME 426	Computer Aided Design (CAD) -II	3	1.5
NAME 430	Computer Programming in Ship Design	3	1.5
<b>Total (5T + 3S)</b>		<b>27.00</b>	<b>18 + 3.0 = 21</b>

**Level-4 Term-II**

Course No.	Course Title	Contact hours	Credit hours
<b>Theoretical Courses</b>			
NAME 457	Ship Economics and Management	3	3
NAME 459	Ship Hull Maintenance and Repair	3	3
NAME 465	Navigation and Maritime Regulations	3	3
<b>Optional courses (any two**)</b>			
NAME 447	Marine Pollution and Prevention	3	3
NAME 453	Power and Propulsion System	3	3
NAME 463	Ship Performance	3	3
NAME 477	Control Engineering	3	3
NAME 489	Introduction to Offshore Structure	3	3
NAME 499	Shipyards Management	3	3
<b>Seasonal Courses</b>			
NAME 400	Project and Thesis	6	3
NAME 460	Marine Engineering Seasonal	3	1.5
<b>Total (5T + 2S)</b>		<b>24.00</b>	<b>19.50</b>

### **4.3 Detail syllabus of Undergraduate Courses of the Department of Naval Architecture & Marine Engineering**

#### **4.1.1 Compulsory Courses**

##### **NAME 107: Basic Naval Architecture**

2.00 Credit, 2 hrs. /wk

Ship's terms, general particulars and Hull form definition of ships and ocean structures. Definition of Lightweight, deadweight, capacity and tonnage. Displacement, tonne per cm immersion and wetted surface area. Basic idea on ship design, various drawings in ship design, description of general arrangement (GA), shell expansion, lines plan and other related drawings.

##### **Reference Book**

1. Reed's Naval Architecture for Marine Engineers, E.A. Stokoe, 2003, Thomas Reed Publications.
2. Theoretical Naval Architecture, E.L. Attwood & H.S. Pengelly, 1962, Longmans Green & Co. Ltd.
3. Basic Ship Theory, K.J. Rawson & E. C. Tupper, Vol. 1 & 2., Longman Group Limited.
4. Ships & Naval Architecture, R. Munro-smith, 1973, Institute of Marine Engineers.
5. Naval Architecture: Examples and Theory, B. Baxter, Second Impression 1977, Charles Griffin & Company LTD..
6. Basic Naval Architecture, K. C. Barnby, Fifth Edition 1967, Hutchinson Scientific Technical Co. Ltd.
7. Applied Naval Architecture, Munro- Smith, 1967, Longmans Green & Co. Ltd.

##### **NAME 109: Basic Marine Engineering**

2.00 Credit, 2 hrs. /wk

Basic idea on ship propulsion sys and machinery, basic engine types, operation of SI engine, CI engine, Gas turbine engine. Supercharging, scavenging and exhaust gas analysis and air pollution.

##### **Reference Book**

1. Introduction to marine engineering, D.A. Taylor.
2. Marine internal combustion engine, A.B. Kane.

##### **NAME 150: Engineering Drawing**

1.50 Credit, 3 hrs./wk.

Introduction, Instruments and their uses, First and third angle projections, Orthographic drawings, Isometric views, Missing lines and views, Sectional views and conventional practices, Auxiliary views.

**NAME 157: Hydrostatics and Stability**

3.00 Credit, 3 hrs. /wk

Prereq. NAME 107

Hydrostatic calculations. Initial stability, free surface effects, stability at large angles, intact stability computations, damaged stability and its calculations by lost buoyancy and added weight method. Inclining experiment. International Maritime Organization (IMO) stability criteria, wind heel criteria. Subdivision and floodable length calculations. Subdivision indices. Launching calculations.

**Reference Book**

1. Theoretical Naval Architecture, E.L. Attwood & H.S. Pengelly, 1962, Longmans Green & Co. Ltd.
2. Reed's Naval Architecture for Marine Engineers, E.A. Stoked, 2003, Thomas Reed Publications.
3. Basic Ship Theory, K.J. Rawson & E. C. Tupper, Vol. 1 & 2., Longman Group Limited.
4. Naval Architecture: Examples and Theory, B. Baxter, Second Impression 1977, Charles Griffin & Company Ltd.

**NAME 158: Ship Design Studio I**

1.50 Credit, 3 hrs /wk

Reproduction of general arrangement (GA) plan, lines plan and Bonjean curves.

**ME 177: Basic Thermal Engineering**

3.00 Credit, 3 hrs /wk.

Fundamental concepts of thermodynamics, it's laws and their corollaries, Non flow process and flow processes, Thermodynamic cycles and processes, Properties of pure substances, Mixture of gas and vapor.

Internal combustion engines: Petrol engines, Diesel engines and Gas turbines with their cycles and accessories, Steam generation units with accessories and mountings, Steam turbines.

**Reference Book**

1. A textbook of Thermal Engineering, R. S. Khurmi; J. K. Gupta.

**ME 178: Basic Thermal Engineering Sessional**

1.50 Credit, 3hrs./wk.

Seasonal based on ME 177

**Shop 180: Foundry and Welding Shop Sessional**

1.50 Credit, 3 hrs./wk

**Foundry:** Introduction to Foundry: Tools and equipments, Patterns: Definition and function, Types and pattern making, Molding: Definition, Molding materials, Sand

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Preparation, Types of mould and moldings procedure, Cores: Types of cores, Core making, Core materials, Casting: Metal melting, Pouring and casting, Furnaces, Fuels, Casting of cast iron, Steel making processes, Non-ferrous metal casting procedure, Inspection of casting and casting defects.

**Welding:** Methods of metal joints: Riveting, Grooving, Soldering, Welding, Types of welding joint and welding practice, Position of Welding: Flat, Vertical, Horizontal, Overhead, Polarity of welding, Electric arc welding and the necessary accessories, welding of different types of materials: Low carbon steel, cast iron, Brass, Copper, Stainless Steel, Aluminum, Types of Electrode, Fluxes and their composition, Arc welding, defects, Test of arc welding: Visual, Destructive and Non-destructive.

Types of gas welding and gas welding equipment; Gases and types of flame; Welding of different types of materials; Gas welding defects; Test of gas welding.

### **EECE 181: Electrical Engineering Principles**

3.00 Credit, 3 hrs /wk

Direct Current: Theorems of electric circuit, electrical network analysis, measuring instruments. Alternating current: AC quantities and waveforms, phasor algebra, AC circuit analysis, three phase circuits. Transformers: Single phase and three phase, auto transformer. Fundamentals of DC generators, DC motors: principle and operation.

### **Reference Book**

1. Fundamentals of Electricity – Charles Alexander, Matthew asdic
2. Introductory circuit analysis-Robert Boyleston
3. Alternating currentckts –Russelm; corcoran
4. A Textbook of Electrical Technology, vol-2 B.L. Theresa

### **Shop 190: Machine shop Sessional**

0.75 Credit, 1.5 hrs./wk

Kinds of tools, Common bench and hand tools, Marking and layout tools, Measuring tools, Cutting tools, Bench work with job, Drilling Machine, Practice: Types of drilling machine, use and application, Shaper machine practice: Types of shaper machine, Size and capacity, use and application. Lathe machine practice: Types of lathe, Size and capacity, use and application. Lathe machine practice: Types of lathe, Size and capacity, use and application, Milling Machine practice: Types of milling machine, use and application.

