4.1 Introduction

Course schedule for the undergraduate students of the Department of Naval Architecture and Marine Engineering is given below.

Summary of Course Curriculum

	Total	Departmental
Theory Subjects	40	23
Sessional Subjects	28	19
Theory (Credit Hours/Contact Hours)	117/117	69/ 69
Sessional (Credit Hours/Contact Hours)	43.5/87	31.5/63
Total Credit hours	160.50	
Total contact hours	204.00	

Contact hours and credit hours in eight terms in NAME department

Level-Term	Contact hours for Theory courses	Contact hours for Sessional courses	Cumulative contact hours	Cumulative credit hours
1-I	14.0	10.5	24.5	19.25
1-II	15.0	12	51.5	40.25
2-I	14.0	10.5	76.0	59.50
2-II	14.0	12.0	102	79.50
3-I	14.0	12.0+6.0*	134	102.5
3-II	16.0	6	156	121.5
4-I	15.0	9.0	180	141
4-II	15.0	9.0	204	160.5
Total	**117.0**	**87**	**204**	**160.5**
***Training course** (4 week @ 21 hr/week ≈ 14 week @ 6 hr/week)				

Distribution of credit hours for different categories of courses in NAME dept.

Level-Term	1-I	1-II	2-I	2-II	3-I	3-II	4-I	4-II	Total
Huminities (credit hr.)	2+0	-	2+1.5	2+0	2+0	-	-	-	8+1.5
Mathematics (credit hr.)	3+0	3+0	3+0	3+0	-	4+0	-	-	16+0
Basic Sciences (credit hr.)	6+1.5	3+1.5	-	-	-	-	-	-	9+3
Departmental Engineering (credit hr.)	3+0	3+3	6+3	6+4.5	9+6+3	9+3	6+4.5	9+4.5	51+(28.5+3)
Allied Engineering (credit hr.)	0+3.75	6+1.5	3+0.75	3+1.5	-	-	3+0	-	15+7.5
Optional Courses (credit hr.)	-	-	-	-	3+0	3+0	6+0	6+0	18+0
Total	14+5.25	15+6	14+5.25	14+6	14+6+3	16+3	15+4.5	15+4.5	117+43.5

4.2   Course Content of the Department of Naval Architecture & Marine Engineering

<u>**Level-1 Term-I**</u>

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Chem 109	Chemistry -1	3	3
Hum 111	English	2	2
Math 181	Differential Calculus and Integral Calculus	3	3
NAME 117	Hydrostatics and Stability	3	3
Phy 105	Structure of Matter, Electricity, Magnetism and Modern Physics	3	3
Sessional Courses			
Chem 114	Chemistry Sessional -1	3	1.5
ME 160	Mechanical Engineering Drawing-1	3	1.5
Shop 186	Machine Shop Sessional	1.5	0.75
Shop 188	Foundry and Welding Shop Sessional	3	1.5
Total (5T + 4S)		**24.50**	**19.25**

Level -1 Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
EEE 161	Electrical Engineering Principles	3	3
ME 169	Basic Thermal Engineering	3	3
Math 183	Coordinate Geometry and Ordinary Differential Equation	3	3
NAME 123	Fluid Mechanics	3	3
Phy 107	Waves and Oscillations, Geometrical Optics and Wave Mechanics	3	3
Sessional Courses			
ME 170	Basic Thermal Engineering. Sessional.	3	1.5
NAME 118	Ship Design and Drawing I	3	1.5
NAME 124	Fluid Mechanics Sessional	3	1.5
Phy 102	Physics Sessional	3	1.5
Total (5T +4S)		**27.00**	**21.00**

Level-2 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
HUM 113	Economics	2	2
Math 281	Vector Analysis and Differential Equation (Special Types)	3	3
MME 293	Shipbuilding Materials	3	3
NAME 219	Marine Engines and Fuels	3	3
NAME 251	Mechanics of Structure	3	3
Sessional Courses			
Hum 102	English Sessional	3	1.5
MME 294	Shipbuilding Materials Sessional	1.5	0.75
NAME 238	Ship Design and Drawing II	3	1.5
NAME 252	Mechanics of Structure Sessional	3	1.5
Total (5T + 4S)		**24.50**	**19.25**

