MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY
(MIST)

COURSE CURRICULUM OF

NAVAL ARCHITECTURE AND MARINE ENGINEERING

DEPARTMENT OF NAVAL ARCHITECTURE AND MARINE ENGINEERING
(NAME)

JANUARY 2018

COMMITTEE FOR SYLLABUS REVIEW – NAME DEPT, MIST

The under-graduation course curriculum of the department of Naval Architecture and Marine Engineering (NAME) of Military Institute of Science and Technology (MIST) has been reviewed by the committee as mentioned below.

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Head of NAME Department
Military Institute of Science and Technology

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Head, Science & Humanities Department
Military Institute of Science and Technology

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Senior Instructor, NAME Department
Military Institute of Science and Technology

3. Dr. M Reaz Hasan Khadakar
Professor, NAME Department
Military Institute of Science and Technology

4. Commander Kaosar Rashid, (E), psc, BN
Instructor Class-A, NAME Department
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5. Lt Commander M G Mohiuddin, BN
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Major Muhammad Rabiul Islam, PhD, EME
Instructor Class-B, NAME Department
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C. BUP Members

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College Inspector
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2. _____

Cdre S M U Ahmed, (C), NUP, ndc, afwc, psc, BN
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E. Member Secretary

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Major Osman M Amin, PhD, Engrs
Program Coordinator, NAME Department
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CHAPTER – 1

GENERAL INFORMATION

1.1. Introduction.

The necessity of establishing a technical institute for Bangladesh Armed Forces was felt in the late eighties. In the absence of such an institution, officers of Bangladesh Armed Forces had been graduating from Bangladesh University of Engineering and Technology (BUET), Bangladesh Institute of Technology (BIT) and other foreign institutions of science and technology. With a view to meet the increasing demand for the development and dissemination of engineering and technological knowhow, Bangladesh Armed Forces established the Military Institute of Science and Technology (MIST) that promises to provide facilities for higher technical education both for the officers of Bangladesh Armed Forces as for civil students from home and abroad. The motto of MIST is Technology for Advancement. Founded on 19 April 1998, MIST started its journey on 31 January 1999 by offering a four-year Bachelor degree on engineering fields. In course of time, Bachelor of Science program on Naval Architecture & Marine Engineering (NAME) is started on 27 January 2013 from 2012-2013 session. By this time, students of two batches have been graduated successfully.

1.2 Vision of MIST.

Vision: With its foundation in technology, sciences and professional practice, MIST advances the discovery and application of knowledge that accelerates economic growth, national/regional development and social innovation and inspires graduates who will continue to make an impact on the world, as it is and as it will be.

Mission: MIST is working on following missions:

a. Provide superior undergraduate and graduate programs that are technology-enriched and responsive to the needs of students and the evolving workplace.
b. Conduct research that creates knowledge, solves problems, results in economic and social innovation and engages students.
c. Facilitate life-long learning that is flexible, inclusive and emphasizes college university transfers.
d. Develop academic and research collaborations with industry and community that stimulate and enhance the region and institute at home and abroad.
e. Cultivate a dynamic learning environment for students by promoting social engagement, fostering critical thinking and integrating experiences inside and outside the classroom.

1.3 Motto and Values of MIST.

Motto: As an Institution without gender biasness, MIST is steadily upholding its motto "**Technology for Advancement**" and remains committed to contributing to the wider spectrum of national educational arena, play a significant role in the development of human resources and gradually pursuing its goal to grow into a '**Centre of Excellence**'.

Values:

a. **Integrity and Respect-**We embrace honesty, inclusivity, and equity in all that we do.
b. **Honesty and Accountability-**Our actions reflect our values, and we are accountable for both.
c. **Dedication to Quality and Intellectual Rigour-**We strive for excellence with energy, commitment and passion.
d. **Pursuit of Innovation-**We cultivate creativity, adaptability and flexibility in our students, faculty and staff.

1.4 Eligibility of Students for Admission in MIST.

The students must fulfill the following requirements:

a. **Bangladeshi Students.** Minimum qualifications to take part in the admission test are as follows:

(1) The applicant must have passed SSC/equivalent examination in Science Group obtaining GPA 4.00 (without fourth subject) in the scale of 5.0 and in HSC/Equivalent examination from Board of Intermediate and Secondary Education/Madrasa Education Board/Technical Education Board in science group the applicant must have obtained minimum 'A+' (Plus) in any TWO (2) subjects out of FIVE (5) subjects including Mathematics, Physics, Chemistry, English, and Bengali and 'A' in rest THREE (3) subjects.

(2) The applicant must have qualified in minimum five subjects including Mathematics, Physics, Chemistry and English Language with minimum 'B' in average in GCE 'O' Level and in 'A' level he/she must have obtained minimum 'A' in ONE subject out of three subjects including Mathematics, Physics, and Chemistry with and minimum 'B' in rest TWO subjects.

(3) Applicants who have passed HSC or Equivalent examination in the current year or one year before the notification for admission can apply.

(4) Sex: Male and Female.

b. **Foreign Students.** Maximum 3% of overall vacancies available will be kept reserved for the foreign students and will be offered to foreign countries through AFD of the Government of the People's Republic of Bangladesh. Applicants must fulfill the following requirements:

(1) Educational qualifications as applicable for Bangladeshi civil students or equivalent.

(2) Must have security clearance from respective Embassy/High Commission in Bangladesh.

(3) Sex: Male and Female.

In the event of non-availability of foreign students, Bangladeshi civil candidates will fill up the vacancies.

1.5 Number of Seats.

The highest number of seats for 04(Four) years Bachelor Degree in Engineering programmes (Unit – A) and 5 (Five) years Bachelor Degree of Architecture programmes are as follows:

Allocation of Seats			
Ser	Unit	**Department**	**Seats**
1	**A**	Civil Engineering (CE)	60
2		Computer Science and Engineering (CSE)	60
3		Electrical, Electronic and Communication Engineering (EECE)	60
4		Mechanical Engineering (ME)	60
5		Aeronautical Engineering (AE)	50
6		Naval Architecture and Marine Engineering (NAME)	40
7		Biomedical Engineering (BME)	40
8		Nuclear Science and Engineering (NSE)	40
9		Civil & Environmental Engineering Civil & Water Resources Engineering	60
10		Industrial and Production Engineering (IPE)	50
11		Petroleum and Mining Engineering (PME)	25
12	**B**	Architecture (Arch)	25
	Total		570

The total number is 570. In general, about 50% seats will be allocated to military officers. However, in case of the requirement of military students vacancy is less in any particular year, the deficient vacancy will be filled up by civil students. MIST also maintains quota as mentioned below:

Ser	**Quota Allocation**	**Seats**
1	General Candidates	54%
2	Children of Military Personnel	40%
3	Children of Freedom Fighters	2%
4	Tribal Citizen	1%
5	International Students	3%
	Total	100%

1.6 Admission Procedure

1.6.1 **Syllabus for Admission Test.** Admission test will be conducted on the basis of the syllabus of Mathematics, Physics, Chemistry and English (comprehension and functional) subjects of HSC examinations of all boards of secondary and higher secondary school certificates. Admission test will be conducted out of 200 marks and the distribution of marks is given below:

Ser	Subjects	Marks
a.	Mathematics	60
b.	Physics	60
c.	Chemistry	60
d.	English	20
	Total =	200

1.6.2 **Final Selection**. Students will be selected on the basis of results of the admission test. Individual choice for selection of departments will be given preference as far as possible. In case of tie in the result of admission test, difference will be judged on the basis of marks obtained in Mathematics, Physics, Chemistry and English respectively in admission test.

1.6.3 **Medical Checkup.** Civil candidates selected through admission test will go for medical checkup in MIST/CMH. If the medical authority considers any candidate unfit for study in MIST due to critical/contagious/mental diseases as shown in medical policy of MIST will be declared unsuitable for admission.

1.7 Students Withdrawal Policy

1.7.1 For Poor Academic Performance.

In all the Engineering Degree programs, it is expected that all military and civil students will earn degree by clearing all the offered courses in the stipulated time. In case of failure, the following policies will be adopted:

a. Military students failing in three or more courses/subjects in any level comprising of two regular terms will be withdrawn from the institution. Civil students will be allowed to repeat the level once, but have to complete the course within six years of registration.

b. Students failing in maximum two courses/subjects in any level, each comprising of two regular terms will be re-examined after a short term of about 6 weeks.

c. Re-examination, after short term, will be conducted at the institution before commencement of the next level.

d. Students failing in maximum one course/subject in the re-examination will be promoted to the next higher level. The failed subject will be termed as backlog subject and the students have to pass the backlog subject in the next scheduled re-examination, but without any short term. Otherwise, he/she will be withdrawn from this institution.

e. No student will be allowed to appear more than twice in the re-examinations on a particular course/subject in the whole undergraduate course.

f. Students in all levels will be allowed to appear in the re-examination on two courses/subjects including the backlog one.

g. Students repeating a level will be granted exemption for those subjects in which they earned 'B+' or better grade in the previous academic year subject to approval of the Academic Council, MIST.

h. Students will be promoted to the second term of each level, irrespective of their results in the first term of the level.

j. After Level-4, re-examination, if any military student fails in maximum one course/subject, but not the backlog subject, then he/she will leave MIST and will be allowed to appear in the next scheduled re-examination of the respective course without any short term. In that examination if he/she cannot pass the course/subject or if he/she does not appear in the referred examination within 6 years of registration will lose the scope of completing graduation. This failure will also be recorded in the dossier of military officers. Civil students will be allowed to complete the course in maximum six years.

k. In case of sickness which leads to missing of more than 40% class or miss term final examination (supported by requisite medical documents), students may be allowed to withdraw from that term and repeat the whole level in the next year, subject to the approval of Academic Council, MIST.

l. In case of Bangladesh Navy student officers, if one fails, will be allowed to repeat only once in the whole program (course) if desired by the Naval Headquarters.

m. Failure to secure/achieve a minimum GPA of 2.20 in two consecutive levels will also lead to withdrawal of the students.

1.7.2 Withdrawal on Disciplinary Ground

a. **Unfair Means.** Adoption of unfair means may result in expulsion of a student from the programme and so from the Institution. The Academic Council will authorize such expulsion on the basis of recommendation of the Disciplinary Committee, MIST and as per policy approved by the affiliating university. Following would be considered as unfair means adopted during examinations and other contexts:

(1) Communicating with fellow students for obtaining help in the examination.

(2) Copying from another student's script/ report /paper.

(3) Copying from desk or palm of a hand or from other incrimination documents.

(4) Possession of any incriminating document whether used or not.

b. **Influencing Grades.** Academic Council may expel/withdraw any student for approaching directly or indirectly in any form to influence a teacher or MIST authority for grades.

c. **Other Indiscipline Behaviors.** Academic Council may withdraw/expel any student on disciplinary ground if any form of indiscipline or unruly behavior is seen in him/her which may disrupt the academic environment/programme or is considered detrimental to MIST's image.

d. **Immediate Action by the Disciplinary Committee of MIST.** The Disciplinary Committee, MIST may take immediate disciplinary action against any student of the Institution. In case of withdrawal/expulsion, the matter will be referred to the Academic Council, MIST for post-facto approval.

1.7.3 **Withdrawal on Own Accord.** A student who has already completed some courses and has not performed satisfactorily may apply for a withdrawal.

CHAPTER – 2

DEPARTMENT OF NAVAL ARCHITECTURE & MARINE ENGINEERING (NAME)

2.1 Introduction.

Our Lord, Almighty, has created human being in a state of weakness, but blessed with extra ordinary divine intelligence and engineers amongst us who could perceive the need of time. In this regard, maritime related engineering is one of the important aspects in the history of civilization and ships are one of the oldest forms of transport used by human being.

Naval architecture has been an inherent part of the evolution of ships or crafts, and naval architecture and marine engineering is a very interesting branch of study. Graduates in this field of study have actually duel degrees. In one way these graduates are naval architects, and another way they are marine engineers. Study in NAME provides insight to design, to build, to operate and to maintain vessels which move just above, on or under the sea. It can be said that naval architects connect nation to nation and civilization to civilization through rivers, seas and oceans. Basically, a good naval architect is he who can acquire required knowledge of designing and building marine vehicles satisfactorily, and utilize such knowledge for the benefit of mankind.