### **NAME 205: Shipbuilding Materials**

3.00 Credit, 3 hrs /wk

Metals as materials of construction; Industrially significant properties of metallic materials; Production, properties and uses of Pig Iron, Cast Iron and Carbon Steels; Nonferrous alloys; Protective Coatings; Ferrous ally: Plan carbon, alloy, tool, stainless, heat-resisting and creep resisting steels etc.; The Fe-Fe<sub>3</sub>C equilibrium; Different types of heat treatment operations; Case hardening of steels, Cement, Ferro-cement, Timber, Rubber, Glass and Plastics.

### **Reference Book**

1. Introduction to Physical Metallurgy, Sidney H Anvers.



**NAME 206: Shipbuilding Materials Sessional**

0.75 Credit, 1.50 hrs./wk.

Experiments based on NAME 205

**NAME-208: Ship Design Studio II**

1.50 Credit, 3 hrs /wk

Prereq. NAME 107, NAME 157, NAME 158

Hydrostatic calculation, stability and cross curves, trim calculations.

**NAME 213: Fluid Mechanics**

3.00 Credit, 3 hrs./wk

Fluid properties, fluid statics and kinematics, continuity, energy and momentum principle, energy and hydraulic grade-lines, laminar and turbulent flows, introduction to boundary layers, drags, and wakes, friction and flow through pipes, impact of jets, dimensional analysis, principles of similitude and model testing, Aerofoil and its application. Hydraulic machines: reciprocating and centrifugal pumps, Cavitations.

**Reference Book**

1. Hydraulics, Fluid Mechanics and Hydraulic Machines, R. S. Kurume.
2. Fluid mechanics with Engineering application, Daugherty; Fanzine; Fennimore.

**NAME 214: Fluid Mechanics Sessional**

1.50 Credit, 3 hrs /wk

Experiments based on NAME 213

**NAME 219: Engineering Mechanics**

3.00 Credit, 3 hrs /wk

Basic concept of mechanics, Statics of particles and rigid bodies, Centroid of lines, areas and volumes, forces in truss, frames and cables, Friction, moment of inertia of areas and masses, relative motion.

Kinetics of particles; Newton's second law of motion, principle of works, energy, impulse and momentum; System of particles, kinematics of rigid bodies, Kinetics of plane motion of rigid bodies, forces, forces and acceleration, principles of work and energy, Basic concepts of lagrangian and Hamiltonian mechanics.

**Reference Book**

1. Vector mechanics for engineers, Ferdinand P. Beer & E. Russell Johnston
2. Introduction to statics & dynamics, RudraPratap & Andy Ruina
3. Statics & Dynamics, R.C. Hibbeler.

**NAME 226: Computer Aided Design (CAD) I**

1.50 Credit, 3 hrs /wk

Introduction to CAD. Drawing unit and scale, 2-D drawing tools, modification tools, layers, hatching and dimensioning.

Working in 3-D space, 3-D coordinate systems, drawing sheet layout, viewpoints, 3-D drawing tools, 3-D wire frame modeling, surface modeling, solid modeling and rendering.

Application of CAD in ship design. Introduction to computer aided manufacture (CAM).

**NAME 227: Mechanics of Structure**

3.00 Credit, 3 hrs /wk

Fundamental of stress analysis. Mechanical properties of materials. Normal, shear and combined stresses. Joint and beam analyses: continuous beam, beam on elastic foundation, curved beam. Column and buckling analyses. Thick cylinder and pressure vessel. Torsion and shaft design. Theories of failure.

**Reference Book**

1. Mechanics of Materials – James M. Gere
2. Strength of Materials – Andrew Pytel, Ferdinand L. Singer

**NAME 228: Mechanics of Structure Sessional**

1.50 Credit, 3 hrs /wk

Tension, direct shear, hardness and impact tests of steel specimen. Slender column test for different end loading conditions. Static bending test. Performance test of welded and riveted joints.

**NAME 229: Marine Engines and Fuels**

3.0 Credit, 3 hrs /wk

Prereq. ME 171, NAME 107

Study of internal combustion engines. Fuels and combustion, Internal combustion engine systems: introduction, fuel oil, injection, intake, exhaust etc. Engine components: crankshaft, bearings, connecting rod, piston, liner, ring, thrust bearing etc. Marine fuel: types, grading, testing, treatment methods, blending, catalytic cracking etc. HSD, IFO and heavy fuel engines. Gas turbines. Nuclear power plants. Types of engine and various systems.

Introduction to combustion chamber: open and divided, combustion chamber in marine diesel engines. Turbo-charging: thermodynamics, principle, types and design limitations. Vessel type and engine choice.

Study of sources of energy, introduction to renewable energy sources.

**Reference Book**

1. Engineering Fundamentals of the Internal combustion Engine-Will and W. Pulkrabek
2. Marine Internal combustion Engine – A. B. Kane.
3. Marine Diesel Engine- Divehi Arana.
4. Pounder's Marine Diesel Engine and Turbine- Doug woodland.

**NAME 253: Marine Hydrodynamics**

3.00 Credit, 3 hrs /wk

Prereq. ME 213

Flow of an ideal fluid: equation of continuity, streamlines, streak lines and path lines, two-dimensional flow patterns, rotational and irrotational flows, vortices, velocity potential functions, stream functions, Euler's equation of motion, Bernoulli's equation, velocity and pressure distribution.

Uniform flow, irrotational vortex, circulation, source, sink and doublet, flow past a half body, cylinder and Rankine body, virtual mass and Magnus effect.

Conformal transformation: analytic functions, singularities, Cauchy-Riemann equations, complex potential, application of conformal transformation to some flow cases, Joukowski's hypothesis, lift of an infinite aerofoil. Theorems of Green, Stokes, Cauchy and Biot-Savart and their application to some hydrodynamic problems.

Flow of a real fluid: Navier-Stokes equations, displacement, momentum and energy thickness of the boundary layer, and characteristics of flow around a ship hull.

**Reference Book**

1. Applied Hydrodynamics, H.R. Valentine, 1969, Newnes-Butterworth; Student international edition.
2. Marine Hydrodynamics, J.N. Newman, 1977, MIT press.
3. Hydrodynamics of High Speed Marine Vehicles, O.M. Faltinsen, 2005, Cambridge University Press.

**NAME 254: Marine Hydrodynamics Sessional**

1.50 Credit, 3 hrs /wk

Prereq. NAME 213, NAME 214

Experiments based on NAME 253

**NAME 258: Ship Design Studio-III**

1.50 Credit, 3 hrs /wk

Prereq. NAME 208

Hull form design, space allocation and general arrangement (GA). Preliminary structural design of ships using Rule Book. Mid-ship section, longitudinal construction and shell expansion drawings. Capacity plan.

**EECE 281: Electrical and Electronic Technology for Marine Application**

3.00 Credit, 3 hrs /wk

Three phase induction motors. AC generators, synchronous motor, speed control of three phase motors. Diodes, BJTs, diode and BJT circuits, MOSFET and SCR as power switching devices, controlled rectifiers and inverters. Radar and wireless equipments, electronic navigation aids, LORAN, RDF and Decca Chain.

**Reference Book**

1. A Text book of Electrical Technology- B.L. Theraja;
2. Electronic Devices & Circuit theory-Robert L. Boylestad.

**EECE 282: Electrical and Electronic Technology for Marine Application Sessional**

1.50 Credit, 3 hrs/wk

Laboratory experiments based on EECE 281

**NAME 300: Ship Design Project and Presentation**

3.00 Credit, 3 hrs /wk

Prereq. NAME 258

[Presentation will be made before teachers and students of the department twice in a term]

Design of a particular ship: principal particulars, lines plan, displacement, general arrangement (GA), freeboard, volume, scantling, power, machinery, endurance, outfit, approximate trim and cross curves of stability, power, engine selection and propeller design.