Level -2 Term –II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
EEE 261	Electrical and Electronic Technology for Marine Engineers	3	3
Hum 211	Sociology	2	2
Math 283	Statistics, Partial Differential Equation and Matrices	3	3
NAME 217	Theoretical Ship Design	3	3
NAME 223	Marine Hydrodynamics	3	3
Sessional Courses			
EEE 262	Electrical and Electronic Technology for Marine Engineers Sessional	3	1.5
NAME 224	Marine Hydrodynamics Sessional	3	1.5
NAME 248	Ship Design and Drawing III	3	1.5
NAME 246	Computer Aided Design (CAD)	3	1.5
Total (5T + 4S)		**26.00**	**20.00**

Level-3 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Hum 313	Principles of Accounting	2	2
NAME 323	Resistance and Propulsion of Ships	3	3
NAME 345	Welding Technology	3	3
NAME 351	Ship Structure	3	3
Optional courses (any one **)			
NAME 315	Country Boats	3	3
NAME 335	Port and Harbor Engineering	3	3
NAME 353	Sea Waves and Spectral Analysis	3	3
NAME 357	Marine Pollution	3	3
NAME 371	Finite Element Method for Ship Structure	3	3
Sessional Courses			
NAME 324	Resistance and Propulsion of Ships Sessional	3	1.5
NAME 338	Ship Design Project and Presentation	3	1.5
NAME 348	Ship Design and Drawing – IV	3	1.5
NAME 352	Ship Structure Sessional	3	1.5
	Total (5T+4S)	**26.00**	**20.00**
Training course during vacation			
NAME 310	Shipyard Practice (consolidated 4 weeks)	21	3

Level-3 Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Math 381	Fourier Analysis, Harmonic Function, Complex Variable and Laplace Transforms	4	4
NAME 319	Theory of Machines	3	3
NAME 355	Ship Construction	3	3
NAME 329	Heat Transfer	3	3
Optional courses (any one **)			
NAME 327	Economic and Social Aspects of Marine Transportation System	3	3
NAME 343	Marine Acoustics	3	3
NAME 347	Design of Special Ships	3	3
NAME 363	Computational Fluid Dynamics (CFD)	3	3
Sessional Courses			
NAME 336	Computer Programming in Ship Design - I	3	1.5
NAME 338	Ship Design Project and Presentation	3	1.5
Total (5T+2S)		**22.00**	**19.00**

Level-4, Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
IPE 479	Engineering Management	3	3
NAME 415	Marine Maintenance and Repair	3	3
NAME 419	Motion and Control	3	3
Optional courses (any two **)			
NAME 413	Theory of Hydrofoils	3	3
NAME 439	Ship Vibration	3	3
NAME 451	Advanced Ship Structure	3	3
NAME 455	Computer Aided Ship Production	3	3
NAME 457	Fishing Vessel Technology	3	3
NAME 471	Computer Aided Ocean Structure Analysis	3	3
NAME 475	Dredger and Dredging Technology	3	3
NAME 477	Optimization Methods in Ship Design	3	3
Sessional Courses			
NAME 400	Project and Thesis	3	1.5
NAME 416	Numerical Computations Sessional	3	1.5
NAME 436	Computer Programming in Ship Design-II	3	1.5
Total (5T + 3S)		**24.00**	**19.50**

Level -4, Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
NAME 427	Maritime System and Management	3	3
NAME 429	Marine Engineering	3	3
NAME 449	Navigation and Maritime Regulations	3	3
Optional courses (any two**)			
NAME 423	Power and Propulsion Systems	3	3
NAME 425	Shipyard Management	3	3
NAME 447	Design of Inland Waterways Transportation System	3	3
NAME 461	Hydro-elasticity	3	3
NAME 465	Marine Production and Planning	3	3
NAME 467	Control Engineering	3	3
NAME 469	Ship Performance	3	3
NAME 481	Optimum Structural Design	3	3
Sessional Courses			
NAME 400	Project and Thesis	6	3
NAME 430	Marine Engineering Sessional	3	1.5
Total (5T+2S)		**24.00**	**19.50**