To be prepared for the professional tasks, students of naval architecture are primarily studying hydrodynamic theories and concerned computational methods to develop efficient hull form to be operated at desired movability with minimum energy consumption. Secondly, they have to go through material science in depth to build better quality ships to be sustainable in unfriendly weather conditions at sea. As the field of naval architecture is the part and parcel of mechanical engineering, it is impossible to be a good naval architect without being a good mechanical engineer, and knowledge on mechanics, theory of machine, heat transfer, diesel engine, gas turbine, nuclear power, fuel cells, pumps, compressor, refrigeration, air-conditioning etc is absolutely essential. Moreover, machinery controls, whether it is mechanical, pneumatic or electronic, control engineering expertise for the marine engineers is also required. Above all, today's technology is computer based and no ship is designed without the use of software. It is now the demand of the day to have upper hand on computer programming language and numerical simulations to bring forward what the graduating students are principally learning in the field of naval architecture and marine engineering. The last but not the least is the humanities and the management for efficient cost estimation, human resource management and enhancement of leadership.

2.2 Vision and Mission of NAME Department

Vision: To be national and international centre of excellence offering a study programme of high quality, innovation and creativity in the field of Naval Architecture and Marine Engineering.

Mission: To produce engineers and researchers with sound knowledge on fundamentals of traditional, modern and emerging areas of Naval Architecture and Marine Engineering together with innovative design abilities and managerial skills to achieve sustainable national development.

2.3 Faculty Member of NAME

A. Military Faculty Members

1. Cdre M Munir Hassan, (E), BN
2. Captain M Muzibur Rahman, (E), psc,BN
3. Commander Kaosar Rashid, (E), psc, BN
4. Lt Commander M G Mohiuddin, BN
5. Major Muhammad Rabiul Islam, PhD, EME
6. Major Osman M Amin, PhD, Engrs

B. Civil Faculty Members

1. Professor Dr. M Reaz Hasan Khadakar
2. Asst Professor Dr. S M Ikhtiar Mahmud
3. Asst Professor Md. Mezbah Uddin
4. Lec Md. Rafi Rahman
5. Lec Razia Sultana Kamol
6. Lec Abu Afree Andalib
7. Lec Nafisa Nubayaatt Haq
8. Lec Daluar Hussain
9. Lec Md Towhidur Rahman

C. Guest Faculty Members

1. Professor Dr. Md. Sadiqul Baree
2. Professor Dr. S Reaz Ahmed
3. Professor Dr. Md. Rafiqul Islam
4. Professor Dr. Md. Shahjada Tarafder
5. Professor Dr. Md. Goutam Kumar Saha
6. Assoc Professor Dr. Md. Mashiur Rahaman

2.4 **Facilities of the Department.** The NAME department endeavors to provide its faculty members and students adequate laboratory, library and other facilities to undertake undergraduate courses. Since the engineering education is laboratory intensive, following laboratories are catered for such requirements:

(1) Computer Aided Ship Design Lab
(2) Ships Structure and Fabrication Lab
(3) Marine Machinery Lab
(4) Ship Instrument Lab
(5) Damage Control Fire Fighting and Life Saving Lab
(6) Ship Propulsion Lab
(7) Ship Resistance Lab

(8) Machine Tools Lab
(9) Model Fabrications Lab
(10) Towing tank stability Lab
(11) Marine Transportation Lab
(12) Hydrodynamics Lab
(13) Auxiliary Machinery Lab
(14) Marine Electronics Lab

In addition to above laboratories, NAME students have to undertake laboratory courses (sessional) in Physics, Chemistry, Workshop, Electrical Engineering and Civil Engineering too. If necessary undergraduate students can have the access to the facilities of other departments and centers during their project, thesis and research works.

Besides the stated laboratories, NAME department has established “Ship Design and Marine Structural Solution Center” to take the challenge of professional engineering to an eminent level.

CHAPTER - 3

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAMME

Introduction

3.1 MIST is going to introduce course system for undergraduate studies from the academic session 2017-18. Therefore, the rules and regulations mentioned in this paper will be applicable to students for administering undergraduate curriculum through the Course System. This will be introduced with an aim of creating a continuous, even and consistent workload throughout the term for the students.

The Course System

3.2 The salient features of the Course System are as follows:

a. Number of theory courses will be generally 5 in each term. However, with the recommendation of course coordinator and Head of the Department, Commandant MIST may allow relaxation in this regard. This relaxation is to be reported to Academic Council of MIST.
b. Students will not face any level repeat for failing.
c. Students will get scope to improve their grading.
d. Introduction of more optional courses to enable the students to select courses according to their individual needs and preferences.
e. Continuous evaluation of students' performance.
f. Promotion of student-teacher interaction and contact.

3.3 Beside the professional courses pertaining to each discipline, the undergraduate curriculum gives a strong emphasis on acquiring thorough knowledge in the basic sciences of mathematics, physics and chemistry. Due importance is also given on the study of several subjects in humanities and social sciences.

3.4 The first two years of bachelor's degree programs generally consist of courses on basic engineering, general science and humanities subjects; while the third and subsequent years focus on specific disciplines.

Number of Terms in a Year

3.5 There will be two terms (Term I and Term II) in an academic year. In addition to these two regular terms there will be a short term after the Term II of each academic session. During the short term, students can take only failed courses to cover up the credit deficiencies.

3.6 Respective departments will take the decisions about courses to be offered during each short term depending upon the availability of course teachers and number of students willing to take a particular course.

Duration of Terms

3.7 The duration of each of Term I and Term II (maximum 22 weeks) may be as under:

Ser	Events	Durations
1.	Classes before Mid Term	7 weeks
2.	Mid Term Vacation	1 week
3.	Classes after Mid Term	7 weeks
4.	Makeup Classes and Preparatory leave	2/3 weeks
5.	Term Final Examination	2/3 weeks
6.	Term End Vacation	1/2 week

3.8 The duration of a Short Term will be around 7 weeks of which about 6 weeks will be spent for class lectures and one week for Term Final Examination. The duration for Short Term and Examination will be as under:

1.	Classes	6 weeks
2.	Final Examination	1 week
Total		**7 Weeks**

Course Pattern and Credit Structure

3.9 The undergraduate program is covered by a set of theoretical courses along with a set of laboratory (sessional) courses to support them.

Course Designation System

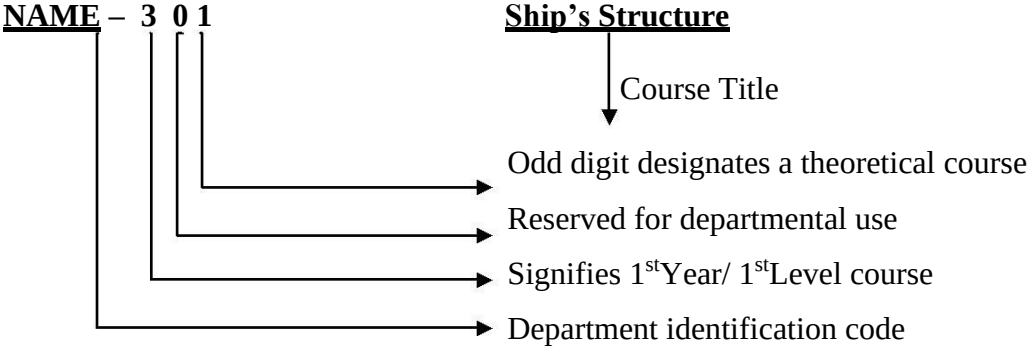
3.10 Each course is designated by a maximum of three/four letter code identifying the department offering the course followed by a three-digit number having the following interpretation:

a. The first digit corresponds to the year/level in which the course is normally taken by the students.

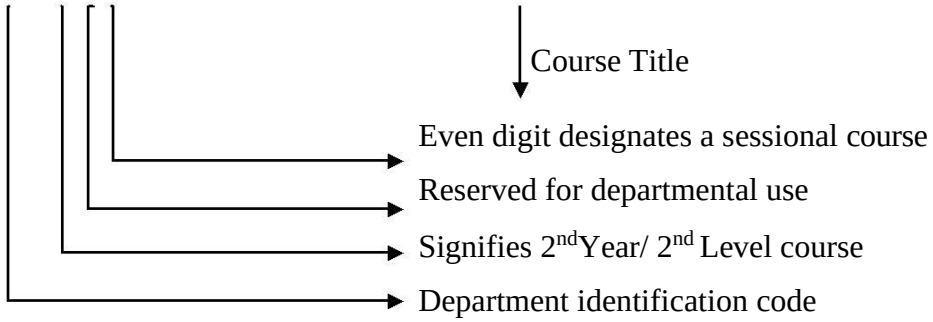
b. The second digit is reserved for departmental use. It usually identifies a specific area/group of study within the department.

c. The last digit is an odd number for theoretical courses and an even number for sessional courses.

3.11 The course designation system is illustrated as Follows:



NAME - 2 0 8 **Ship Design and Drawing II**



Assignment of Credits

3.12 The assignment of credits to a theoretical course follows a different rule from that of a sessional course.

a. Theoretical Courses: One lecture per week per term is equivalent to one credit.

b. Sessional Courses: Credits for sessional courses is half of the class hours per week per term.

Credits are also assigned to project and thesis work taken by the students. The amount of credits assigned to such work varies from one discipline to another.

Types of Courses

3.13 The types of courses included in the undergraduate curricula are divided into the following groups:

a. Core Courses: In each discipline, a number of courses are identified as core courses, which form the nucleus of the respective bachelor's degree program. A student has to complete all the designated core courses of his/her discipline.

b. Prerequisite Courses: Some of the core courses are identified as prerequisite courses for a specific subject.

c. Optional Courses: Apart from the core courses, the students can choose from a set of optional courses. A required number of optional courses from a specified group have to be chosen.

Course Offering and Instruction

3.14 The courses to be offered in a particular term are announced and published in the Course Catalog along with the tentative Term Schedule before the end of the previous term. The courses to be offered in any term will be decided by Board of Undergraduate Studies (BUGS) of the respective department.

3.15 Each course is conducted by a course teacher who is responsible for maintaining the expected standard of the course and for the assessment of students' performance. Depending on the strength of registered students (i.e. on the number of students) enrolled for the course, the teacher concerned might have course associates and Teaching Assistants (TA) to aid in teaching and assessment.

Teacher Student Interaction

3.16 The new course system encourages students to come in close contact with the teachers. For promotion of a high level of teacher-student interaction, each student is assigned to an adviser and the student is free to discuss all academic matters with his/her adviser. Students are also encouraged to meet any time with other teachers for help and guidance in academic matters. However, students are not allowed to interact with teachers after the moderation of questions.

Student Adviser

3.17 One adviser is normally appointed for a group of students by the BUGS of the concerned department. The adviser advises each student about the courses to be taken in each term by discussing the academic program of that particular term with the student.

3.18 However, it is also the student's responsibility to keep regular contact with his/her adviser who will review and eventually approve the student's specific plan of study and monitor subsequent progress of the student.

3.19 For a student of second and subsequent terms, the number and nature of courses for which he/she can register is decided on the basis of academic performance during the previous term. The adviser may permit the student to drop one or more courses based on previous academic performance.

Course Registration

3.20 Any student who uses classroom, laboratory facilities or faculty-time is required to register formally. Upon admission to the MIST, students are assigned to advisers. These advisers guide the students in choosing and registering courses.

3.21 **Registration Procedure.** At the commencement of each term, each student has to register for courses in consultation with and under the guidance of his/her adviser. The date, time and venue of registration are announced in advance by the Registrar's Office. Counseling and advising are accomplished at this time. It is absolutely essential that all the students be present for registration at the specified time.

3.22 **Pre-conditions for Registration**.

a. For first year students, department-wise enrollment/admission is mandatory prior to registration. At the beginning of the first term, an orientation program will be conducted for them where they are handed over with the registration package on submission of the enrolment slip.

b. Any student, other than the new batch, with outstanding dues to the MIST or a hall of residence is not permitted to register. Each student must clear their dues and obtain a clearance certificate, upon production of which, he/she will be given necessary Course Registration Forms to perform course registration.

c. A student is allowed to register in a particular course subject to the class capacity constraints and satisfaction of pre-requisite courses. However, even if a student fails in a pre-requisite course in any term, the concerned department (BUGS) may allow him/her to register for a course which depends upon the pre-requisite course provided that his/her attendance and performance in the continuous assessment of the mentioned pre-requisite course is found to be satisfactory.