**NAME 301: Ship Structure**

3.00 Credit, 3 hrs /wk

Prereq. NAME 219

Forces on the ship. Ship strength calculation: section modulus, longitudinal and transverse strength of ship. Dynamic effects on ship structure. Structural discontinuities, stress concentration, superstructure theory. Plate and shell analyses: grillages, buckling of plates. Composite construction. Introduction to Finite Element Methods (FEM).

**Reference Book**

1. Strength of Ship Structures, W. Muckler, 1967, Edward Arnold Publishers Ltd. London.
2. Merchant Ship Construction, D.A. Taylor, 1980, Butterworth's & Co. Publishers Ltd
3. Ship Structural Design: A Rationally – Based Computer Aided Optimization Approach, O.F. Hughes, 1983, John Wiley & Sons Inc.

**NAME 302: Ship Structure Seasonal**

1.50 Credit, 3 hrs /wk

Prereq. NAME 206

Study of asymmetric bending. Determination of shear center. Analysis of truss. Compression test of helical spring. Tension test of plastic specimen. Solving problems using finite element package.

**NAME 305: Shipbuilding Technology**

3.00 Credit hrs, 3 hrs /wk

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Different types of welding and their equipment. Welding principle, methods: MMAW, GMAW, SAW, Electro slag welding, TIG and SS welding, MIG and aluminium welding. Types of welding joints. Welding symbols. Welding sequence in shipbuilding, Common defects in ship welding: welding distortion monitoring and control, inspection and testing of welded specimen. Nondestructive testing.

Details of ship structural member: structural discontinuity, stress concentration, remedial measures. Cathodic protection, surface preparation and painting. Shipyard facilities: various shops and production facilities and their layout. Process of ship construction. Numerical control. Boat building by materials other than steel.

### **Reference Book**

1. Practical Ship Design, D.G.M. Watson, 1998, Elsevier Science Ltd.
2. Merchant Ship Construction, D.A. Taylor, 1980, Butterworth's & Co. Publishers Ltd
3. Ship Construction, D.J. Eyres, 5<sup>th</sup> Edition 2001, Butterworth-Heinemann.

### **NAME 307: Design of Marine Vehicles**

3.00 Credit, 3 hrs /wk

Prereq. NAME 157

Engineering design-philosophy. Various design stages: concept design, basic designs, preliminary designs, contract designs, detailed designs.

Design spiral: cargo routes, estimation of dimensions and hull form and displacement, preliminary G. A plan, calculation of freeboard, depth and volume, calculation of longitudinal strength and powering, selection of machinery and outfit, checking for trim and stability, estimation of lightweight and cargo deadweight, economic criteria and evaluation. Case studies of typical marine vehicles.

### **Reference Book**

1. Principles of Naval Architecture, Vol. 1, 2 &3,
2. Practical Ship Design, D.G.M. Watson, 1998, Elsevier Science Ltd.
3. Design of Ship Hull Structures: A practical Guide for Engineers, Y Komodo; Y. Takeda; M Mano & T. Okada, 2009, Springer-Verlag Publishing Co.

### **NAME 308: Ship Design Studio IV**

1.50 Credit, 3 hrs /wk

Prereq. NAME 258

Rudder and steering arrangement, shafting and propeller arrangement, propeller drawing and main engine foundation.

### **NAME 350: Shipyard Practice/ Industrial Training**

1.50 Credit,

Practical Works concentrated in 4 weeks.

Ship design: basic design, estimation, hull design, piping and equipment design, shell expansion, detailed construction drawings.

**NAME 353: Resistance and Propulsion of Ships**

3.00 Credit, 3 hrs /wk

Pre req. NAME 253

Phenomena resisting the motion of ships. Resistance due to friction, wave making, form, appendage, wind and waves, squat, blockage and shallow water effects. Estimation of powering using methodical series and statistical methods. Advantageous effects of hull form changes-bulbous bows. Asymmetric sterns and optimum trim for ships in ballast.

Screw propeller geometry. Momentum and blade element theories. Propellers in open water, propeller coefficients and design charts. Hull propeller interaction- wake, thrust deduction and relative rotative efficiency. Propeller cavitations. Propeller blade strength. Screw design according to circulation theory for uniform and non-uniform wake. Speed trials and service performance analysis.

**Reference Book**

1. Fundamentals of Ship Resistance and Propulsion, S.A. Harvard, 1983, Wiley Publishers Ltd.
2. Fundamentals of Ship Resistance & Propulsion, A.J.W.Lap&Ir.J.D. Van Manen,
3. Principles of Naval Architecture, Vol. 1, 2 & 3
4. Hydrodynamics of Ship Propellers, J.P. Breslin& P. Anderson, First paperback Edition 1996, Cambridge University Press

**NAME 354: Resistance and Propulsion of Ships Sessional**

1.50 Credit, 3 hrs /wk

Seasonal based on NAME 353

**NAME 359: Marine Engineering -I**

3.00 Credit, 3 hrs /wk

Prereq. NAME 229

Construction and operation of SI engine, CI engine, Gas turbine and water jet. Governor's operation, Supercharging, scavenging, low load running, luboil testing etc. Engine operation and testing, Combustion, Fuel metering. Compressors and turbine; compression process, volumetric efficiency, multistage compression, inter cooling, various types of compressor and gas turbine. Engine and shaft alignment. Engine diagnosis and fault finding.

**Reference Book**

1. Engineering Fundamentals of the Internal combustion Engine-Will and W. Pulkrabek.
2. Main Internal combustion Engine – A. B. Kane.
3. Marine Diesel Engine- Divehi Arana.
4. Pounder's Marine Diesel Engine and as Turbine- Doug woodland.

**NAME 360: Marine Engineering Seasonal - I**1.50 Credit, 3 hrs /wk

Seasonal based on NAME 359

**NAME 369: Heat Transfer**3.00 Credit, 3 hrs /wk

Introduction: steady and unsteady state conduction in one dimension: cases of single and composite walls, cylinders and spheres, fins of uniform cross section. Transient heat transfer: system with negligible internal resistance. Hiesler charts. Introduction to two and three dimensional heat conduction. Convection: forced and natural, basic mechanism, methods of evaluation, non-dimensional parameters, empirical and semi-empirical methods. Radiation: fundamental laws, black and gray bodies, form factors, evaluation of form factors. Heat exchangers: parallel flow and counter flow. LMTD relationship. Heat transfer cases in ship design: insulation in bulkheads, refrigerated spaces, fish holds in trawlers.

**Reference Book**

1. Engineering Thermodynamics: Work and Heat Transfer, G.F.C. Rogers & Y. R. Mathew, 1967, English Language Book Society & Longmans Green & Co. Ltd.

**NAME 374: Numerical Analysis Seasonal**0.75 Credit, 1.5hrs /wk

**Syllabus:** Interpolation methods, solution of numerical, algebraic & transcendental equations. Numerical differentiation & integration. Solving equations by finite difference technique. Regression analysis the method of least squares, curve fitting. Application to Naval Architecture problems.

**Reference Book**

1. Numerical methods, Balagurusamy.

**NAME 400: Project and Thesis**6.0 Credit, 12 hrs /wk

Major field of project and thesis are as follows: (a) ship design (b) ship construction (c) strength of ship (d) material testing and fracture problems (e) ship motion (f) resistance and propulsion of ships (g) marine engines and ship vibration (h) marine transportation system (i) marine engineering (j) dynamics of ship/floating bodies/structures (k) Environmental impact assessment (l) Life cycle assessment (LCA) (J) Shipbuilding practice of Bangladesh (K) Ship recycling industry of Bangladesh (L) Potential of Bangladeshi shipyards (M) Local ship design capability (N) Prospect of Bay of Bangle (O) Off shore installation and prospect of sea resource of Bangladesh (P) Local and International Ship/Shipbuilding market analysis etc.