GROUP A: Hydrodynamics and Structural Division   **(TABLE A)**

Course No.	Name of the Course	Credits hours	Type of Course
NAME 343	Marine Acoustics	3	Hydrodynamics
NAME 353	Sea Waves and Spectral Analysis	3	Hydrodynamics
NAME 363	Computational Fluid Dynamics (CFD)	3	Hydrodynamics
NAME 371	Finite Element Method for Ship structure	3	Structure
NAME 413	Theory of Hydrofoils	3	Hydrodynamics
NAME 423	Power and Propulsion Systems	3	Hydrodynamics
NAME 439	Ship Vibration	3	Hydrodynamics
NAME 451	Advanced Ship Structure	3	Structure
NAME 461	Hydro-elasticity	3	Structure
NAME 469	Ship Performance	3	Hydrodynamics
NAME 471	Computer Aided Ocean Structure Analysis	3	Structure
NAME 481	Optimum Structural Design	3	Structure

GROUP B: Design and Production Division (**TABLE B**)

Course No.	Name of the Course	Credits hours	Type of Course
NAME 315	Country Boats	3	Design/ Production
NAME 327	Economic and Social Aspects of Marine Transportation System	3	Design
NAME 335	Port and Harbor Engineering	3	Design/ Production
NAME 347	Design of Special Ships	3	Design/ Production
NAME 357	Marine Pollution	3	Design
NAME 425	Shipyard Management	3	Production
NAME 447	Design of Inland Waterways Transportation System	3	Design
NAME 455	Computer Aided Ship Production	3	Production
NAME 457	Fishing Vessel Technology	3	Design
NAME 465	Marine Production and Planning	3	Production
NAME 467	Control Engineering	3	Design
NAME 475	Dredger and Dredging Technology	3	Design/ Production
NAME 477	Optimization Methods in Ship Design	3	Design

** Optional courses are divided into two major divisions:
1)   Hydrodynamics and Structural division and
2)   Design and Production division.

A student belonging to a particular division must take six optional courses (two in level 3 and four in level 4) altogether from that division in level 3 and Level 4.

Moreover, a student belonging to Hydrodynamics and Structural division must take at least two optional courses from Hydrodynamics courses and at least   two optional courses from Structural courses shown in TABLE – A. Similarly, a student belonging to Design and production division must take at least two optional courses   from   Design courses and at least two optional courses from Production courses shown in TABLE – B.

4.3   Detail Syllabus of Undergraduate Courses of the Department of Naval Architecture & Marine Engineering

4.3.1   Compulsory Courses

NAME 117: Hydrostatics and Stability
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, 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.

NAME 118 Ship Design and Drawing I
1.50 Credit, 3 hrs. /wk.

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

NAME 123: Fluid Mechanics
3.00 Credit, 3 hrs./wk.

Fluid properties, fluid statics and kinematics, continuity, energy and momentum principles, 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.

NAME 124: Fluid Mechanics Sessional
1.5 Credit, 3 hrs. /wk.

Experiments based on NAME 123

NAME 217: Theoretical Ship Design
3.00 Credit, 3 hrs. /wk.
Prereq.: NAME 117

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 merchant ships.

NAME 219: Marine Engines and Fuels
3.00 Credit, 3 hrs. /wk.

Prereq. ME 169

Performance 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.

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.

NAME 223: Marine Hydrodynamics
3.00 Credit, 3 hrs. /wk.
Prereq. NAME 123

Flow of an ideal fluid: equation of continuity, streamlines, streak lines and path lines, two-dimensional flow patterns, rotational and irrotational flows, vorticity, 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 Blasius 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.

NAME 224: Marine Hydrodynamics Sessional
1.50 Credit, 3 hrs. /wk.
Prereq. NAME 123, NAME 124

Experiments based on NAME 223

NAME 238 Ship Design and Drawing II
1.50 Credit, 3 hrs. /wk.
Prereq.: NAME 117, NAME 118

Hull form design, Space allocation and general arrangement (GA), Hydrostatic calculation, stability and cross curves, checking compliance with standard stability criteria, trim calculations.