3.23 **Registration Deadline**. Each student must register for the courses to be taken before the commencement of each term. Late registration is permitted only during the first week of classes. Late registration after this date will not be accepted unless the student submits a written application to the registrar through the concerned Head of the department explaining the reasons for delay. Acceptable reasons may be medical problems with supporting documents from the Medical Officer of MIST or some other academic commitments that prohibit enrollment prior to the last date of registration.

3.24 **Penalty for Late Registration**. Students who fail to register during the designated dates for registration are charged a late registration fee of Tk. 100.00 (One hundred only) per credit hours. Penalty for late registration will not be waived.

Limits on the Credit Hours to be taken

3.25 A student should be enrolled for at least 15 credit hours and is allowed to take a maximum of 24 credit hours. Relaxation on minimum credit hours may be allowed. A student must enroll for the sessional courses prescribed in a particular term within the allowable credit hour limits.

3.26 In special cases where it is not possible to allot the minimum required 15 credit hours to a student, the concerned department (BUGS) may permit with the approval of the Comdt, a lesser number of credit hours to suit individual requirements. Such cases are also applicable to students of Level 4 requiring less than 15 credit hours for graduation.

Course Add/Drop

3.27 A student has some limited options to add or drop courses from the registration list. Addition of courses is allowed only within the first two weeks of a regular term and only during the first week of a short term. Dropping a course is permitted within the first four weeks of a regular term and two weeks of a short term.

3.28 Any student willing to add or drop courses has to fill up a Course Adjustment Form. This also has to be done in consultation with and under the guidance of the student's respective adviser. The original copy of the Course Adjustment Form has to be submitted to the Registrar's Office, where the required numbers of photocopies are made for distribution to the concerned adviser, Head, Dean, Controller of Examinations and the student.

3.29 All changes must be approved by the adviser and the Head of the concerned department. The Course Adjustment Form has to be submitted after being signed by the concerned persons.

Withdrawal from a Term

3.30 If a student is unable to complete the Term Final Examination due to serious illness or serious accident, he/she may apply to the Head of the degree awarding department for total withdrawal from the term before commencement of term final examination. However, application may be considered during term final examination in special case. The application must be supported by a medical certificate from the Medical Officer of MIST. The concerned student may opt for retaining the sessional courses of the term. The Academic Council will take the final decision about such applications. However, the total duration for graduation will not exceed 6 academic years.

The Grading System

3.31 The total performance of a student in a given course is based on a scheme of continuous assessment, for theory courses this continuous assessment is made through a set of quizzes, class tests, class evaluation, class participation, homework assignment and a term final examination. The assessments for sessional courses are made by evaluating performance of the student at work during the class, viva-voce during laboratory hours and quizzes. Besides that, at the end there will be a final lab test. Each course has a certain number of credits, which describes its corresponding weightages. A student's performance is measured by the number of credits completed satisfactorily and by the weighted average of the grade points earned. A minimum grade point average (GPA) is essential for satisfactory progress. A minimum number of earned credits also have to be acquired in order to qualify for the degree. Letter grades and corresponding grade points will be given as follows:

Numerical Markings	Grade	Grade Points
80% and above	A+	4.00
75% to below 80%	A	3.75
70% to below 75%	A-	3.50
65% to below 70%	B+	3.25
60% to below 65%	B	3.00
55% to below 60%	B-	2.75
50% to below 55%	C+	2.50
45% to below 50%	C	2.25
40% to below 45%	D	2.00
below 40%	F*	0.00
Incomplete	I	-
Withdrawal	W	-
Project/ Thesis continuation	X	-

* Subject in which the student gets F grade shall not be regarded as earned credit hours for the calculation of Grade Point Average (GPA).

Distribution of Marks

3.32 **Theory.** Thirty percent (30%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. quizzes, home assignments, class tests, observations/ class participation and class attendance. This marks must be submitted to Office of the Controller of Examinations before commencement of final exam. The rest of the marks will be allotted to the Term Final Examination. The duration of final examination will be three (03) hours. The scheme of continuous assessment that a particular teacher would follow for a course will be announced on the first day of the classes.

Distribution of marks for a given course per credit is as follows:

Class Participation/Observation	5%
Class Attendance	5%
Homework assignment/Quizzes/CTs	20%
Final Examination (Section A & B)	70%
Total	**100%**

3.33 **Sessional/Practical Examinations**. Sessional courses are designed and conducted by the concerned departments. Examination on sessional/practical subjects will be conducted by the respective department before the commencement of term final examination. The date of practical examination will be fixed by the respective department. Students will be evaluated in the sessional courses on the basis of the followings (all or as decided by the Examination Sub-Committee):

a. Class Attendance
b. Class performance/observation
c. Lab Test/Report Writing/project work/Assignment
d. Quiz Test
e. Viva Voce

Total **100%**

3.34 **Sessional Course in English**. The distribution will be as under:

a. Class Attendance
b. Class performance/observation
c. Written Assignment
d. Oral Performance
e. Listening Skill
f. Group Presentation
g. Viva Voce

Total **100%**

3.35 **Basis for awarding marks for class attendance**.
This will be as follows:

	Marks
90% and above	100%
85% to less than 90%	80%
80% to less than 85%	60%
75% to less than 80%	40%
Below 75%	0%

Collegiate and Non-collegiate

3.36 Students having class attendance of 90% or above in individual subject will be treated as collegiate and less than 90% and up to 75% will be treated as non-collegiate in that subject. The non-collegiate student(s) may be allowed to appear in the examination subject to payment of non-collegiate fee/fine of an amount fixed by MIST/BUP. Students having class attendance below 75% will be treated as dis-collegiate and will not be allowed to appear in the examination and treated as fail. But in a special case such students may be allowed to appear in the examination with the permission of Commandant and it must be approved by the Academic Council.

Calculation of CGPA

3.37 Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/completed by a student. For example, if a student passes/completes n courses in a term having credits of C1, C2, ..., Cn and his grade points in these courses are G1, G2, ... Gn respectively, then

$$\text{GPA} = \frac{\text{Grade points earned in the semester}}{\text{Credits completed in the semester}}$$

$$= \frac{\text{Summation of (Credit hours in a course} * \text{Grade point earned in that course)}}{\text{Total number of credit hours completed}}$$

$$= \frac{\sum_{i=1}^{n} \mathbf{Ci} * \mathbf{Gi}}{\sum_{i=1}^{n} \mathbf{Ci}}$$

3.38 The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the terms passed/completed by a student. For example, if a student passes/ completes n terms having total credits of TC1, TC2, ... , TCn and his GPA in these terms are GPA1, GPA2,... , GPAn, respectively then

$$\mathbf{CGPA} = \frac{\sum_{i=1}^{n} \mathbf{TCi} * \mathbf{GPAi}}{\sum_{i=1}^{n} \mathbf{TCi}}$$

Numerical Example

Suppose a student has completed eight courses in a term and obtained the following grades:

Course	Credit Ci	Grade Points	Gi	Ci*Gi
NAME-107	3.00	A	3.75	11.25
NAME-206	0.75	A+	4.00	3.00
MATH-151	3.00	A-	3.50	10.50
PHY-121	3.00	B+	3.25	9.75
HUM-413	3.00	A	3.75	11.25
HUM-132	1.50	A	3.75	5.625
NAME-201	3.00	A	3.75	11.25
NAME-307	3.00	A-	3.50	10.50
NAME-308	1.5	B+	3.25	4.875
Total	**21.75**			**78.00**

$$\mathbf{GPA} = \frac{\mathbf{78.00}}{\mathbf{21.75}} = \mathbf{3.59}$$

Suppose a student has completed four terms and obtained the following GPA:

Level	Term	Earned Credit Hours	Earned GPA	TCi*GPAi
		Tci	GPAi	
1	I	21.75	3.75	81.5625
1	II	20.75	3.61	74.9075
2	I	19.50	3.21	62.595
2	II	21.00	2.98	62.58
Total		83.00		281.645

$$\mathbf{CGPA} = \frac{\mathbf{281.645}}{\mathbf{83}} = \mathbf{3.39}$$

Minimum Earned Credit and GPA Requirement for Obtaining Degree

3.39 Minimum credit hour requirements for the award of bachelor's degree in engineering (B.Sc. Engineering) and other discipline will be decided as per existing rules. The minimum GPA requirement for obtaining a Bachelor's degree in Engineering and Architecture is 2.20.

Impacts of Grade Earned

3.40 The courses in which a student has earned a 'D' or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained an 'F' grade will not be counted towards his/her earned credits or GPA calculation. However, the 'F' grade will remain permanently on the Grade Sheet and the Transcript.

3.41 A student who obtains an 'F' grade in a core course will have to repeat that particular course. However, if a student gets an 'F' in an optional course, he/she may choose to repeat that course or take a substitute course if available. When a student will repeat a course in which he/she has previously obtained an 'F', he/she will not be eligible to get a grade better than 'B+' in that repeated course.

3.42 If a student obtains a grade lower than 'B+' in a particular course he/she will be allowed to repeat the course only once for the purpose of grade improvement. However, he/she will not be eligible to get a grade better than 'B+' for an improvement course.

3.43 A student will be permitted to repeat for grade improvement purposes a maximum of 6 courses in BSc. Engineering programs and a maximum of 7 courses in B. Arch. program.

3.44 If a student obtains a 'B+' or a better grade in any course he/she will not be allowed to repeat the course for the purpose of grade improvement.

Classification of Students

3.45 At MIST, regular students are classified according to the number of credit hours completed/ earned towards a degree. The following classification applies to all the students:

Level	Credit Hours Earned	
	Engineering	Architecture
Level 1	0.0 to 36.0	0.0 to 34.0
Level 2	More than 36.0 to 72.0	More than 34.0 to 72.0
Level 3	More than 72.0 to 108.0	More than 72.0 to 110.0
Level 4	More than 108.0	More than 110.0 to 147.0
Level 5		More than 147.0

3.46 However, before the commencement of each term all students other than new batch are classified into three categories:

a. **Category 1:** This category consists of students who have passed all the courses described for the term. A student belonging to this category will be eligible to register for all courses prescribed for the upcoming term.

b. **Category 2:** This category consists of students who have earned a minimum of 15 credits but do not belong to category 1. A student belonging to this category is advised to take at least one course less since he might have to register for one or more backlog courses as prescribed by his/her adviser.

c. **Category 3:** This category consists students who have failed to earn the minimum required 15 credits in the previous term. A student belonging to this category is advised to take at least two courses less than a category 1 student subject to the constraint of registering at least 15 credits. However, he will also be required to register for backlog courses as prescribed by the adviser.

3.47 **Definition of Graduating Student**. Graduating students are those students who will have $\leq$ 24 credit hour for completing the degree requirement.

Performance Evaluation

3.48 The performance of a student will be evaluated in terms of two indices, viz. Term Grade Point Average and Cumulative Grade Point Average which is the grade average for all the terms completed.

3.49 Students will be considered to be making normal progress toward a degree if their Cumulative Grade Point Average (CGPA) for all work attempted is 2.20 or higher. Students who regularly maintain a term GPA of 2.20 or better are making good progress toward the degrees and are in good standing with MIST. Students who fail to maintain this minimum rate of progress will not be in good standing. This can happen when any one of the following conditions exists.

a. The term GPA falls below 2.20.
b. The Cumulative Grade Point Average (CGPA) falls below 2.20.
c. The earned number of credits falls below 15 times the number of terms attended.

3.50 All such students can make up their deficiencies in GPA and credit requirements by completing courses in the subsequent term(s) and backlog courses, if there are any, with better

grades. When the minimum GPA and credit requirements are achieved the student is again returned to good standing.