**NAME 403: Dynamics of Marine Vehicles**3.00 Credit, 3 hrs /wk

Introduction to sea keeping. Recapitulation of gravity waves. Wave record analysis. Rayleigh distribution. Spectral representation of the seaway. Directional spectra. Ship motion in regular waves- Response amplitude operators. Motions in irregular sea. Slamming and deck wetness.

Introduction to maneuverability, Motion stability criterion, ITTC maneuvering standards- Design of control surface-Rudder design.

### **Reference Book**

1. Dynamics of Marine Vehicles, R. Bhattacharyya, 1978, John Wiley & Sons Ltd.
2. Theory and Applications of Ocean Surface Waves, C.C. Mei; M. Stiassnie; D.K.P. Yue, 2005, World Scientific Publishing Co. Pvt. Ltd.

### **NAME 409: Marine Engineering -II**

3.00 Credit, 3 hrs /wk

Prereq. NAME 359

Pumps: types: characteristics, NPSH, head calculation. Blowers and compressors. Refrigeration and air-conditioning: thermodynamics, principles. Air conditioning system for ships. Heating and ventilation systems. Air treatment in cargo spaces.

Marine auxiliary machineries: windlasses, winches, cargo access equipment for dry, unitized, liquid and cryogenic cargoes, steering gear: types and characteristics. Drive design criteria, testing, commissioning. Pipe materials, piping systems and valves, steam traps, anchors, anchor hawse, chains, etc. Emergency systems. Propeller, shaft and stern gear arrangement.

### **Reference Book**

1. Marine Auxiliary Machinery- H.D Mc George
2. Marine Auxiliary Machinery and System – M. Khetagurov

### **NAME 426: Computer Aided Design (CAD)-II**

1.50 Credit, 3 hrs /wk

Pre req: NAME 326

Ship design in AUTO CAD as per Ship Design Studio sessionals (I – IV).

### **NAME 430: Computer Programming in Ship Design**

1.50 Credit, 3 hrs /wk

Introduction to computer hardware, software and operating systems. Introduction to C and C++ programming languages. C and C++ fundamentals – data types and expressions. Operators. Libraries. Statements. Arrays and strings. Functions. Function overloading. Control statements. Pointers. Input and output systems. Object oriented programming (OOP).

Application to the computations of stability, trim and structural strength of marine vehicles.



**NAME 457: Ship Economics and Management**

3.00 Credit, 3 hrs /wk

Prereq. NAME 307

Shipbuilding cost estimation. Tendering and contracts. Freight market and operating economics. Chartering of ships. Alternative maritime designs. Overall optimization for speed size combinations of ships. Relative importance of technical and economic features. Importance and use of ICT in maritime designs. Safety management concept in ships and ports and ISO certifications.

Management practices in maritime projects. Commercial, marketing, legal and financial aspects of shipbuilding and shipping.

**Reference Book**

1. Engineering Economics & Ship Design, I.L. Buxton, 3<sup>rd</sup> Edition, 1987, British Maritime Technology Ltd.
2. Cost Management in Shipbuilding - Planning, Analysing and Controlling Product Cost in the Maritime Industry, Jan O. Fischer, GerdHolbach, GKP Publishing, Cologne 2011.

**NAME 459: Ship Hull Maintenance and Repair**

3.00 Credit, 3 hrs /wk

Prereq. NAME 409

Maintenance requirements – corrosion, fatigue, marine fouling. Failure causes – fatigue failure of structural members, deformation failures, failure due to corrosion. Repairs to failures, Measures for failure of structural members due to deformation, corrosion, fatigue, crack detection etc. Prevention of marine growth and removal of marine growth both in dry and wet condition. Design considerations with regard to maintenance. Maintenance scheduling. Welding repair decision model. Classification requirements of hull survey, identification of defects, plates and welds. In situ plate cutting and welding, tolerance requirements, distortion removal. Underwater welding – dry and wet. Welding Inspection. Impact of preventive maintenance and repair techniques on operation.

**Reference Book**

1. Ship Construction, D.J. Eyres, 5<sup>th</sup> Edition 2001, Butterworth-Heinemann.

**NAME 460: Marine Engineering Seasonal**

1.50 Credit, 3 hrs /wk

Seasonal based on NAME 409.

**NAME 465: Navigation and Maritime Regulations**

3.00 Credit, 3 hrs /wk

Outline of navigation. Navigational aids and aids to navigation. Shipping laws and safety rules. Inland shipping ordinance (ISO) of Bangladesh. Life saving appliances and fire fighting equipment. Safety of life at sea (SOLAS). International load line convention (ILLC). Role of IMO. Registration and survey of ships. Marine personnel. Accident

enquiries. International marine conventions. Collision regulations. Legislations of marine pollutions. Outline of laws at sea.

**Reference Book**

1. The Principles and Practice of Navigation, A. Frost, 1993, Glasgow Brown Son & Ferguson Ltd.

**IPE 479: Engineering Management**

3.00 Credit, 3 hrs /wk

Management: evaluation of management thought, classical quantitative and behavioral schools, interactions between organizations and their environment.

Management principles, Management functions. The management team, management by objectives.

Organizational structures; co-ordinations and spans of control, the informal organization, authority delegation and decentralization, groups and committees, managing organizational change and conflict.

Motivation, performance and satisfaction; Leadership, Training, Incentive systems and performance appraisal.

Quantitative Techniques in Management decision; decision making process, optimization techniques, their applications to industrial problems.

Financial management, Budgetary control, Cost management and control. Investment schedule, criterion of investment.

Operations management: Types of production; forecasting, inventory management, scheduling, maintenance management, Quality management, Layout planning, Management information system.

**Reference Book**

1. Management (6<sup>th</sup> edition) James A.F. Stoner.

#### 4.1.2 Optional Courses

##### **NAME 315: Port and Harbor Engineering**

3.00 Credit, 3 hrs /wk

Introduction to port and harbor. Harbor classifications. Port facilities: Berthing and mooring structures and fendering systems. Operational and environmental loads. Wave oscillations in harbor and its control. Maneuvering of ships within harbor. Cargo handling in ports. Offshore mooring- design of breakwaters, jetties, wharfs, quays, diaphragm walls, slipways and docks. Sediment transport and maintenance dredging in harbors. Control and marine pollution in ports. Brief of Bangladesh Ports. Prospect of deep sea port in Bangladesh.

##### **Reference Book**

1. Ports and Terminals, Prof. I. H. Ligteringen, September 2000, Delft University of Technology.
2. Design and Construction of Ports and Marine Structures, A. D. Quinn, 2<sup>nd</sup> Edition 1972, McGraw-Hill Book Company Ltd.

##### **NAME 321: Finite Element Method for Ship Structure**

3.00 Credit, 3 hrs /wk

Prereq. ME 219, ME 227

Basic concept of finite element method (FEM) and its application to ship structure, stiffness matrices, assembly of global stiffness matrix, boundary conditions, plane strain and plane stress analysis, convergence requirements. Isoperimetric elements in two and three dimensions. Formulation of stiffness matrix for beam, linear static analysis. Introduction to Finite Element softwares and analysis of frame and shell elements.