NAME 246: Computer Aided Design (CAD)
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 248: Ship Design and Drawing III
1.50 Credit, 3 hrs. /wk.
Prerequisite: NAME 238

Scantling of structural members, Mid-ship section, longitudinal

construction and shell expansion drawings. Capacity plan.

NAME 251: 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.

NAME 252: 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 310: Shipyard Practice
3.0 Credit, consolidated 4 weeks @ 21hrs./wk.

Ship design: basic design, estimation, hull design, piping and equipment design, shell expansion, detailed construction drawings. Ship construction: mould loft, gas cutting, CNC cutting, welding, fabrication, sub-assembly, assembly, field assembly, erection, launching, outfitting, delivery trial, Diesel engine workshop practice.

NAME 319: Theory of Machines
3.00 Credit, 3 hrs/wk.

Introduction, Kinematics and Kinetics of motion, Simple harmonic motion, Simple mechanism, Velocity in mechanisms (instantaneous centre methods and relative velocity method), Accelerations in mechanisms, Mechanisms with lower pairs, Friction, Belt, rope and chain drive. Toothed gearing, Gear trains, Gyroscopic couple and precision motion, Design of marine shafts, stern tube and bearing.

NAME 323: Resistance and Propulsion of Ships
3.00 Credit. 3 hrs/wk.
Prereq. NAME 223

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.

NAME 324: Resistance and Propulsion of Ships Sessional
1.50 Credit. 3 hrs/wk.

Sessional based on NAME 323

NAME 329: 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.

NAME 336: Computer Programming in Ship Design-I
1.50 Credit, 3 hrs. /wk.

Introduction to computer hardware, software and operating systems. Algorithms and flowcharts. Introduction to programming languages. FORTRAN 77 and FORTRAN 90: variables, statements, format directed input and output, nesting, arrays and pointers, subprograms and modules, graphics programming, using library functions, dynamic link library (DLL), dynamic memory allocation, creating multi-thread application, programming with mixed languages, debugging. Computer applications to naval architecture problems especially hydrostatic calculations of marine vehicles.

NAME 338: Ship Design Project and Presentation
3.00 Credit, 6hrs. /wk.
Prereq. NAME 118, NAME 238, NAME 246, NAME 248

[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 stability, light weight and deadweight, design update and final design with lines, GA, midship, profile, deck and bottom construction based on Rule Book, shell expansion, hydrostatic curves, trim and cross curves of stability, power, engine selection and propeller design.

NAME 345: Welding Technology
3.00 Credit, 3 hrs. /wk.

Development of ship welding. Different types of welding and their equipment. Welding principle, types of power sources and their characteristics. Welding methods: MMAW, GMAW, SAW, Electroslag welding, TIG. 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. Non destructive testing. Methods and principles of cutting, cutting equipment. Steel surface preparation – shot blasting, acid pickling, etc.

NAME 348: Ship Design and Drawing IV
1.50 Credit, 3 hrs. /wk.
Prerequisite: NAME 118, NAME 238, NAME 248

Rudder design and drawing. Steering arrangement. Shafting and propeller arrangement. Main engine foundation.

NAME 351: Ship Structure
3.00 Credit, 3 hrs/wk.
Prereq.: NAME 251

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

NAME 352: Ship Structure Sessional
1.50 Credit, 3 hrs/wk.
Prereq. NAME 252

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 355: Ship Construction
3.00 Credit, 3 hrs. /wk.

Development of ship structure. Details of 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. Introduction to the rules of Classification Societies.

NAME 400: Project and Thesis
4.50 Credit, 9 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) etc.

NAME 415: Marine Maintenance and Repair
3.00 Credit. 3 hrs/wk
Prereq.: NAME 345, NAME 355

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, 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.

NAME 416: Numerical Computations Sessional
1.5 Credit, 3 hrs. /wk.

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

NAME 419: Motion and Control
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.

NAME 427: Maritime System and Management
3.00 Credit. 3 hrs/wk.
Prereq.: NAME 217

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.

NAME 429: Marine Engineering
3.00 Credit. 3 hrs/wk.
Prereq.: NAME 219

Pumps: types: characteristics, NPSH, head calculation. blowers and compressors. Refrigeration and air-conditioning: thermodynamics, principles. Air conditioning system for ships. Heating and ventilating 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.