Rules for Self-Study Courses

3.51 A self-study course is among the regular courses listed in the course catalog. This type of course is offered only in exceptional cases. The following rules are applicable to all self-study courses:

a. Whether a course is to be floated as a self-study course will be decided by the Head of the concerned department in consultation with the teacher/course coordinator concerned. Such a decision also has to be reported to the Academic Council.

b. A self-study course may be offered in a particular term only if the course is not running in that term as a regular course.

c. The self-study course is offered to a student in his/her graduating term if it helps him/her to graduate in that term.

d. A student is allowed to register for a maximum of two theory courses on a self-study basis.

e. Students should have 75% class attendance.

f. Normally no lecture will be delivered for a self-study course but laboratory/design classes may be held if they form part of a course.

g. The course coordinator/course teacher will assign homework, administer quizzes, and final examination for giving assessments at the end of the term.

h. No Laboratory/Sessional Course can be taken as self-study course.

Rules for Courses Offered in Short Term

3.52 A Short Term course will be conducted after one week of completion of Term II Final Examination in each year. The following rules are applicable to Short Term courses:

a. The courses to be run during the short term shall be decided on the recommendations of departments on the basis of essential deficiencies to be made up by a group of students. Once floated, other students could be allowed to register in those courses subject to the capacity constraints and satisfaction of prerequisites.

b. Student will be allowed to register in a maximum of three theory courses during the Short Term.

c. Graduating students may register for Short Term examinations after finalization of result of Term 2 final examination.

d. A certain fee for each credit hour to be registered to be borne by the students who enroll during Short Term.

Minimum Earned Credit and GPA Requirement for Obtaining Degree

3.53 Minimum credit hour requirements for the award of bachelor's degree in engineering (BSc. Engg) and architecture (B. Arch.) will be decided by the respective department (BUGS). However, at least 157 credit hours for engineering and 189 credit hours for architecture must be earned to be eligible for graduation, and this must include the specified core courses. The minimum GPA requirement for obtaining a Bachelor's degree in engineering and architecture is 2.20.

3.54 A student may take additional courses with the consent of his/her Adviser in order to raise GPA, but he/she may take a maximum of 15 such additional credits in engineering and 18

such additional credits in architecture beyond respective credit-hour requirements for Bachelor's degree during his/her entire period of study.

Application for Graduation and Award of Degree

3.55 A student who has fulfilled all the academic requirements for Bachelor's degree will have to apply to the Controller of Examinations through his/her Adviser for graduation. Provisional Degree will be awarded by BUP on completion of credit and GPA requirements.

Time Limits for Completion of Bachelor's Degree

3.56 A student must complete his studies within a maximum period of six years for engineering and seven years for architecture.

Attendance, Conduct and Discipline

3.57 MIST has strict rules regarding the issues of attendance in class and discipline.

3.58 **Attendance**. All students are expected to attend classes regularly. The university believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly and one is required to attend the classes as per MIST rules.

3.59 **Conduct and Discipline**. During their stay in MIST all students are required to abide by the existing rules, regulations and code of conduct. Students are strictly forbidden to form or be members of student organization or political party, club, society etc., other than those set up by MIST authority in order to enhance student's physical, intellectual, moral and ethical development. Zero tolerance in regards of sexual abuse and harassment in any forms and drug abuse and addiction are strictly observed in the campus.

Teacher-Student Interaction

3.60 The academic system in MIST encourages students to come in close contact with the teachers. For promotion of high level of teacher-student's interaction, a course coordinator (CC) is assigned to each course. Students are free to discuss with CC about all academic matters. Students are also encouraged to meet other teachers any time for help and guidance for academic matters. Heads of the departments, Director of Administration, Director of Students Welfare (DSW), Dean and Commandant address the students at some intervals. More so, monthly Commandant's Parade is organized in MIST where all faculty members, staff and students are formed up, thereby increasing teacher-student interaction.

Absence during a Term

3.61 A student should not be absent from quizzes, tests, etc. during the term. Such absence will naturally lead to reduction in points/marks, which count towards the final grade. Absence in the Term Final Examination will result in an F grade in the corresponding course. A student who has been absent for short periods, up to a maximum of three weeks due to illness, should approach the course teacher(s) or the course coordinator(s) for make-up quizzes or assignments immediately upon return to classes. Such request has to be supported by medical certificate from competent authority (e.g. CMH/MIST Medical Officer).

Recognition of Performance

3.62 As recognition of performance and ensure continued studies MIST awards medals, scholarships and stipends will be given as per existing rules and practices.

Types of Different Examination

3.63 Following different types of final Examinations will be conducted in MIST to evaluate the students of Undergraduate Programs:

a. **Term Final Examination:** At the end of each normal term (after 22wk or so), Term Final Examination will be held. Students will appear in the Term Final Examination for all the theory courses they have taken in the Term.

b. **Short Term Examination:** Short Term may be conducted after one week completion of Term 2 final examination. Students will be allowed to take maximum three theoretical courses in the Short Term. Examination will be conducted at the end of Short Term (6^{th} week class). However, Head of concerned department with the approval of Commandant may decide to take Supplementary examination instead of Short Term. No Laboratory/Sessional Courses can be taken in short term.

c. **Supplementary Examination:** It will take place once in a year, after each term-I final break. It should be completed within first 3 weeks of a new term. Students will be allowed to appear this examination for one subject at a time. Graduating students will be allowed to appear maximum two subjects during supplementary examination in their last Term. However, Head of the concerned department with the approval of Commandant may decide to take another Supplementary Examination instead of Short Term. In that case, a student will be allowed to take only one failed course in the particular Supplementary Examination. This examination will be conducted in the previous week of the beginning of Term I. Highest achieved grade for all courses of Supplementary Examination will be B+.

d. **Improvement Examination:** It will be taken during supplementary and short term examination. Questions will be same as the question of the regular examination of that Short Term Final Examination (if any). Student can take two subject at a time and maximum 6 subjects in the whole academic duration. If a student obtains a grade lower than 'B+' in a course, he/she will be allowed to repeat the course only once for grade improvement. However, he/she will not be eligible to get a grade better then 'B+' for an improvement course. Among the previous result and improvement examination result, best one will be considered as final result for an individual student. However, performance of all examination i,e previous to improvement examination, shall be reflected in the transcript.

e. **Self-Study Course Examination:** Only graduating students (level-4) will be allowed to appear at Self Study course examination. It will be taken with Term Final Examination. No regular class will be arranged for this, but teachers will be assigned for supervising and guiding the students for study, conducting class test/quiz and regular assessment for 30% marks. Maximum two theory courses may be taken as self-study course by a student. Highest achieved grade for these courses will be B+. In that case a student will be allowed to take maximum 24 credit instead of 15 in the last Term of his/her graduation.

f. **Special Referred Examination:** Since course system will start from 1st Term of 2018, for all casualty cases like referred, backlog, failed courses, level repeat students will be given chance to clear their respective all failed courses by appearing in this examination. It will be held after the confirmation of the result of Term-II Final Examination of 2017 and before starting of the class of the Term-I of 2018. Students of all levels, failed in any courses even after appearing in Special Referred Examination-1, will be allowed to re-appear again in the failed courses during Special Referred Examination-2 to be held during Mid Term break of Term-1 of 2018. Student of Level-4 of 2017, failed in any courses even after appearing in these two referred examinations, will be allowed to clear failed courses as a last chance, during Term-1 final examination of 2018 (as a Special Referred Examination-3). Students of other levels, failed in any courses even after appearing in two Special Referred Examinations, will be allowed to clear these failed courses as per normal rules of course system (either by retaking these courses or appearing at the supplementary Examination). Highest grade for courses in all these examinations will be 'B+'.

Rules of Different Examinations

3.64 **Term Final Examination.** Following rules to be followed:

a. Registration to be completed before commencement of the class. A student has to register his desired courses paying registration, examination fee and other related fees.

b. Late registration will be allowed without penalty within first one week of the term.

c. Within 1st two weeks of a term a student can Add/Drop course/courses. To add a course, in the 3rd week, one has to register the course by paying additional fees. To drop a course, one has to apply within three weeks and paid fees will be adjusted/ refunded. If anyone wants to drop a course after three weeks and within 4 weeks, that will be permitted but paid fees will not be refunded in that case.

d. Registrar office will finalize registration of all courses within 7 (seven) weeks, issue registration slip and that will be followed by issuing Admit Card.

e. Term Final Examination to be conducted in the 18-20th week of the term as per approved Academic Calendar.

3.65 **Short Term Examination.** Following rules to be followed:

a. Short Term for period of 6 weeks may be offered by a department after one week of completion of Term II Final Examination.

b. Short Term Final Examination is to be conducted on 7th week of Short Term.

c. Only repeat course can be offered, not any fresh course.

d. Classes will be arranged for the students who register a failed course in the Short Term.

e. After 6 (six) weeks of class, in the 7th week short Term Examination will be held. Academic calendar for this Short Term will be declared by the Department during the Mid-Term break of Term-II.

f. One student can take only three (failed/improvement) courses at a time in the Short Term.

g. Students will have to complete registration of course for Short Term by paying all the fees, before starting of the Term-II final Exam.

h. Graduating students may register for Short Term examinations after finalization of result of T 2 final examination.

j. Maximum grading will be 'B+'.

k. Question Setting, Moderation, Result Publication will be done following the same rules of Term Final Exam as per Exam Policy. Separate Tabulation sheet will be made for this examination.

l. However, Head of concerned department with the approval of Commandant may decide to take Supplementary Examination instead of Short Term.

3.66 **Supplementary Examination.** Following rules to be followed:

a. After the final break of every Term-I, Supplementary Examination will be held (once in a year).

b. Examination will be taken on 70% marks like Term Final examination. Remaining 30% marks on continuous assessment earned previously in that particular course will be counted. If a student fails in a course more than once in regular terms, then best one of all continuous assessment marks will be counted.

c. A student will be allowed to take one course at a time for each supplementary examination, but in the graduating Term one student can take two courses if required.

d. Highest grade of supplementary examination will be 'B+'.

e. Registration for supplementary courses to be done during the mid-term break of Term 1, paying the required fees.

f. Examination will be completed after Term I End break within three weeks of Term II.

g. If any student fails in a course, he can clear the course retaking it 2nd time or, he can clear the examination appearing at the supplementary examination as well. But anyone fails twice in a course consecutively, he has to take approval of Academic Council of MIST for appearing third/last time in a course and need to pay extra financial penalty.

h. If anyone fails in the sessional course, that course cannot be cleared in the supplementary examination.

j. Question setting, Moderation, Result Publication will be done following the same rules of Term Final Examination as per Examination Policy.

k. However, Head of the concerned department with the approval of Commandant may decide to take another Supplementary Examination instead of Short Term. In that case, a student will be allowed to take only one failed course in that particular Supplementary Examination. This examination will be conducted in the previous week of the beginning of Term 1. Registration of that Supplementary Examination should be completed during registration of Short Term course.

3.67 **Improvement Examination.** Following rules to be followed:

a. Any student gets a grading below 'B+' and desires to improve that course, he will be allowed to appear the improvement examination for that particular course.

b. Highest grade of Improvement examination will be 'B+'.

c. One student is allowed to appear at Improvement exam in 6 (six) courses in his whole graduation period taking maximum two courses at a time.

d. For Improvement examination, registration is to be done before Term 2 Final Examination with the Short Term Courses or, during the registration of Supplementary Courses by paying all the fees.

e. Improvement examination to be taken during the supplementary and short term examinations.

f. Choice of Improvement course is restricted within the offered courses of that Short Term by the Departments and in two courses at a time.

g. Question Setting, Moderation and Result Publication to be done with courses of regular Term Final Examination.

3.68 **Self-Study Course and Examination.** Following Rules to be followed:

a. An irregular student for completion of his graduation, can take maximum two repeat courses as self-study course in the graduating Term if he desires and is accepted by department.

b. One student can take maximum 24 credit hours course in the graduating Term to complete his graduation.

c. Registration for self-study course by paying all fees, must be completed with other course of regular Term.

d. To run the self-study course, concerned Department will assign one teacher each for every self-study course offered. No regular theory class will be held, but that assigned teacher will take necessary class Tests, Quiz Test and give attendance and observation marks to give 30% marks at the end of the Term. For remaining 70% marks written examination will be taken with the Term Final Examination.

e. Assigned teacher for self-study examination will be responsible for setting questions of 70% marks and other examination formalities.

f. Question Setting, Moderation, and Result Publication to be done with courses of Term Final Examination.

g. Grading of Self Study course and examination will be maximum 'B+'.