##### **Reference Book**

1. Finite Elements in Engineering, T. R. Chandrupatla & A.D. Belegundu, 3<sup>rd</sup> Edition 2004, Prentice-Hall of India private Ltd.
2. Design of Ship Hull Structures: A practical Guide for Engineers, Y. Okumoto; Y. Takeda; M. Mano & T. Okada, 2009, Springer-Verlag Publishing Co.

##### **NAME 357: Design of Special Ships**

3.00 Credit, 3 hrs /wk

Prereq. NAME 307

Special design features of trawlers, tugs, container ships, ro-ro ships and tankers.

Submarines (Diesel-Electric, AIP and Nuclear) and other warships (Frigate, Corvette, OPV, LPC, LCT and LCVP).

High speed crafts and multi-hull vessels.

##### **Reference Book**

1. Hydrodynamics of High Speed Marine Vehicles, O.M. Faltinsen, 2005, Cambridge University Press.
2. Practical Ship Design, D.G.M. Watson, 1998, Elsevier Science Ltd.
3. Fiber Glass Boats, Hugo Du Plessis, 3<sup>rd</sup> Edition, 1996, McGraw-Hill Book Company.

**NAME 367: Economic and Social Aspects of Marine Transportation System**

3.00 Credit, 3 hrs /wk

Impact of transportation system on ways of human life, effects on the environment and on the local and global politics. UNCTAD conference on shipping: cargo sharing rules, vessel flag protection acts, waiver rules. Liner Conferences. Feeder Trade Committees, Economy and the marine transportation system. Regional inland waterway transportation network: India-Bangladesh, South-east Asia. Transportation system as a prerequisite to local and global development.

**Reference Book**

1. Sea Transport, P.M. Alderton, 3<sup>rd</sup> Edition 1984, Thomas Reed Publications Ltd.

**NAME 373: Computation Fluid Dynamics**

3.00 Credit, 3 hrs /wk

Prereq. NAME 213, NAME 253

Introduction. Governing equations of fluid flow. Green's theorem, Boundary integral methods and its application to radiation and diffraction problems, Discretisation schemes: finite difference methods, finite volume methods, finite element methods, spectral methods etc. Grid generation. Flow visualization and frictional resistance computation for double body flows using Navier-Stokes equations.

Free surface flow, free surface computation with linear and fully nonlinear conditions. Numerical treatment of fluid-body interface, turbulence modeling. CFD application to free surface flow past ship shape objects using Reynolds Averaged Navier Stokes Equation (RANSE).

**Reference Book**

1. Computational Methods for Fluid Dynamics, J.H. Ferziger & M. Peric, 3<sup>rd</sup> Edition 2002, Springer-Verlag Publishing Co. Ltd.
2. Programming with Fortran, Seymour Lipchitz & Arthur Poe, First Edition June 1982, Schaum's Outline Series, McGraw-hill Book Company, Singapore.
3. C++: The Complete Reference, Herbert Schildt 4<sup>th</sup> Edition 200, McGraw-Hill Publishing Co. Ltd

**NAME 389: Marine Production and Planning**

3.00 Credit, 3 hrs /wk

Overview of ship production system. Information for shipbuilding production. Product standardization and work simplification. Product work breakdown and integrated zone

engineering. Linear programming concepts. Network analysis. Scheduling and resource allocation. Data Base Management System (DBMS) in production planning and control.

**Reference Book**

1. Introduction to Operation Research – Hamdy A Taha

**NAME 425: Shipbuilding Practice in Bangladesh**

3.00 Credit, 3 hrs /wk

Definition of Shipbuilding, Ship Recycling, Shipyard, Dockyard, Shipbuilding and Shipping Market. Shipyards of Bangladesh. Shipbuilding practice in Bangladesh. Local Shipbuilding Market analysis. International shipbuilding market analysis. Shipbuilding Potential in Bangladesh. Shipbuilding Problems in Bangladesh. Shipbuilding Future of Bangladesh. Local and international shipbuilding demand and supply analysis. Global Shipbuilding Forecast.

**NAME 431: Ship Hull Vibration**

3.00 Credit, 3 hrs /wk

Vibration induced in ship structure due to wave, propeller and machinery. Free and forced vibration of single, two and multi-degree of freedom systems. Transverse vibration of beams. Added mass of hull girder vibration. Empirical formulae for calculating hull frequencies. Tensional, flexural and longitudinal vibrations of propeller shafting system. Measurement of ship vibration. Allowable limits of vibration in a ship. Consequences of vibration in different types of vessels. Reduction of vibration by propeller and machinery selection, suppression, isolation and insulation.

**Reference Book**

1. Ship Hull Vibration, F.H. Todd, First Edition 1961, Edward Arnold Publishers Ltd.

**NAME 435: Computer Aided Ship Production**

3.00 Credit, 3 hrs /wk

Introduction to computer aided manufacture (CAM). B-spline, non-uniform rational B-spline, physically based deformable surface, sweeps and generalized cylinders, offsets, blending and filtering surfaces. Mathematical representation of hull form. Numerical control (NC), robotics application in CAM, shell plate development. Modern ship production methods a ship system and concurring engineering context. Basic fabrication and material handling processes, process planning and scheduling.

**NAME 437: Inland Water Transportation System**

3.00 Credit, 3 hrs /wk

**Syllabus:** Inland waterways & their Reculiarities. Maintenance col navigational channel; situation bank erosion & dredging. Inter-modal transportation, Specialized inter-modal transportationvessel. Design at inland waterway transportation system Design& operational aspects of small erafrtr. Design of specialized inland vessel, tug-barge system. Shallow draft tug, inland passenger vessels etc.

**NAME 445: Dredger and Dredging Technology****3.00 Credit, 3 hrs /wk**

Introduction. Dredging methods, hydraulic and mechanical dredger types: drilling pontoon, deeper dredger, backhoe method, bucket dredger, grab dredger, cutter suction hopper dredger, dustpan dredger, special purpose dredger etc.

Cutter suction dredger: design features, types of cutter, design of ladder, performance parameters, positioning system. Dredging calculation: estimating discharge-head, effect of dredge material characteristics, pump performance characteristics, estimation of output of various types of dredging. Special features of dredge pump. Types of floaters. Pipeline fittings. Brief review of dredging operation, dredging need in Bangladesh.

**NAME 447: Marine Pollution and Prevention****3.00 Credit, 3 hrs /wk**

General concepts of marine pollution. Types of marine pollution: oil pollution, heavy metal pollution, synthetic organic chemical pollution, eutrophication. Biological consequences of marine pollutants – substances harmful to living organisms. Sources of marine pollution: natural, transportation, accidents, and routine discharge. Monitoring of pollution and environmental impact assessment. Life cycle assessment of marine transport. Past, current, and proposed approaches for the improvement of marine pollution problems related to marine transports.

Pollutants and Their Effects on the Marine, The Impact of Oil Pollution, Cleanup Procedures for Oil Spills, Ocean Outfall Disposal of Liquid Wastes, Ocean Disposal of Shipboard Wastes, Ocean Dumping of Sludge and Solid Wastes, Ocean Disposal of Dredge Spoils, Alternatives to Open Sea Dumping, Radioactive Waste Disposal in the Oceans, the regulation of vessel-source pollution, IMO laws and treaties. Contemporary ship recycling industry of Bangladesh and its potential & problem.

**Reference Book**

1. Marpol annex, regulations.

**NAME 453: Power and Propulsion Systems****3.00 Credit, 3 hrs /wk**

Prereq. NAME 353

Ship power and propulsion systems. Steam, diesel and gas turbine power plants together with speed reducers and propulsors.

Propellers-fixed pitch, controllable pitch, tandem, contra-rotating, super-cavitating, ducted, vertical axis and water jet. Comparative studies of different propellers.