NAME 430: Marine Engineering Sessional
1.50 Credit. 3 hrs/wk.

Sessional based on NAME 219 and NAME 429

NAME 436: Computer Programming in Ship Design-II
1.50 Credit, 3 hrs. /wk.
Prereq.: NAME 336

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 449: 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.

4.3.2   Optional Courses

NAME 315: Country Boats
3.00 Credit. 3 hrs/wk.

Country boats: types, sizes, hull shape and hydrostatic characteristics. Evaluation of hull shapes, Structural design of country boats. Timber used for boat building and treatment methods. Traditional and novel construction method. Mechanized and sail propulsion of country boats. Artisanal offshore fishing boats of Bangladesh and other places of the world. Advantages and disadvantages of country boats and scopes of improvements. Role of country boats in Bangladesh. Socio-economic aspects of country boat operations. Alternative boatbuilding materials for country boats. Current topics on country boats.

NAME 327: 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.

NAME 335: Port and Harbor Engineering
3.00 Credit. 3 hrs/wk.

Introduction to port and harbor structures. Harbor classifications. Port facilities: Berthing and mooring structures and rendering 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.

NAME 343: Marine Acoustics
3.00 Credit. 3 hrs/wk.

Underwater noise. Acoustic conversion efficiency. Types of under water noise. Noise control. Elementary characteristics of sound. Wave equation. Plane sound waves, spherical waves, transmission at media interfaces. Acoustic radiation. Radiation efficiency- noise level, spectra and bandwith. Propeller noise. Singing. Cavitation noise. Structure – fluid interaction - structural resonance, acoustic control measures, hull array. Devices for under water sound production and reception. Commercial applications of underwater acoustics.

NAME 347: Design of Special Ships

3.00 Credit. 3 hrs/wk.
Prereq. NAME 317

Special design features of trawlers, tugs, container ships, ro-ro ships, tankers, submarines and other warships, high speed crafts, and multi-hull vessels.

NAME 353: Sea Waves and Spectral Analysis
3.00 Credit. 3 hrs/wk.

Waves and the sea. Irregular wave patterns. Time series: Fourier analysis, spectral density. Sea spectra: International Towing Tank Conference (ITTC) spectra, International Ship and Offshore Structure Congress (ISSC) spectra, Joint North Sea Wave Project (JOHNSWAP) spectra. Direction spectra. Recent development in spectral analysis. Spectrum of related quantities: excitation and response spectra, spectral estimates and parameters, selection of extreme value distributions.

NAME 357: Marine Pollution
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.

NAME 363: Computational Fluid Dynamics
3.00 Credit. 3 hrs/wk.
Prereq.: NAME 123, NAME 223

Introduction. Governing equations of fluid flow. Green's theorem, Boundary integral methods and its application to radiation and diffraction problems, Discretisetion 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).

NAME 371: Finite Element Method for Ship structure
3.00 Credit. 3 hrs/wk.
Prereq. NAME 251

Basic concept of finite element method (FEM) and its application to ship structure, transformations of local and global coordinate system, stiffness matrices, assembly of global stiffness matrix, boundary conditions, plane strain and plane stress analysis, convergence requirements. Isoparametric elements in two and three dimensions. Formulation of stiffness matrix for beam and shell elements, linear static analysis. Problems involving non-linear material behaviour. Introduction to Finite Element softwares and analysis of frame structures.

NAME 413: Theory of Hydrofoils
3.00 Credit. 3 hrs/wk.
Prereq. NAME 323

Definition and geometry of hydrofoils. Analytic investigation of flow past a hydrofoil. Theory of thin hydrofoils. Theory of hydrofoils having

arbitrary shapes. 2-D and 3-D hydrofoils. Design and analysis of hydrofoil sections. Cavitating hydrofoils.

Application of hydrofoils to high-speed craft, control surface and propeller.

NAME 423: Power and Propulsion Systems
3.00 Credit. 3 hrs/wk.
Prereq. NAME 323

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

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

NAME 425: 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.

NAME 439: Ship 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. Torsional, 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.

NAME 447: Design of Inland Waterways Transportation System.
3.00 Credit, 3 hrs/wk.