3.69 **Special Referred Examination.** Following rules will be followed:

a. Immediately after the finalization of result of Term-2 final exam of 2017, for all failed/leftover courses, special referred examination will be arranged and students will have to register the courses for the examination by paying required fees and charges. Following the registration, Admit Card will be issued.

b. Examination will be held before commencement of Term-1 of 2018.

c. One student can appear at all of his failed courses (Referred/Backlog) in the Referred Examination including present level-repeat students.

d. Highest grade for all courses in this Examination will be 'B+'.

e. Question Setting, Moderation and Result Publication will be done following the same rules of Term Final Examination as per Examination Policy.

f. Separate Tabulation Sheet will be made for this special referred examination.

Irregular Graduation

3.70 If any graduating student clears his/her failed course in Term-1 and his graduation requirements are fulfilled, his graduation will be effective from the result publication date of Term-1 and that student will be allowed to apply for provisional certificate.

CHAPTER 4

COURSE CURRICULUM OF BACHELOR IN NAME

4.1 Program Outcome

Based on the suggestion of Board of Accreditation for Engineering and Technical Education (BAETE), Bangladesh, the Bachelor in Naval Architecture & Marine Engineering (NAME) program will have following outcomes:

a) PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

b) PO 2: Problem analysis: Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.

c) PO 3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.

d) PO 4: Investigation: Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

e) PO 5: Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

f) PO 6: The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

g) Po 7: Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.

h) PO 8: Ethics: Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.

i) PO 9: Individual work and teamwork: Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.

j) PO 10: Communication: Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

k) PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.

l) PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

4.2 Course Schedule

Keeping the above mentioned program outcome, the course schedule for the undergraduate students of the Department of Naval Architecture and Marine Engineering is given below:

Summary of Course Curriculum

	Engineering	Science	Humanities	Total
Theory Subjects	29	8	3	40
Sessional Subjects	23	2	2	26
Theory Contact Hours	88	24	7	119
Sessional Contact Hours	70.5 + 4 weeks	6	4.5	81 + 4 weeks
Theory Credit Hours	88	24	7	119
Sessional Credit Hours	36.75	3	2.25	42
Total Credit	124.75	27	9.25	161
Percentage	77.4845	16.7702	5.74534	100

Contact hours and credit hours' distribution in eight terms

Level-Term	Theory contact hours	Sessional contact hours	Theory credit hours	Sessional credit hours	Total contact hours	Total credit hours	Cumulative credit hours
1-I	14	12	14	6	26	20	20
1-II	15	12	15	6	27	21	41
2-I	15	10.5	15	5.25	25.5	20.25	61.25
2-II	16	10.5	16	5.25	26.5	21.25	82.5
3-I	15	9	15	4.5	24	19.5	102
3-II	15	9	15	4.5	24	19.5	121.50
4-I	14	9	14	6	23	20	141.50
4-II	15	9	15	4.5	24	19.5	161
Total	**119**	**81**	**119**	**42**	**200**	**161**	

Distribution of credit hours for different categories of courses in NAME Dept						
Sr	Level Term	Humanities (credit hr)	Sciences (credit hr.)	Core Engineering (credit hr.)	Optional courses (credit hr.)	Total
1	1-I	2+1.50	9+1.5	3+3	-	14+6=20
2	1-II	-	6+1.5	9+4.5	-	15+6=21
3	2-I	-	3+0	12+5.25	-	15+5.25=20.25
4	2-II	3+0	3+0	10+5.25	-	16+5.25=21.25
5	3-I	-	-	12+4.5	3+0	15+4.5=19.5
6	3-II	-	3+0	9+4.5	3+0	15+4.5=19.5
7	4-I	2+0	-	9+6	3+0	14+6=20
8	4-II	0+0.75	-	6+3.75	9+0	15+4.5=19.5
	Total	**7+2.25 =9.25**	**24+3=27**	**70+36.75=106.75**	**18+0**	**119+42=161**

4.3 Term Wise Distribution of Courses

Level-1 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Chem 121	Engineering Chemistry	3	3
Hum 131	English	2	2
Math 151	Differential Calculus and Integral Calculus	3	3
Phy 121	Structure of Matter, Electricity, Magnetism and Modern Physics	3	3
NAME 107	Introduction to Naval Architecture and Marine Engineering	3	3
Sessional Courses			
Hum 132	English Sessional	3	1.5
NAME 150	Mechanical Engineering Drawing	3	1.5
Chem 122	Engineering Chemistry Sessional	3	1.5
Shop 180	Workshop Practice (Foundry, Welding and Machine Shop Sessional)	3	1.5
	Total (5T + 4S)	**26.00**	**20.00**

Level-1 Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Phy 123	Waves and Oscillations, Geometrical Optics and Wave Mechanics	3	3
Math 153	Ordinary and Partial Differential Equations	3	3
NAME 157	Hydrostatics and Stability	3	3
NAME 177	Thermal Engineering	3	3
NAME 115	Computer Programming Language	3	3
Sessional Courses			
Phy 124	Physics Sessional	3	1.5
NAME 158	Ship Design and Drawing -1	3	1.5
NAME 178	Thermal Engineering Sessional	3	1.5
NAME 116	Computer Programming Lab	3	1.5
Total (5T + 4S)		**27**	**21**

Level-2 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Math 251	Vector Analysis and Coordinate Geometry	3	3
NAME 205	Shipbuilding Materials and Metallurgy	3	3
NAME 213	Fluid Mechanics	3	3
NAME 201	Mechanics of Structure	3	3
NAME 207	Ship Design - I	3	3
Sessional Courses			
NAME 206	Shipbuilding Materials and Metallurgy Sessional	1.5	0.75
NAME 208	Ship Design and Drawing -II	3	1.5
NAME 214	Fluid Mechanics Sessional	3	1.5
NAME 226	Computer Aided Design (CAD)	3	1.5
	Total (5T + 4S)	**25.5**	**20.25**

Level-2 Term- II

Course No.	Course Title	Contact hours	Credit hours
NAME 215	Ship Construction and Welding Technology	3	3
Math 253	Statistics, Laplace transform and Matrices	3	3
NAME 253	Marine Hydrodynamics	3	3
NAME 281	Marine Electrical and Electronics	4	4
HUM 223	Economics and Sociology	3	3
Sessional Courses			
NAME 202	Mechanics of Structure Sessional	1.5	0.75
NAME 254	Marine Hydrodynamics Sessional	3	1.5
NAME 258	Ship Design and Drawing -III	3	1.5
NAME 282	Marine Electrical and Electronics Sessional	3	1.5
	Total (5T + 4S)	**26.50**	**21.25**

Level-3 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
NAME 301	Ship Structure	3	3
NAME 309	Marine Engineering -I	3	3
NAME 363	Numerical Methods	3	3
NAME 353	Theories of Resistance and Propulsion	3	3
	Optional -1*	3	3
Sessional Courses			
NAME 300	Ship Design Project	3	1.5
NAME 302	Ship Structure Sessional	1.5	0.75
NAME 308	Application of ship design software	3	1.5
NAME 354	Resistance and Propulsion of Ships Sessional	1.5	0.75
	Total (5T + 4S)	**24**	**19.50**

Level-3 Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Math 351	Fourier Analysis, Harmonic Function and Complex Variable	3	3
NAME 369	Heat Transfer	3	3
NAME 307	Ship Design - II	3	3
NAME 311	Theory of Machines and Machine Elements Design	3	3
	Optional – 2*	3	3
Sessional Courses			
NAME 300	Ship Design Project	3	1.5
NAME 360	Marine Engineering Sessional -I	3	1.5
NAME 364	Numerical Methods Sessional	3	1.5
	Total (5T + 3S)	**24.00**	**19.50**

* Optional Courses will be offered as required from the subjects mentioned in para 4.4.

** 04 Weeks Industrial/Shipyard Training course will be conducted as NAME-450 on completion of level 3 before commencing level 4.

Level-4 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
NAME 403	Dynamics of Marine Vehicles	3	3
NAME 409	Marine Engineering II	3	3
NAME 479	Engineering Management	3	3
Hum 413	Principles of Accounting	2	2
	Optional -3*	3	3
Sessional Courses			
NAME 400	Thesis	6	3
NAME 430	Application of Computer Programming for Optimization of Ship Design	3	1.5
Training course/Internship **			
NAME 450	Shipyard Practice/Industrial Training (4 Weeks)	4 Weeks	1.5
	Total (5T + 3S)	**23.00+ 4 Weeks**	**20**

Level-4 Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
NAME 457	Maritime Economics and Management	3	3
NAME 459	Marine Maintenance and Repair Engineering	3	3
	Optional-4*	3	3
	Optional-5*	3	3
	Optional-6*	3	3
Sessional Courses			
NAME 400	Thesis	6	3
NAME 460	Marine Engineering Sessional-II	1.5	0.75
NAME 490	Bangladesh Studies for Naval Architects	1.5	0.75
	Total (5T + 2S)	**24.0**	**19.50**

4.4 List of Optional Courses

a. One theoretical course will be registered for each term at level 3 as offered from the following list (Optional 1 and Optional 2):

Optional courses for level 3 (one for each term as offered)			
NAME 305	Composite Materials	3	3
NAME 315	Port and Harbor Engineering	3	3
NAME 321	Finite Element Method for Ship Structure	3	3
NAME 373	Computational Fluid Dynamics (CFD)	3	3
NAME 389	Marine Production and Planning	3	3

b. One theoretical course will be registered at the first term of level four and three courses at the second term of level four as offered from the following list (Optional 3,4,5,6):

Optional courses for level 4 (as offered)			
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 447	Maritime Transportation System	3	3
NAME 453	Power and Propulsion System	3	3
NAME 463	Ship Performance	3	3
NAME 465	Marine Safety and Pollution	3	3
NAME 477	Control Engineering	3	3
NAME 481	Optimization Method in Ship Design	3	3
NAME 483	Theory of Hydrofoils	3	3
NAME 489	Introduction to Offshore Structure	3	3
NAME 493	Marine Acoustics	3	3
NAME 499	Shipyard Management	3	3

4.5 Detailed Curriculum and Outcome Based Mapping of Undergraduate Courses

4.5.1 Engineering Theory Courses (Compulsory)

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Introduction to Naval Architecture and Marine Engineering

Course Code: NAME 107

Level: Level 1 Term I

Credit Hour: 3.00

Rationale: Compulsory Theoretical Course

Pre-requisite (if any):

Course Synopsis:

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; Wetted surface area; Trapezoidal Rule, Simpson's First Rule, Simpson's Second Rule, Five-eight-minus one rule, Six Ordinates Rule, Basic idea on ship design; various drawings in ship design, Description of general arrangement (GA); Shell expansion; lines plan and other related drawings.

Basic idea on ship propulsion system and machinery; Description of auxiliary machineries and ship fittings

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify and explain different type of ship terminology.
2. Describe concepts regarding specification of ships dimensions and forms.
3. Explain displacement, lightweight, deadweight, capacity and tonnage.
4. Apply different approximation methods for Area, Volume and Moment.
5. Describe General arrangement (GA), Shell expansion & lines plans of a ship.

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, class tests, exercise, Assignments and Final Exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						

Minimum Attendance: As per the regulation of MIST

Text books:

1. Reed's Naval Architecture for Marine Engineers, E.A. Stoked, 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.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering.

Course Title: Computer Programming Language.

Course Code: NAME 115

Level and Term: Level 1, Term II

Credit Hour: Three (3.0)

Rationale: A Compulsory Theoretical course based on development of computer skills..

Pre-requisite (if any):

Course Synopsis:

Programing basics, Algorithm, Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Encapsulation, classes and objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references; Inheritance: single and multiple inheritance; Polymorphism: overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O; Template functions and classes; Multi-threaded Programming.