**Reference Book**

1. Fundamentals of Ship Resistance and Propulsion, S.A. Harwood, 1983, Wiley Publishers Ltd.
2. Fundamentals of Ship Resistance & Propulsion, A.J.W. Laker & J.D. Van Manen,
3. Principles of Naval Architecture, Vol. 1, 2 & 3

4. Hydrodynamics of Ship Propellers, J.P. Breslin & P. Anderson, First paperback Edition 1996, Cambridge University Press

**NAME 463: Ship Performance**

3.00 Credit, 3 hrs /wk

Introduction. Hull roughness: measurement, bottom condition and speed loss, propeller roughness, propeller and hull interaction. Methods of predicting resistance increase due to hull and propeller roughness. Normal speed loss. Power diagram. Hull maintenance. Added resistance due to ship motion, wave reflection, wind, yawing and drift. Rudder resistance. Normal speed loss of a ship in a seaway.

**Reference Book**

1. A guide to ship design Anthony F. Molland

**NAME 477: Control Engineering**

3.00 Credit, 3 hrs /wk

Introduction to theory of control system, mechanical, hydraulic, pneumatic, thermal and electro-mechanical control systems. Representation of control systems- block diagrams. Study of frequency, step function and system responses. Transfer functions and characteristics functions. Routh's criterion for stability. System analysis – Nyquist and Bode diagrams. Root locus plots. Terms, definitions and symbols of control loop/flow. Solenoid and its working principle, use and fault finding. Useful problem and solution of a simple control system

System compensation, analogues of control system, application of servomechanisms in marine – mechanical system, hydraulics, servo control, pneumatic and electro mechanical controls.

**Reference Book**

1. Ship Maneuverability – Theory & its Application, M. Hirano & J. Takashina, 2010, Mitsui Akishima Research Laboratory.
2. Guidance and Control of Ocean Vehicles, T. I. Fossen, 1994, Wiley Publishers Ltd.

**NAME 481: Optimization Method in Ship Design**

3.00 Credit, 3 hrs /wk

**Syllabus:** Concept of optimization. Linear programming simplex algorithm, dual simplex algorithm integer programming-Branch & Bound method. Cutting plane method force integerization. Powell's method. Constrained optimization. Lagrangean functions,, penalty functions, Sequential unconstrained minimization technique (SUMT). Optimality criteria method. Sequential linear programming (SLP), introduction to genetic algorithm & neural network. Formulation & solution of ship design problems.

**Reference Book**

1. Introduction to Operation Research – Hamdy A Taha

**NAME 489: Introduction to Offshore Structure**

**3.00 Credit, 3 hrs /wk**

Wind, wave & current loads on offshore structures. Types at platforms. TLPs, Jackets, Semisubmersibles. Jack-ups, concrete gravity. Floating platforms-sizing, stability, structural design of TLPs (tension-leg platform). Introduction to fixed offshore structures-sizing & layout, structural design of Jackets. Break waters & Seawalls. Design of offshore pipelines. Hydrostatics, hydrodynamic analysis & structural design. Buoys & Mooring system- mooring configurations, advantages & disadvantages. Safety of offshore structures-reliability & risk assessment, failure modes.

**Reference Book**

1. Eliminator of ocean Engineering. Dr. Ashoke Bhar
2. Introduction to offshore structures, Design, fabrication, Installation, W.J. Geatt.

**NAME 499: Shipyard Management**

**3.00 Credit, 3 hrs /wk**

Organogram. Responsibility and accountability chain. Management: structure and style. Trade union: legal rights and collective bargaining. Factors related to job satisfaction and dissatisfaction. Performance appraisal. Shipbuilding: phase-wise work contents, initial estimation procedures and practice, information flow, agreements. Handling of material and material flow. Plant location: layout and construction, plant safety. Designer's roles: owner's requirements, builder's profit and society's rules. Material and technological constraints. Alternative designs and acceptance of a compromise design. Post-production assessment for future guidance.



**4.3.3 Detail Syllabus of undergraduate Courses offered by other departments****Chem 121: Chemistry-I**3.00 Credit, 3 hrs /wk**Sec A**

Modern concept of Atomic Structure, Different atom models, quantum numbers, electronic configuration, advanced concepts of bonds and molecular structure, Crystal structures, Modern periodic table, Chemistry of Transition metals, Properties and uses of noble gases, Acids and Bases, Selected topics on organic chemistry, Introduction to organic polymer, Basic concepts of dyes color and constitution.

**Sec B**

Chemistry of solutions, Properties of dilute solutions, Chemical equilibrium, Thermo chemistry, Electrochemical cells, Ionization of water and  $p^H$ , Chemical kinetics, Phase rule and phase diagrams.

**Chem 122: Chemistry Seasonal**1.50 Credit, 3 hrs./ wk.

Volumetric Analysis: Acid base titration, Oxidation-reduction titration, Determination of Cu, Fe and Ca volumetrically, Complex metric titration, determination of Ca, Mg in water.

**Hum 131 : English**2.00 Credit, 2 hrs./wk.**Section-A**

**General Discussion:** Introduction, various approaches to learning English, characteristics of good learners, learning styles and strategies.

**Grammar and Usage:** Construction of sentences, Vocabulary, diction, Synonyms and Antonyms, grammatical errors, WH Questions, sentence variety and style, conditionals. Academic word lists, collocation, phrases and idioms.

**The phonetics:** IPA, English vowels and consonants, weak forms, assimilation and elision, differences between British, American and other accents, accentuation and Intonation, Common Mistakes in English Pronunciation.

**Reading Skill:** Discussion, readability, scan and skin reading, generating ideas through purposive reading, reading selective stories, comprehension. Reading and Identifying differences between different genres of texts, critical reading.

**Speaking Skill:** Practicing dialogue, storytelling, describing pictures, charts/graphs, sharing anecdotes.

**Section-B****Writing Skill:**

**Introduction:** Principles of effective writing, organization, planning and development of writing, writing of composition, Paragraph, précis and amplification.

**General Strategies for the Writing Process:** Generating ideas, stating problems, drafting and finalizing, revising and editing.

**Approaches to Communication:** Communication today, business communication, tenders and quotation, journal articles, Job letters and official Letters.

Writing arguments, biographies, memoirs, describing charts/graphs etc.

**References:**

1. Prose of Our Time-AhsanulHaque, Serajul Islam Chowdhury& M. Shamsuddoha; NawrozeKitabistanBanglabazar, New Market.
2. A Guide to Correct Speech-S. M. Amanullah.
3. Business correspondence and Report writing –R. C. Sharma & Krishna Mohan; Tata McGraw-Hill Publishing Company Ltd.
4. Sheep or Ship – Ann Baker.
5. Dictionary of Pronunciation-Daniel Jones.
6. Advance Learners Degree General English- Chowdhury and Hossain.
7. The most Common Mistakes in English Usage – Thoma'sEllioft Berry.
8. A Practical English Grammar – A Thomas, A V Martinet.
9. A Book of Modern English Prose-Z R Siddique and others; Kathakali, Dhaka.

**Hum 132 : English**

1.50 Credit, 2 hrs./wk.

**Listening Skills and Note Taking:** Listening to recorded texts and class lectures and learning to take useful notes based on listening.

**Developing Speaking Skill:** Communicative expressions for personal identification, life at home/Dormitory, Advice and opinion, Instruction and directions, requests, complaints, apologies, describing people and places, narrating events.

**Tutorial Discussion:** On a given topic to test the proper use of phonetics, pronunciation, grammar, logic and confidence.