Inland waterways and their peculiarities. Maintenance of navigational channel; siltation bank erosion and dredging. Inter-modal transportation, Specialized inter-modal transportation vessel, Design of inland waterway transportation system. Design and operational aspects of small crafts. Design of specialized inland vessel; tug-barge system, shallow draft tug, inland passenger vessels, etc.

NAME 451: Advanced Ship Structure
3.00 Credit, 3 hrs/wk.
Prereq.: NAME 251

Energy and Matrix methods of structural analysis. Formulation of stiffness matrix for beam, bar and shell elements. Assembly of stiffness matrix for frame, truss and shell plated structures. Ship structures, hull girder responses. Application of Finite Element method. Plastic Analysis. Introduction to fatigue and fracture analysis.

NAME 455: Computer Aided Ship Production
3.00 Credit. 3 hrs/wk.

Prereq. NAME 246, NAME 355

Introduction to computer aided manufacture (CAM). Surface modeling. 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 in a total ship system and concurring engineering context. Basic fabrication and material handling processes, process planning and scheduling.

NAME 457: Fishing Vessel Technology
3.00 Credit. 3 hrs/wk.
Prereq. NAME 217

Types of sea fish for human consumption. Fishing methods and gear types: active and passive gears, advantages and disadvantages. Fish finding and communication equipment. General arrangement and space requirement of fishing craft. Stability, propulsion systems and sea-keeping characteristics of fishing craft. Fish hold architecture. Fish processing and preservation. Fishing harbor design. Fisheries economics.

NAME 461: Hydro elasticity
3.00 Credit. 3 hrs/wk.
Prereq. NAME 251, NAME 351

Hull and its structural dynamic behavior. Wave forces. Response of ship to waves. Transient loading, seaquakes and tsunamis. Statistical analysis of ship response. Flow induced vibration. Numerical methods of solutions of hydro elasticity problems. Hydro elasticity applications to high speed vessel, very large hinged vessels, array of elastically connected cylinders, risers, pipelines etc.

NAME 465: 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.

NAME 467: 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.

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

NAME 469: Ship Performance
3.00 Credit, 3 hrs/wk.

Introduction. Hull roughness: roughness measurement, bottom condition and speed loss, propeller roughness, propeller and hull interaction. Methods of predicting resistance increase due to hull and propeller roughness. Nominal 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.

NAME 471: Computer Aided Ocean Structure Analysis
3.00 Credit. 3 hrs/wk.

Prereq. NAME 251, NAME 351

Complexity involved in structural design of ship, submarine, offshore platform, coastal structures and their components. Review of structural mechanics relevant to ocean structures. Formulation of different basic elements. Treatments for combination of basic elements to form special elements like stiffened panel element for the analysis of ship, submarine and offshore deck structures, break water and other coastal structures.

NAME 475: 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 dredger, trailing suction hoper 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 477: Optimization Methods in Ship design
3.00 Credit, 3 hrs/wk.

Concept of optimization. Linear programming: simplex algorithm, dual simplex algorithm. Integer programming: Branch and 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 and neural network. Formulation and solution of ship design problems.

NAME 481: Optimum Structural Design
3.00 Credit, 3 hrs/wk.
Prereq.: NAME 251, NAME 351

Introduction. Mathematical formulation of structural optimization problems. Structural design optimization approaches. Reviews of structural analysis procedures: elastic analysis, plastic analysis of framed structures. Re-analysis methods: direct methods, iterative methods and approximate methods.

Optimality criteria methods: fully stressed design, displacement limited design. Linear programming: problem formulation and method solution. Non-linear programming: methods for unconstrained minimization, penalty function methods, methods of feasible directions. Applications: steel elements, plastic design by linear programming, optimal design of elastic grillages.

4.4 Detail Syllabus of Undergraduate Courses offered by other departments

Chem 109: Chemistry-I
3.00 Credit, 3 hrs. /wk.

Modern concept of Atomic Structure, 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, 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, Selected topics on organic chemistry, Introduction to organic polymer, Basic concepts of dyes color and constitution.

Chem 114: Inorganic Quantitative Analysis Sessional
1.50 Credit, 3 hrs. /wk.