Structured programming language: data types, operators, expressions, control structures; Functions and program structure: parameter passing conventions, scope rules and storage classes, recursion; Header files; Preprocessor; Pointers and arrays; Strings; Multidimensional array; User defined data types: structures, unions, enumerations; Input and Output: standard input and output, formatted input and output, file access; Variable length argument list; Command line parameters; Error Handling; Graphics; Linking; Library functions. Reference language: C, Java, Python etc.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Explain the concept and purpose of computer programming.
2. Identify classes, objects, members of a class and the relationships among them needed for
3. a specific problem.
4. Create Java/C application programs using sound practices.
5. Apply proper program structuring
6. Use testing and debugging tools to discover errors.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Lab tests, Assignments and Quiz test.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Minimum Attendance: As per the regulation of MIST**.**

Text books:

1. Code Complete: A Practical Handbook of Software Construction – Steve McConnell
2. Introduction to Algorithms – Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein
3. Structure and Interpretation of Computer Programs – Harold Abelson
4. C Programming Language – Brian W. Kernigha and Dennis M. Ritchie

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Hydrostatics and Stability

Course Code: NAME 157

Level: Level 1 Term II

Credit Hour: 3.00

Rationale: Compulsory Theoretical Course based on ship design and stability.

Pre-requisite (if any): NAME 107

Course Synopsis:
Hydrostatic calculations & hydrostatic curves; Bonjean curves; wetted surface; Equilibrium conditions; Initial stability; Stability at large angles; Metacentric height; Cross curves of stability; GZ curve; Free surface effect; effects of changes in weight on stability; Inclining experiment; Dynamical stability; Trim and Heel; Moment causing trim; effect of added weights on draft; Submerged equilibrium; Intact stability of unusual ship forms; Subdivision and damage stability calculations. Load line regulations; Tonnage regulations; Damaged stability and its calculations by lost buoyancy and added weight method; International Maritime Organization (IMO) Stability criteria; Stability criteria for damaged stability; wind heel criteria; Subdivision and floodable length calculations; Subdivision indices; Launching calculations & Methods.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Carry out Hydrostatic calculations and draw hydrostatic curves.
2. Explain concepts regarding ships intact stability, damage stability, dynamical stability & GZ-curve.
3. Calculate the change in stability caused by loading, discharging or moving of weights on board of a ship.
4. Calculate change in draft and trim caused by loading, discharging or moving of weights on board of a ship.
5. Conduct Inclining experiment of a ship
6. Apply Vessel’s Launching and Docking.

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, class tests, exercise, Assignments and Final Exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Minimum Attendance: As per the regulation of MIST

Text books:

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. Ship Hydrostatics and Stability, Adrian Biran.
4. Ship Stability for Masters and Mates, D. R Derrett.
5. Basic Ship Theory, K.J. Rawson & E. C. Tupper, Vol. 1 & 2., Longman Group Limited.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Thermal Engineering

Course Code: NAME 177

Level: Level 1, Term II

Credit Hour: 3.0

Rationale: Compulsory Theoretical Course to enhance knowledge on mechanical engineering.

Pre-requisite (if any):

Course Synopsis:

1. Fundamental concepts of thermodynamics, its laws and their corollaries.
2. Non Flow process and flow process.
3. Thermodynamic cycles and processes.
4. Properties of pure substances.
5. Mixture of Gas and Vapor.
6. Study of steam generation units (boiler).
7. Introduction to steam turbines with their accessories and efficiency.
8. Study of sources of energy: conventional and renewable.
9. Refrigeration and air conditioning system, thermodynamic cycles of various types of engines.

Learning Outcomes (LO):

1. On completion of this course students should be able to:
   Apply understanding of the nature and operating principles of energy flows to systems encountered in engineering
2. Describe and apply basic thermodynamic principles and laws of physics to analyzing and predicting performance of idealized forms of thermodynamic systems
3. Describe and assess benefits of improvements to thermodynamic systems
4. Relate idealized thermodynamic system models to corresponding real systems

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 1	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x						
LO 2	x	x	x			x						
LO 3	x	x	x			x			x	x		
LO 4			x	x		x			x		x	

Text books:

1. Thermodynamics: An Engineering Approach - Yunus A. Cengel,Michael A. Boles
2. Fundamentals of Engineering Thermodynamics- Michael J. Moran &Howard N. Shapiro.
3. Fundamentals of Thermodynamics – R E Sonntag, C. Borgnakke, G J. Van Wylen.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Mechanics of Structure

Course Code: NAME 201

Level and Term: Level 2, Term I

Credit Hour: Three (03)

Rationale: Compulsory Theoretical Course

Pre-requisite (if any):

Course Synopsis: -

Introduction to Mechanics of Structure: Basic Concept of Mechanics, Importance of Mechanics of Structure in Ship Design, History of Structural Failure of Ships.
Centroids of Plane Areas, Centroids of Composite Areas, Moments of Inertia of Plane Areas, Parallel-Axis Theorem for Moments of Inertia, Polar Moments of Inertia, Products of Inertia, Rotation of Axes, Principal Axes and Principal Moments of Inertia.
Tension, Compression, and Shear: Normal Stress and Strain, Mechanical Properties of Materials, Elasticity, Plasticity, and Creep, Linear Elasticity, Hooke's Law, and Poisson's Ratio, Shear Stress and Strain, Allowable Stresses and Allowable Loads, Design for Axial Loads and Direct Shear, Problems.
Axially Loaded Members: Changes in Lengths of Axially Loaded Members, Changes in Lengths Under Non uniform Conditions, Statically Indeterminate Structures, Thermal Effects, Misfits, and Prestrains, Stresses on Inclined Sections, Strain Energy, Impact Loading, Repeated Loading and Fatigue, Stress Concentrations, Nonlinear Behavior, Elastoplastic Analysis, Problems
Torsion: Torsional Deformations of a Circular Bar, Circular Bars of Linearly Elastic Materials, Non-uniform Torsion, Stresses and Strains in Pure Shear, Relationship Between Moduli of Elasticity E and G, Transmission of Power by Circular Shafts, Statically Indeterminate Torsional Members, Strain Energy in Torsion and Pure Shear, Thin-Walled Tubes, Stress Concentrations in Torsion, Problems.
Shear Forces and Bending Moments: Types of Beams, Loads, and Reactions, Shear Forces and Bending Moments, Relationships Between Loads, Shear Forces, and Bending Moments, Shear-Force and Bending-Moment Diagrams, Problems.
Stresses in Beams: Pure Bending and Non-uniform Bending, Curvature of a Beam, Longitudinal Strains in Beams, Normal Stresses in Beams, Design of Beams for Bending Stresses, Non-prismatic Beams, Shear Stresses in Beams of Rectangular Cross Section, Shear Stresses in Beams of Circular Cross Section, Shear Stresses in the Webs of Beams with Flanges, Built-Up Beams and Shear Flow, Beams with Axial Loads, Stress Concentrations in Bending, Problems.

Analysis of Stress and Strain: Plane Stress, Principal Stresses and Maximum Shear Stresses, Mohr's Circle for Plane Stress, Hooke's Law for Plane Stress, Triaxial Stress, Plane Strain, Problems.

Applications of Plane Stress: Spherical Pressure Vessels, Cylindrical Pressure Vessels, Maximum Stresses in Beams, Combined Loadings, Problems.
Deflections of Beams: Differential Equations of the Deflection Curve, Deflections by Integration of the Bending-Moment Equation, Deflections by Integration of the Shear-Force and Load Equations, Method of Superposition, Moment-Area Method, Non-prismatic Beams, Strain Energy of Bending, Castigliano's Theorem, Deflections Produced by Impact, Discontinuity Functions, Use of Discontinuity Functions in Determining Beam Deflections, Temperature Effects, Problems.
Statically Indeterminate Beams: Types of Statically Indeterminate Beams, Analysis by the Differential Equations of the Deflection Curve, Method of Superposition, Temperature Effects, Longitudinal Displacements at the Ends of a Beam, Problems.
Columns: Buckling and Stability, Columns with Pinned Ends, Columns with Other Support Conditions, Columns with Eccentric Axial Load, The Secant Formula for Columns, Elastic and Inelastic Column Behavior, Inelastic Buckling, Design Formulas for Columns, Problems.
Various Theories of Failure: Maximum Principal Stress theory also known as Rankine's Theory, Maximum Shear Stress theory or Guest And Tresca's Theory, Maximum Principal Strain theory also known as St.Venant's Theory, Total Strain Energy Theory or Haigh's Theory, Maximum Distortion Energy theory or Vonmises and Hencky's Theory.
Introduction to FEM of Structure

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify structural elements
2. Explain the application of loads on structural elements
3. Calculate the stress strain and bending moment
4. Draw shear force and bending moment at different loading conditions

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x

Textbook:

1. Mechanics of Structure, James M Gere
2. Mechanical Behavior of Materials, Meyers and Chawla
3. Strength of Material, Gupta and Khurmi
4. Mechanics of Material, Russell C Hibbeler

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Shipbuilding Materials and Metallurgy

Course Code: NAME 205

Level and Term: Level 2, Term I

Credit Hour: Three (03)

Rationale: Compulsory Theoretical course based on marine materials to select the most optimum materials on the basis of engineering and environmental point of view.

Pre-requisite (if any):

Course Synopsis:

Metals as materials of construction: What is material Science and Engineering, Classification of materials; Materials Design and Selection.
Industrially significant properties of metallic materials: Technological Significance; Terminology for Mechanical Properties; Tensile test: Use of the stress-strain diagram, True Stress and True Strain; The Bend test for Brittle materials; Hardness of Materials; Strain Rate Effects and Impact Behavior; Fracture Mechanics; Micro-structural features of fracture in metallic materials, ceramics, glasses and composites; Fatigue; Results and applications of fatigue test; Creep, Stress Rupture and Stress Corrosion.
Production, properties and uses of Pig Iron, Cast Iron and Carbon Steels: Blast Furnace production of Pig Iron; Bessemer process for the production of steel; The Open Hearth Process.
Phase diagrams, The Fe-Fe_3C equilibrium diagram: Equilibrium diagrams, Phase diagrams for two metals completely soluble in liquid and solid states, Two metals completely soluble in the liquid state and completely insoluble in the solid state; Two metals completely soluble in the liquid state but only partly soluble in the solid state; The Eutectoid Reaction; The Iron-Iron Carbide Diagram;
Heat treatment of Steel: Full Annealing; Spheroidizing; Stress-relief Annealing; Process Annealing; Normalizing; Hardening, Austentizing Temperature, Mechanism of heat removal during Quenching, Quenching medium; Tempering;
Cast Iron, Alloy, tool, stainless, heat-resisting and creep resisting steels etc.: White Cast Iron, Malleable Cast Iron, Pearlitic Malleable Iron, Gray Cast Iron, Mechanical properties and applications of Gray Cast Iron, Silicon in Cast Iron, Alloy Cast Iron; Stainless steel types.
Case hardening of steels: Carburizing; Nitriding; Cyaniding; Flame hardening; Induction hardening.
Nonferrous alloys: Copper alloys, Brass alloys, Bronze alloys, Gun metal, Bearing Materials, Aluminium alloys, Magnesium alloys, Tin alloys.
Protective Coatings. Cement, Timber, Rubber, Glass and Plastic

Learning Outcomes (LO): On successful completion of this Lesson, students should be able to:

1. Compare the materials and their properties used in the marine industry.
2. Investigate the design criteria of materials.
3. Select materials for a particular application
4. Apply the different materials, their processing and heat treatments in suitable application in marine engineering fields.
5. Select materials for different environment.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study/Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						

Minimum Attendance: As per the regulation of MIST

Text books:

1. Introduction of Physical Metallurgy, S.H. Avner, 2nd edition, McGraw-Hill International Editions, Materials Science and Metallurgy Series, 2000.
2. Essentials of Materials Science and Engineering, D.R. Askeland and P.P. Fulay, 2nd edition, Cengage Learning Publishers, Nelson Education Ltd., 2010.
3. Chemistry of Engineering Materials, R.B. Leighou, 1942.
4. Engineering Materials 2: An Introduction to Microstructures, Processing and Design, M.F. Ashby and D.R.H. Jones, 2nd edition, Butterworth-Heinemann publishers ltd., 1998.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF NAVAL ARCHITECTURE AND MARINE ENGINEERING

Program: BSc Engineering in Naval Architecture and Marine Engineering

Course Title: Ship Design – I

Course Code: NAME 207

Level: Level 2 Term I

Credit Hour: 3.0

Rationale: Compulsory Theoretical Course based on design philosophy of Marine Crafts.