**Public Speaking:** Demonstration by teacher for a short specific period, speaking by students (each student minimum twice) on different easy given topics well in advance as per a schedule maximum for 3 to 4 minutes for each student, Debriefing on public speaking.

**Extempore:** Minimum two presentations by each students for duration of maximum 3 to 4 minutes, Debriefing on extempore presentation.

Presentation: On a given professional topic or on a given research paper using power point for 40 minutes followed by question and answer session, Group presentation on different given topics by the students using power point.

**References:**

1. Prose of Our Time-AhsanulHaque, Serajul Islam Chowdhury& M. Shamsuddoha; NawrozeKitabistanBanglabazar, New Market.
2. A Guide to Correct Speech-S. M. Amanullah.
3. Business correspondence and Report writing –R. C. Sharma & Krishna Mohan; Tata McGraw-Hill Publishing Company Ltd.
4. Sheep or Ship – Ann Baker.
5. Dictionary of Pronunciation-Daniel Jones.
6. Advance Learners Degree General English- Chowdhury and Hossain.
7. The most Common Mistakes in English Usage – Thoma'sEllioft Berry.
8. A Practical English Grammar – A Thomas, A V Martinet.
9. A Book of Modern English Prose-Z R Siddique and others; Kathakali, Dhaka.

### **Hum 223 : Economics**

3.00 Credit, 3 hrs./wk.

Microeconomics: Definition of economics; Resource allocation-Production Possibility Frontier (PPF); Market, Global Market and Government in a modern economy; Basic elements of demand and supply; Choice and utility; indifference curve technique; Free market economy; Theory of production; Analysis of cost, Firms' Equilibrium, Short run long run cost curves.

Macroeconomics: Key concepts of macroeconomics; Saving, consumption, investment; National income analysis; Inflation, Unemployment. Cost benefit analysis, NPV, IRR, Payback period.

Development: Theories of developments; Banking system of Bangladesh, National Budget, Development partners (World Bank, Asian Development Bank, World Trade Organization, International Monetary Fund)

### **Text and Ref Books:**

1. Economics by Samuelson.
2. Economics by John Sloman
3. Economics Development by Michael Todaro
4. Money and Banking by Dudley g luekett.
5. Banking (Bangla Version)-MonoranjanDey.
6. Banking (Bangla Version)- Zahirul Islam Shikde.

### **Hum 313 : Principles of Accounting**

3.00 Credit, 3 hrs./wk.

A study of accounting as an information system, fundamental accounting concepts and principles used to analyze and record business transactions, Recording system: Double-entry book keeping and accounting, accounting equation, measuring and recording business transactions. Accounting cycle: Journal, ledger, trail balance, preparation of financial statements considering adjusting and closing entries, financial statements analysis and interpretation : Ratio analysis-tests for profitability, liquidity, solvency and overall measure.

**Cost in general:** Objectives and classifications. Overhead costs: Allocation and apportionment. Products costing: Cost sheet under job costing. Process costing, costing by products and joint products.

**Marginal costing:** Tools and techniques; Cost-volume profit analysis: Meaning, break-even analysis, contribution margin technique and sensitivity analysis, designing the optimal product mix.

**Relevant costing:** Analysis, Profitability within the firm. Guidelines for decision-making: Short-run decisions.

**Long run planning and control:** Capital budgeting; the master budget, flexible budget and standard cost, variance analysis.

**Text and Ref Books:**

1. Accounting Principles-Jerry J. Weygandt, Donald E.Kieso, and Paul D.Kimmel  
Publisher: Wiley; 8 edition.
2. Cost Accounting: Theory and Practice-Bhabatosh Banerjee; Publisher: Prentice – Hall of India Pvt. Ltd; 12Rev Ed edition.
3. Cost and Management Accounting-Duncan Williamson; Publisher: Prentice Hall.
4. Introduction to Management Accounting-Charles T. Horngren, Gary L. Sundem, William O. Stratton and Jeff Schatzberg; Publisher: Prentice Hall; 14 edition.
5. Managerial Accounting 10/e Update Edition-Ray; Noreen, Eric Garrison; Publisher: McGraw-Hill
6. Fundamental Accounting Principles-Kermit Larson, John Wild and Barbara Chiappetta; Publisher: McGraw-Hill/Irwin;16 edition.

**Math 151 : Differential Calculus and Integral Calculus**

3.00 Credit, 3 hrs /wk

**Differential Calculus:** Limit, Continuity and Differentiability. Differentiation of explicit and implicit functions and parametric equations. Differentials. Successive differentiation of various types of functions, Leibnitz's theorem. Roles' theorem. Mean Value theorems. Taylor's theorem. Maclaurin's theorem. Lagrange's form of remainders. Cauchy's form of reminder. Expansion of functions by differentiation and integration. Evaluation of indeterminate forms by L'Hospitals rule. Equation of tangent and normal. Partial differentiation. Euler's theorem. Maxima and Minima of functions of single variable. Curvature and circle of curvature. Asymptotes.

**Integral Calculus:** Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integral with properties. Improper integral. Beta function and Gamma Function. Area. Arc lengths of curves in Cartesian and polar co-ordinates. Volumes of solid of revolution. Area of surface revolution.

**Math 153: Ordinary Differential Equation and Partial Differential Equation**

3.00 Credit, 3 hrs /wk

**Ordinary Differential Equation:** Degree and order of ordinary differential equation, Formation of differential equation, Formation of differential equations, Solutions of first order differential equations by various methods, Solution of general linear equations of 2<sup>nd</sup> and higher orders with constant co-efficient, Solutions of homogeneous linear

equations of higher order when the dependent and independent variables are absent, Solution of Euler's linear homogeneous equation, Solution of differential equation by the methods based on factorization of the operator.

**Partial Differential Equation:** Introduction, Equations of the linear and non-linear first order, Standard forms, Linear equations of higher order, Equations of the second order with variable co-efficient, Charpit's method and linear PDE with constant coefficients.

**Math 251: Vector Analysis and Co-ordinate Geometry**

3.00 Credit, 3 hrs /wk

**Vector Analysis:** Scalars and vectors, Equality of vectors, Addition and subtraction of vectors, Multiplication of vectors by scalars, Position vector of a point, Resolution of vectors, Scalar and vector product of two vectors and their geometrical interpretation, Triple products and multiple products. Application to geometry and mechanics, Linear dependence and independence of vectors, Differentiation and integration of vectors together with elementary applications, Definition of line, surface and volume integrals, Gradient, Divergence and Curl of point functions, various formulae, Gauss's theorem, Stoke's theorem, Green's theorem and their applications.

**Co-ordinate Geometry:** Change of axes, Transformation of co-ordinates, Pair of straight lines, System of circles, Co-axial system of circles and limiting points, Equations of parabola, Ellipse and hyperbola in Cartesian and polar co-ordinates, Tangents and normals, Pair of tangents, Chord of contact, chord in terms of its middle point, Parametric co-ordinates, Diameters, Conjugate diameters and their properties.

**Math 253: Statistics, Laplace Transform and Matrices**

3.00 Credit, 3 hrs /wk

**Statistics:** Frequency distribution, Mean, median, mode and other measures of central tendency, Standard deviation and other measures of dispersion, Moments, Skewness and Kurtosis, Elementary probability theory and discontinuous probability distribution, e.g. binomial, Poisson and negative binomial, Continuous probability distributions, e.g. normal and exponential, Characteristics of distributions, Elementary sampling theory, Estimation, Hypothesis testing and regression analysis.

**Laplace Transforms:** Definition of Laplace transforms, Elementary transformation and properties, Convolution, Solution of differential equation by Laplace transforms, evaluation of integrals by Laplace transforms.