Volumetric Analysis: Acidimetry-alkalimetry, Titration's involving redox reactions, Determination of Cu, Fe and Ca volumetrically, Complex metric titration, determination of Ca, Mg in water

EEE 161: 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.

EEE 261: Electrical and Electronic Technology for Marine Engineers
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.

EEE 262: Electrical and Electronic Technology for Marine Engineers Sessional
1.50 Credit, 3 hrs/wk.

Laboratory experiments based on EEE 261.

Hum 102:English Sessional
1.50 Credit, 3 hrs. /wk.

Reading: Skimming, Scanning, Reading for general information; Reading for specific information; Distinguish between important information and unimportant information; Distinguish between factual information and non-factual information; Understanding explicit information and implicit information; Comprehension based on selected short stories.

Writing: Sentence structure; Vocabulary and diction; Presenting ideas in an organized way; Knowledge on genre based writing; Writing Paragraph and essay; Writing formal letters (tender, quotation, sales letter, letter of complain, adjustment letter, writing in print media); Writing different types of reports.

Listening: Predicting, understanding native speaker's English from audio and video; Listening for correct pronunciation through audio and video; Distinguish between important and unimportant information during listening; Listening to recorded text for understanding main idea,

specific information, speaker's point of view.

Speaking: Organizing information into coherent structure; Narrating events in structured way; Effective presentation; Participation in debate and dialogue.

Hum 111: English
2.00 Credit, 2 hrs. /wk.

English phonetics: the places and manners of articulation of the English sounds, Vocabulary, English grammar: construction of sentences; some grammatical problems; Comprehension; Composition on current affairs; Précis writing; Report writing: commercial correspondence and tenders; Short stories written by some well known classic writes.

Hum 113: Economics
2.00 Credit, 2 hrs. /wk.

Definition of Economics, Economics and Engineering, Micro Economics: The theory of demand and supply and their elasticity's, Price determination, Nature of an economic theory, Applicability of economic theories to the problem of developing countries, Indifference curve technique, Marginal analysis, Optimization, Market production, Production function, Types of productivity, Rational region of production of an engineering firm, The short run and the long run, Fixed cost and variable cost, Internal and external economies and diseconomies. Macro-economics: Savings, investment, National Income Analysis, Inflation, Monetary policy, Fiscal policy and Trade policy with reference to Bangladesh, Planning in Bangladesh

Hum 211: Sociology
2.00 Credit, 2 hrs. /wk.

Scope , Some basic concepts, Social evaluation and techniques of production, Culture and civilization, Social structure of Bangladesh, Population and world Resources, Oriental and Occidental societies, Industrial revolution, Family-urbanization and industrialization, Urban Ecology, Co-operative and socialist movements, Rural Sociology.

Hum 313: Principles of Accounting
2.00 Credit, 2 hrs. /wk.

Principles of accounting: Accounts, Transactions, The accounting procedures and financial statements, Cost in general: Objectives and classifications, Overhead costing, Cost sheet under job costing, Operating costing and process costing, Marginal costing: Tools and techniques, Cost-volume-profit analysis, Relevant costing: Analyzing the profitability within the firm, Guidelines for decision making, Long-run planning and control, Capital budgeting.

IPE 479: Engineering Management
3 Credit, 3 hrs. /wk.

Management: evolution 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.

Math 181: 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. Rolle's theorem. Mean Value theorems. Taylor's theorem. Maclaurin's theorem. Lagrange's form of remainders. Cauchy's form of remainder. 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 of revolution.

Math 183: Co-ordinate Geometry and Ordinary Differential Equation

3.00 Credit, 3 hrs/wk

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.

Ordinary Differential Equation: Degree and order of ordinary differential equation, Formation of differential equations, Solutions of first order differential equations by various methods, Solution of general linear equations of 2nd and higher orders with constant co-efficients, 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.

Math 281: Vector Analysis and Differential Equation (Special Types)
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.

Differential Equation (Special Types): Solution of differential equations of higher order when dependent and independent variables are absent, Solution of homogeneous differential equations, Solution of differential equation by the method based on factorization of operators, Solution of differential equations in series by the method of Frobenius, Bessel's functions, Legendre's polynomials and their properties.