Pre-requisite (if any): **NAME 107, NAME 157.**

Course Synopsis: 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, volume, tonnage and capacities, calculation of longitudinal strength, resistance and powering, selection of machinery and outfit, checking for trim and stability, estimation of lightweight and cargo deadweight, economic criteria and evaluation.

Extensive use of design computer environment. Given owner's requirements, students individually create and report the conceptual/preliminary design for a displacement ship. Case studies of typical marine vehicles.

Learning Outcomes (LO):

On successful completion of this unit, students should be able to:

1. Analyze the design philosophy and design aspects of different type of ships;

2. Compare the characteristics of different design stages;

3. Evaluate different design parameters, characteristics and performances of ships;

4. Estimate the values of design parameters, capacities and performances;

5. Apply the knowledge in practical ship designs and constructions;

6. Develop and lead effective design teams and design projects;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 1	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Casestudy/Presentation	20%	
LO 1-6	Final Examination	70%	
Total		100%	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Text books:

1. Principles of Naval Architecture, Vol. 1, 2 &3,
2. Ship Design and Performance for Master and Mates, Dr C B Barrass
3. Practical Ship Design, D.G.M. Watson, 1998, Elsevier Science Ltd.
4. Ship Design - Methodologies of Preliminary Design, Apostolos Papanikolaou, Springer
5. Ship design for efficiency and economy, H Schneekluth and V Bertram

Grading system: As per the regulation of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Fluid Mechanics

Course Code: NAME 213

Level and Term: Level 2, Term 1

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical Course to promote the knowledge of the students about the characteristics of fluid flow and its implication in the design of Hydraulic Machineries.

Pre-requisite (if any):

Course Synopsis:

Fluid properties: Classification of Fluid Flows, Density and Specific Gravity, Energy and specific heats, Compressibility and Bulk Modulus, Viscosity, Surface Tension and Capillary Effect.
Fluid statics and kinematics: Pressure head, Pascal's law, Instruments to measure fluid pressure, Total pressure on horizontally, vertically and inclined immersed surfaces, Pressure on a curved surface, Centre of pressure on an inclined immersed surface, Lagrangian and Eulerian descriptions of fluid kinematics, Streamlines and Streamtubes, Pathlines, Streaklines, Timelines, Refractive and surface flow visualization techniques, Plots of fluid flow data, Types of motion or deformation of fluid elements, Vorticity and Rotationality, The Reynolds Transport Theorem, Bernoulli's equation, Euler's equation of motion, Limitations of Bernoulli's equations, Practical Applications of Bernoulli's equation, Venturimeter, Discharge through a Venturimeter, Orifice Meter, Pitot Tube, Discharge over a Rectangular Notch, Discharge over a Triangular Notch.
Continuity, energy and momentum principle: Conservation of Mass, Mass and Volume flow rates, Moving or deforming control volumes, Incompressible flow, General Equation of Energy, Newton's Laws and Conservation of Momentum, The linear Momentum equation.
Friction and flow through pipes, impact of jets: Loss of head in pipes, Darcy's and Chezy's Formula for loss of head in pipes, Graphical representation of Pressure head and velocity head, Hydraulic Gradient line, Total Energy Line, Transmission of power through pipes, Time of emptying a tank through a long pipe, Force of Jet Impinging Normally on fixed, hinged, inclined and moving plate, Force of jet impinging on a fixed and moving curved vane.
Laminar and turbulent flows:
Introduction to boundary layers, drags, and wakes: Drag and Lift, Friction and Pressure Drag, Drag coefficients of common geometries, Parallel flow over flat plates, Flow over cylinders and Spheres, Lift.
Dimensional analysis, principles of similitude and model testing: Fundamental Dimensions, Dimensional Homogeneity, Uses of the principle of Dimensional Homogeneity, Methods of Dimensional Analysis, Rayleigh's Method, Buckingham's Pi-theorem, Selection of Repeating Variables, Advantages of Model Analysis, Hydraulic Similarity, Procedures for model analysis, Comparative studies between prototype and undistorted model.
Aerofoil and its application: Theory of wings, Cavitation.
Hydraulic machines: Reciprocating and Centrifugal pumps.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Explain the physical properties of a fluid and the influence of such properties on fluid flow,
2. Identify the fundamental kinematics of a fluid element,
3. Explain the conservation principle of mass, linear momentum and energy for fluid flow,
4. Apply the basic applied mathematical tools that support fluid dynamics,
5. Create models of inviscid, steady fluid flow over simple profiles and shapes,
6. Interpret the working principles of different hydraulic machineries.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weight	Remarks
LO1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/ Class test/ Assignment/Case study/Presentation	20%	
LO 1-6	Final Examination	70%	
Total		100%	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Text books:

1. A Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines, R.S. Khurmi, 19th Edition, S. Chand & Company Ltd., 2004.
2. Fluid Mechanics: Fundamentals and Applications, Y.A. Cengel and J.M. Cimbala, 1st edition, McGraw Hill Publishers Ltd., 2006.
3. A Textbook of Fluid Mechanics and Hydraulic Machines, R.K. Bansal, 2005.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classed prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Ship Construction and Welding Technology

Course Code: NAME 215

Level and Term: Level 2, Term II

Credit Hour: Three (03)

Rationale: Compulsory Theoretical course based on construction procedure to get quality product by using material and technology

Pre-requisite (if any):

Course Synopsis:

Welding details: Different types of welding and their equipment. Welding principle, methods: MMAW, GMAW, SAW, Electro slag welding, TIG and SS welding, MIG and aluminum welding.
Types of welding and defect: 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.
NDT details: Non-destructive testing.
Details of ship structural member: structural discontinuity, stress concentration, remedial measures. Cathodic protection, surface preparation and painting, Bottom structure, Keel, Single Bottom structure, Single Bottom structure, Double bottom Structure, Shell Plating, Framing, Tank side Bracket, Bilge keel, Bulkhead, Water tight doors, Deep Tank, Topside Tank, Pillars, Deck, Hatches, Bulwark, Superstructure and Deck house, Stem, Bulbous Bows, Chain Locker, Hawse pipe, Rudder, Shafting, Plate and section preparation, Frame Bending
Shipyard facilities: various shops and production facilities and their layout. Process of ship construction. Numerical control. Boat building by materials other than steel.

Learning Outcomes (LO): On successful completion of this Lesson, students should be able to:

1. Assess methods of welding for welding of different units and blocks of the ship
2. Apply rules and regulations related to shipbuilding during construction of vessel
3. Demonstrate the set-up and safe operation of welding and fabrication equipment.
4. Develop a familiarity with the common welding codes and standards in the welding industry
5. Assess the quality of welds and welded fabrications and create detailed inspection documentation and reports on findings including corrective actions.
6. Apply an appropriate knowledge and skills on designing a marine vessel using naval architecture theory.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Minimum Attendance: As per the regulation of MIST

Text books:

1. Practical ship design, D. G. M. Watson. Elsevier Ocean Engineering Book Series, Volume – 1
2. Ship Construction, Fifth edition, D. J. Eyres
3. Merchant Ship Construction, D. A. Taylor
4. Ship Design and Construction, Robert Taggart

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Marine Hydrodynamics

Course Code: NAME 253

Level and Term: Level 2, Term 2

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical Course to promote the knowledge of the students about the characteristics of fluid flow and its implication in the design of Marine Vehicles.

Pre-requisite (if any): NAME 213 (Fluid Mechanics)

Course Synopsis:

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.

Standard Patterns of Flow: 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, Plane progressive waves, Wave energy, Two and three dimensional ship waves, the method of stationary phase, Energy radiation and wave resistance, Body response in regular waves, Wave exciting force and moment and characteristics of flow around a ship hull.

Learning Outcomes (LO): On successful completion of this unit, students should be able to :

1. Describe the flow around bluff and streamlined bodies and discuss the benefits of streamlining,
2. Calculate the pressure distribution and wake field around a submerged body in fluid,
3. Apply fluid flow principles, including conservation of mass, momentum and energy, Bernoulli's principle, the stream and potential functions, and sources and sinks, to assess the forces applied by the flow to submerged bodies in fluid,
4. Estimate the wave-induced loads on simple geometric shapes and find the equations of motions of floating structures like that of ship.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/ Class test/ Assignment/Case study/Presentation	20%	
LO 1-4	Final Examination	70%	
Total		100%	

Minimum Attendance:

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x

Text books:

1. Applied Hydrodynamics, H.R. Valentine, Newnes-Butterworth; Student international edition, 1969.
2. Marine Hydrodynamics Newman, John N. (1977).
3. Theoretical Hydrodynamics, Milne-Thomson, 4th edition, 1962.
4. Fluid Mechanics: Fundamentals and Applications, Y.A. Cengel and J.M. Cimbala, McGraw Hill Publishers Ltd.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classed prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering.

Course Title: Marine Electrical and Electronics.

Course Code: NAME 281

Level and Term: Level 2, Term II

Credit Hour: Four (4.0)

Rationale: Compulsory Theoretical Course based on application of electrical and electronic technology in marine field.

Pre-requisite (if any):

Course Synopsis:

DC and AC circuit analysis: Kirchhoff's law, Thevenin theorem, Norton theorem, Node Pair voltage theorem etc.
Three phase induction motors: Basic Theory, Principle of operation, Types, construction, Equivalent circuit, Starting, speed control, Maintenance, applications.
Single phase induction motors: Basic Theory, Principle of operation, Equivalent circuit, types, starting, Maintenance, applications.
AC generators: Basic Theory, Principle of operation, Construction, excitation system, generator on load, voltage regulation, synchronization, Maintenance and applications.
Synchronous motor: Principle of operation, Starting, application, maintenance
Steering system.
Diodes, BJTs, diode and BJT circuits. IC, MOSFET and SCR as power switching devices. Controlled rectifiers and inverters.
Radar and wireless equipment: Principle, block diagram, different parameters, Maintenance
Navigational and Electronic navigational aids (GPS, Gyro compass. Echo sounder, speed log, LORAN, RDF and Decca Chain).
Power generation and distribution (PGT) system.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Evaluate the basic principles of electrical machinery fitted on a vessel;
2. Describe and apply working idea about the electrical and electronic equipment fitted on a vessel;
3. Develop the idea about the space requirement for electrical and electronic equipment in a vessel;
4. Identify the basic principles about repair and maintenance of electrical and electronic equipment which will help them to work on board as a marine engineer;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation,Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/ Class test/Assignment/Case study/Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x

Minimum Attendance: As per the regulation of MIST**.**

Text books:

1. Electric Machinery Fundamentals- Stephen J. Chapman;
2. A Text book of Electrical Technology (V-II) - B.L. Theraja and A. K. Theraja;
3. Electronic Devices & Circuit theory-Robert L. Boylestad.
4. Principles Of Electronics : V.K. Mehta

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Ship Structure

Course Code: NAME 301

Level and Term: Level 3, Term I

Credit Hour: Three (03)

Rationale: Compulsory Theoretical Course

Pre-requisite (if any):

Course Synopsis:-

Introduction to Ship Structure: Structural analysis in Ship Design, Steps in ship structural design process, Flowchart method for ship structural analysis, Classification of ship structures, Description of forces acting upon a ship at sea, Smith Effect, Slamming, Hogging, Sagging.

Different types of Ship Motion, largest Hogging/Sagging bending moment, Calculation of buoyancy, shear force and bending moment, Total shear force and total bending moment for a ship amongst waves, Buoyancy curve in still water and weight curve, Shearing force and bending moment curves, Buoyancy curves amongst waves compared with buoyancy in still water.

Functions of the ship structures, Strength/distortion of ship structures.

Longitudinal Strength of Ship Structure: Assumed form of wave system for structural design, Difference between sinusoidal wave and trochoidal wave, Formation and necessity of trochoid.

Distance between half height of a trochoidal wave and the equivalent still water level, Buoyancy curves for different positions of wave, 'Sagging Condition' and 'Hogging Condition', Plotting the buoyancy curve, Light weight and dead weight, types of weights, plotting the weight curve.