**Matrices:** Definition of matrix, Different types of matrices, Algebra of matrices, Adjoin and inverse of a matrix, Rank and elementary transformations of matrices, Normal and canonical forms, Solution of linear equations, Quadratic forms, Matrix polynomials, Caley-Hamilton theorem, Eigen values and eigenvectors.

**Math 351: Fourier Analysis, Harmonic Function and Complex Variable**

4.00 Credit, 4 hrs /wk

**Fourier analysis:** Real and complex form, Finite transform, Fourier integral, Fourier transforms and their uses in solving boundary value problems.

**Harmonic Function:** Definition of harmonics, Laplace equation in Cartesian, polar, Cylindrical and spherical co-ordinates, Solutions of these equations together with applications, Gravitational potential due to a ring, Steady-state temperature, Potential inside or outside of a sphere, Properties of harmonic functions.

**Complex Variable:** Complex number system, General functions of a complex variable, Limits and continuity of a function of complex variable and related theorems, Complex differentiation and the Cauchy Riemann equations, Mapping by elementary functions, Line integral of a complex function, Cauchy's integral theorem, Cauchy's integral formula, Liouville's theorem, Taylor's and Laurent's theorem, Singular points, Residue, Cauchy's residue theorem, Evaluation residues, Contour integration, Conformal mapping.

### **Phy 121: Structure of Matter, Electricity & Magnetism and Modern Physics**

3.00 Credit, 3 hrs /wk

#### **Sec A**

**Structure of Matter:** Crystalline and non-crystalline solids, Single crystal and polycrystalline solids, Unit cell, Crystal systems, Co-ordination number, Crystal plane and direction, NaCl and CsCl structure, Packing factor, Miller indices, Relation between interplaner spacing and Miller indices, Bragg's Law, Methods of determination of interplanar

spacing from diffraction patterns; Defects in solids: Point defects, Line defects, Bonds in solids, Interatomic distances, Calculation of cohesive and bonding energy, Introduction to band theory, Distinction between metal, semiconductor and insulator.

**Electricity & Magnetism:** Coulomb's Law, Electric field (E), Gauss's Law and its application, Electric potential (V),

#### **Sec B**

Capacitors and capacitance, Capacitors with dielectrics, Dielectrics-an atomic view, Charging and discharging of a capacitor, Ohm's Law, Kirchhoff's Law, Magnetic field, Magnetic induction, Magnetic force on a current carrying conductor, Torque on a current carrying loop, Hall effect, Faradays Law of electromagnetic induction, Lenz's Law, Self induction, Mutual induction, Magnetic properties of matter, Hysteresis curve, Electromagnetic oscillation, L-C oscillation and its analogy to simple harmonic motion.

**Modern Physics:** Michelson-Morley's experiment, Galilean transformation, Special theory of relativity and its consequences, Quantum theory of radiation, Photo-electric effect, Compton effect & pair production, Wave Particle duality, Interpretation of Bohr's postulates, Radioactive disintegration, properties of nucleus, Nuclear reactions, Fission, Fusion, Chain reaction, Nuclear reactor.

### **Phy 123: Waves & Oscillations, Geometrical Optics and Wave Mechanics**

3.00 Credit, 3 hrs /wk

#### **Sec A**

**Waves & Oscillations:** Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations,

## RESTRICTED

Lissajous figures, Spring-mass system, Calculation of time period of torsional pendulum, Damped oscillation, Determination of damping coefficient, Forced oscillation, Resonance, Two-body oscillations, reduced mass, Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity, Architectural acoustics, Reverberation and Sabine's formula.

**Geometrical Optics:** Combination of lenses: Equivalent lens and equivalent focus length, Cardinal points of a lens, Power of a lens;

### **Sec B**

Defects of images: Spherical aberration, Astigmatism, Coma, Distortion, Curvature, Chromatic aberration; Optical Instruments: Compound microscope, Polarizing microscope, Resolving power of a microscope, Camera and photographic techniques.

**Wave Mechanics:** Principles of statistical physics, Probabilities, Classical statistics, Quantum statistics, Bose-Einstein statistics, Fermi Dirac statistics and their applications, Fundamental postulates of wave mechanics, Time dependent and time independent Schrodinger equation, Schrodinger equation for one-electron atom and its solution, potential barrier and tunnel effect.

### **Phy 124: Physics Sessional**

**1.50 Credit, 3 hrs /wk**

Laboratory Experiments Based on Phy 105 and 107.

**CHAPTER-5****5.0 Courses offered by NAME Department to Students of other departments**

<b>Course No</b>	<b>Course Name</b>	<b>Level-Term</b>	<b>Contact Hours</b>	<b>Credit Hours</b>
ME-415	Hydrostatic and Stability of Ships and Marine Vehicles	4-1 (ME)	3.0	3.0
ME-419	Resistance and Propulsion of Ships	4-2 (ME)	3.0	3.0



**CHAPTER 6****6.0 DETAIL OUTLINE OF UNDERGRADUATE COURSES OFFERED BY ME DEPARTMENT TO OTHER STUDENTS****ME-415 : Hydrostatic and Stability of Ships and Marine Vehicles****3.00 Credit , 3 hrs/wk**

Hull form definition of ships and ocean structures. Lightweight, deadweight, capacity and tonnage measurement, Hydrostatic calculations. Initial stability, free surface effects, stability at large angles, intact stability computations, damages stability and its calculations by lost buoyancy and added weight method, Inclining experiment. International Maritime Organization (IMO) stability criteria, wind heeling criteria, subdivision and floodable length calculations. Subdivision indices. Launching calculations.

**Text and Ref Books:**

1. Basic Ship Theory Volume-I (3<sup>rd</sup> edition) – K. J. Rawson & E. C Tupper.
2. Principles of Naval Architecture (Revised edition), Publisher- The Society of Naval Architecture and Marine Engineers.
3. Know Your Own Ship (28<sup>th</sup> edition) – Walton and Baxter, Publisher- Charles Griffin and Company Ltd.
4. Introduction to Naval Architecture – Thomas C. Gillmer and Bruce Johnson, Publisher – E & F. N Spon Ltd, 11 Fetter Lane, London

**ME-419 : Resistance and Propulsion of Ships****3.00 Credit , 3 hrs/wk**

Phenomena resisting the motion of ships, Resistance due to friction, wave making, form, appendage, wing and waves squat, blockage and shallow water effects. Estimation of powering using methodical series and statistical methods. Advantageous effects of hull form changes – bulbous bows. Asymmetric sterns and optimum trim for ships in ballast.

Screw propeller geometry, Momentum and blade element theories. Propellers in open water, propeller coefficients and design charts. Hull propeller interaction- wake, thrust deduction and relative rotative efficiency. Propeller cavitations. Propeller blade strength. Screw design according to circulation theory for uniform and non-uniform wake. Speed trials and service performance analysis.

**Text and Ref Books:**

1. Muckle's Naval Architecture – by W. Muckle Revised by D. A Taylor.
2. Reed's Naval Architecture
3. Basic Ship Theory Vol-2 (3<sup>rd</sup> edition) – K. J. Rawson & E. C. Tupper, Publisher – Longman Group Limited, LongmanHouse, Burnt Hill, Harlow, Essex CM 20 2JE, England.
4. Principles of Naval Architecture (Revised edition) – Joh P. Comstock, Publisher – The Society of Naval Architects and Marine Engineers.
5. Resistance and Propulsion of Ships – S V A. A. Harvald, Publisher – John Wiley & Sons, New York and Singapore.