Math 283: Statistics, Partial Differential Equation 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, Poison and negative binomial, Continuous probability distributions, e.g. normal and exponential, Characteristics of distributions, Elementary sampling theory, Estimation, Hypothesis testing and regression analysis.

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-efficients.

Matrices: Definition of matrix, Different types of matrices, Algebra of matrices, Adjoint 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, Eigenvalues and eigenvectors.

Math 381: Fourier Analysis, Harmonic Function, Complex Variable and Laplace Transforms
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 of residues, Contour integration, Conformal mapping.

Laplace Transforms: Definition of Laplace transforms, Elementary transformation and properties, Convolution, Solution of differential equation by Laplace transforms, Evaluation of integrals by Laplace's transforms.

ME 160: Mechanical Engineering Drawing-1
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.

ME 169: Basic Thermal Engineering
3.00 Credits, 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.

ME 170: Basic Thermal Engineering Sessional
1.50 Credit, 3 hrs. /wk.

Sessional based on ME 169
MME 293: 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 alloys: Plain carbon, alloy, tool, stainless, heat-resisting and creep-resisting steels etc.; The Fe-Fe_3C equilibrium; Different types of heat-treatment operations; Case hardening of steels, Cement, Ferro-cement, Timber, Rubber, Glass and Plastics.

MME 294:Shipbuilding Materials Sessional
0.75 Credit, 1.50 hrs. /wk.

Experiments based on MME 293

Phy 102: Physics Sessional
3.00 Credit, 3 hrs. /wk.

Laboratory Experiments Based on Phy 107

Phy 105: Structure of Matter, Electricity & Magnetism and Modern Physics
3.00 Credit, 3 hrs. /wk.

Structure of Matter: Crystalline and non-crystalline solids, Single crystal and polycrystal solids, Unit cell, Crystal systems, Co-ordinations number, Crystal planes and directions, NaCl and CsCl structure, Packing factor, Miller indices, Relation between interplaner spacing and Miller indices, Bragg's Law, Methods of determination of interplaner spacing from diffraction patterns; Defects in solids: Point defects, Line defects, Bonds in solids, Interatomic distances, Calculation of cohesive and bonding energy, Introduction to bond theory, Distinction between metal, Semiconductor and insulator.

Electricity & Magnetism: Coulomb's Law, Electric field (E), Gauss's Law and its application, Electric potential (V), Capacitors and capacitance, Capacitors with dielectrics, Dielectrics-an atomic view, Charging and discharging of a capacitor, Ohm's Law, Kirchoff'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, Wave Particle duality, Interpretation of Bohr's postulates, Radioactive disintegration, Properties of nucleus, Nuclear reactions, Fission, Fusion, Chain reaction, Nuclear reactor.

Phy 107: Waves & Oscillations, Geometrical Optics and Wave

Mechanics
3.00 Credit 3 hrs. /wk.

Waves & Oscillations: Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, 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; 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 Schrodinger equation, Schrodinger equation for one-electron atom and its solution.

Shop 186: 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, Machine 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, Milling Machine practice: Types of milling machine, use and application.

Shop 188: 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 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.

Course Equivalence Table

Old Syllabus			New Syllabus		
Course No.	Course Title	Credits	Course No.	Course Title	Credits
NAME 200 NAME 300	Shipyard Practice I Shipyard Practice II	1.5 1.5	NAME 310	Shipyard Practice	3
NAME 218	Ship Design Laboratory - I	1.5	NAME 118	Ship Design and Drawing - I	1.5
NAME 225	Shipbuilding Technology - I	3	NAME 345	Welding Technology	3
NAME 228	Ship Design Laboratory - II	1.5	NAME 238	Ship Design and Drawing - II	1.5
NAME 317	Design of Marine Vehicles	3	NAME 217	Theoretical Ship Design	3
NAME 318	Ship Design Laboratory - III	1.5	NAME 248	Ship Design and Drawing - III	1.5
NAME 325	Shipbuilding Technology - II	3	NAME 355	Ship Construction	3
NAME 328	Ship Design Laboratory - IV	1.5	NAME 348	Ship Design and Drawing - IV	1.5