Sir John. H. Biles approximation method, plotting the load, shearing force and bending moment curves from buoyancy and weight curves in calculation of longitudinal strength of a ship.

Characteristics of shearing force and bending moment curves of a ship,

Sketch the typical curves of load, Shearing force and bending moment for a ship, Influence of position of wave on bending moment, Murray's approximate method for calculating the bending moment of a ship.

Alternative method for calculating the approximate buoyancy moment, Alternative method for calculating the approximate weight moment, Equation for maximum bending moment of a ship, Calculation of maximum bending moment considering the position of maximum is at amidship.

Stresses in the Structure and the Calculation of Deflection: Definition of NA, Flexural rigidity of beam, Section Modulus Strain – Curvature and Moment – Curvature relation for a curved beam, Flexure Formula, Equation for the location of NA in the inclined condition of a Ship, Inclination for greatest and least stresses of an inclined Ship, Stress variation with angle of

inclination of a ship, Formulation of the necessary steps for calculation of the deflection of ship structure, Shear Formula for a Structure.

Influence of shear stress on bending theory stress, Strain energy method for calculating shear deflection, Derivation of equation of shear deflection and calculation of shear deflection, Maximum normal stresses at a cross section, Stress variation in a rectangular cross section for positive and negative bending moment, Different strain energies of a structure.

Local strength problems: Expression for Bending Moment and Deflection of a simply supported beam and its calculation, Expression for Bending Moment and Deflection of a fixed ended beam and its calculation.

Equation for calculating Bending Moment of fixed ended beams, Procedure to determine the total BM of a fixed ended beam, Expressions of shearing force, bending moment and deflection for a flooded watertight bulkhead of a ship, Redundant Structures, Portal frame, Evaluation of the end/corner moment of a portal frame, Influence of rigidity of surrounding structure, Explanation of the importance of the rigidity of the post and stay of a derrick.

Buckling of Structures: Assumptions need to be considered in the theory of buckling structures.

Different states of equilibrium from the viewpoint of buckling of structures.
Expression for critical load and critical stress for a hinged ended column, Expression for total maximum stress for a column with initial curvature, Expression for critical stress considering buckling of a simply supported rectangular plate.

Dynamic Effects: Response of ship due to its Heaving Motion in still water considering un-damped vibration and damped vibration Influences on damping due to heaving motion, Equation for natural pitching period, Equation for pitching angle amongst waves.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify structural elements ships and craft.
2. Calculate light weight of ship.
3. Explain the application of loads on structural elements
4. Calculate the stress, strain, displacement, deflection and bending moment
5. Apply loading and wave effects on ship design

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 1	Attendance	5%	
LO 1-5	Home Work/ Class test/Assignment/Case study/Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						

Textbooks:

1. Strength of ships' structure by W Muckle
2. Ship Structural Analysis and Design by Owen F Huges
3. Buckling of Ship Structure by Shama
4. Design of Ship Hull Structure by Yasuhisa Okumoto
5. Design Principles of Ships and Marine Structures by S C Misra

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: BSc Engineering in Naval Architecture and Marine Engineering

Course Title: Ship Design - II

Course Code: NAME 307

Level: Level 3 Term II

Credit Hour: 3.00

Rationale: Compulsory Theoretical Course based on design of different types of Marine Crafts

Pre-requisite (if any): NAME 207

Course Synopsis:
Design and construction of trawlers, tugs, container ships, Ro-Ro ships, tankers and dredgers including categories, characteristics, General Arrangements, midship sections, structures, equipment, propulsion and other important systems, methods, operations, environmental concerns, special features, etc.
Design and construction of Submarines and other warships (Frigate, Corvette, OPV, LPC, LCT and LCVP) including special characteristics.
Design and construction of High speed crafts and multi-hull vessels including special characteristics. Hydrodynamics of small high-speed craft including planing hulls, air cushion vehicles, surface effect ships and catamarans. Forces and moments acting on a sailing yacht. Speed polar diagrams. Two- and three-dimensional airfoil theory. Application to keel and rudder design. Yacht model testing.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Analyze the design aspects of different type of ships;
2. Compare the characteristics of the design features of different ships;
3. Evaluate different design parameters and performances;
4. Apply the knowledge in practical ship designs and constructions;
5. Develop and lead effective teams and design projects;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 1	Attendance	5%	
LO 1-5	Home Work/ Class test/Assignment/Case study/Presentation	20%	
LO 1-5	Final Examination	70%	
Total		100%	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x					x	x
LO 2	x		x		x					x		
LO 3	x	x		x								
LO 4	x	x	x		x					x		x
LO 5	x			x								

Text books:

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, 3rd Edition, 1996, McGraw-Hill Book Company.
4. Reeds Naval Architecture For Marine Engineers, E A Stokoe
5. Modern Warship: Design and Development, Norman Friedman

Grading system: As per the regulation of MIST

Student Responsibility:

Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Marine Engineering I

Course Code: NAME 309

Level: Level 3, Term I

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical Course based on marine propulsion engines and related topics.

Pre-requisite (if any):
Synopsis:

A. Marine Engines

1. Internal combustion engines (ICE): Related terminology and definitions, Thermodynamic cycles of ICE, Starting system of ICE, Valve timing diagram.
2. CI engine: Basic parts of CI engines, Types, Combustion including phases, Fuel pump mechanism and operation, governor mechanism and operation.
3. SI engine: Combustion of SI engine, Carburetor, Supercharging, scavenging, low load running, lube oil testing etc, Engine operation, testing and Fuel metering.
4. Gas Turbine: Description of major components of GT, Working principle, Practical session on GT propulsion, Construction of compressor and combustion chamber of GT, Various system of GT, Advantage and disadvantage
5. Engine diagnosis and fault finding.
6. Crankcase explosion
7. Crankshaft deflection
8. Load trials
9. Selection criteria of marine engine

B. Marine Fuels

- Types (Petrol, Diesel, Octane, Biofuels etc.)
- Gravity and testing
- Description and characteristics of HSDO, LHSDO, IFO

C. Power Transmission

a. Principle and mechanism of Gear box: Coupling and clutch, Solid drive coupling, Fluid drive coupling, Other couplings
b. Description of ship's shafting system
c. Description of components
d. Construction and operation: Thrust block, Plummer block, Bulkhead gland, Stern tube, Loose coupling
e. Shafting alignment requirements and various methods

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Analyze the working aspects of different types of engine and gas turbine;
2. Evaluate the different types of special features of various types of marine engine and gas turbine;

3. Apply the knowledge on board as a marine engineer;
4. Make decision for suitable engine selection, their operation and shafting arrangement;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/ Class test/Assignment/Case study/Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x		x		x			x			x
LO 2		x				x			x			x
LO 3				x		x			x	x		
LO 4			x			x				x	x	

Text books:

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

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Theory of Machines and Machine Element Design

Course Code: NAME 311

Level: Level 3, Term 2

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical course based on machine functions and mechanism to design machine elements for efficient operations.

Pre-requisite (if any): NAME 201

Course Synopsis:

Fundamental Principles of Machine Design: Working Stresses and Failure Theories; Stresses in curved members; Deflection and stiffness considerations; Column design; Statistical considerations; Types of fits.

Design parameters: analysis with isotropic and anisotropic materials.
Design for static strength; Fracture mechanics in design; Design for fatigue strength.
Design of screws, fasteners and connections; Keys and couplings, welded and brazed joints; Shafts, keys and couplings, Power screws and bolted connections, Belt and chain drives, Brakes and clutches, Welded and Riveted Connections, rope, belt and chain drives.
Springs, Shock and vibration: Properties and design for damping and arresting of vibration.
Bearings: Friction, Design of Journal, Ball, Needle and Roller bearings.
Gears and Gearing systems: spur, helical, worm and bevel gears, Toothed gearing, Gear trains.
Design of marine shafts, stern tube and associated bearings

Lubrication of machine elements: Boundary, Hydrostatic and Hydrodynamic lubrication systems.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. define failure and decide on appropriate failure model;
2. design an appropriate machine element using allowable load, required element life, manufacturing considerations;
3. apply theories of failure and material science in the design of machine elements and components;
4. make proper assumptions, perform correct analysis while drawing upon various machine elements;
5. demonstrate the abilities by performing correctly: the selection, design, analysis and sizing of shafts, springs, bearings, gear types and gear systems;
6. use existing as well as develop new computer based techniques and algorithms for the analysis, selection, and synthesis of machine components and systems

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 1	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x						
LO 2	x	x	x			x						
LO 3	x	x	x			x			x	x		
LO 4			x	x		x			x		x	
LO 5				x	x	x	x	x	x		x	x
LO 6					x	x	x	x	x	x	x	x

Text books:

1. Fundamentals of Machine Design – Andrzej Golenko_
2. Theory of Machine – R.S. Khurmi and J. K. Gupta.
3. Theory of Machine and Mechanisms – Joseph E. Shigley, John Joseph Uicker
4. Standard Handbook of Machine Design – Joseph E. Shigley, Charles R. Mischke, Thomas H.Brown
5. Design of Machine Elements – Sharma, C.S.
6. Theory and Problems of Machine Design –Hall, Holowenco and Laughlin

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Theories of Resistance and Propulsion.

Course Code: NAME 353

Level and Term: Level 3, Term I

Credit Hour: Three (03)

Rationale: Compulsory Theoretical Course

Pre-requisite (if any): NAME 107, NAME 157.

Course Synopsis:-

Theory of Resistance: Resistance of a ship and its component, Towrope or effective power, Effective Horse Power, Dimensional Analysis of Ship Resistance, Total Resistance Coefficient. Wake, Eddy, Different Resistance at different part of Vessel. Definition of Powers and Efficiencies, Forces, velocities, powers and resistances at different locations of vessel, Overall Concept for Powering a Vessel.

Definitions, Parts of estimates of power, Ship power estimate flowchart. Ship resistance determination with model test, Description of Towing Tank with different facilities required for a standard ship model testing facility, Ship model test Purposes. Laws of Comparison: Geometrical Similarity, Kinematic Similarity, Dynamic Similarity. Dynamic Similarity in case of Incompressible Frictionless Fluid and No Free Fluid Surface. Froude experiment on friction, Work of towing tank conference on frictional resistance, Three dimensional viscous resistance formulation, The work of ITTC on Three Dimensional Viscous Resistance Formulation, Calculation of resistance and effective power by three-dimension extrapolation procedure, Corresponding Speeds, Relation of Residuary Resistance with Displacement, Calculation of resistance and effective power by two-dimension extrapolation procedure, Air & Wind Resistance Calculation, Shallow water effect, Shallow Water Effect with narrow channel effect.

Theory of Propulsion: Types of modern propulsion systems and characteristics.

Propeller Geometry, Coefficients, Characteristics: Manufacturing, Generator & Rake, Skew, Propeller Sections, face and back of the blade, face or geometrical pitch, Typical Blade Sections, the pitch angle, representative mean pitch, relation between pitch and pitch angle, velocity diagram of a section, the slip, slip ratio.Wake fraction, Thrust deduction factor, The Axial Momentum Theory of Propeller Action, The Momentum Theory including Angular Motion, Derivation of Blade Element Theory of Screw Propeller, Pitch and Pitch Angle, Slip, Slip Angle, Real Slip Ratio, Slip ratio, PPR face, back, leading edge, trailing edge, different pitch and pitch angle, angle of attack, Skew, Rake, Disk area, projected area, developed area, expanded area, Cavitation, Cavitation Number, Local Cavitation Number, Use of standard series data, Math on Cavitation. Open Water Characteristics, Propeller Hull Interaction (Wake gain, thrust deduction, relative rotative efficiency) Propulsive Efficiency and Propulsion Factor, Standard series and wageningen B PPR series, Math on Blade Element Theory, Math on Momentum Theory, Math on Power & Efficiency.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Identify the components of ship resistance.
2. Calculate the frictional and residual resistance
3. Perform 2D and 3D extrapolation using ITTC methods.
4. Identify geometric parameters of a propeller.
5. Calculate cavitation and relevant characteristics.
6. Apply cavitation minimization.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 1	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Textbooks:

1. Ship Resistance and Propulsion by Anthony F Molland
2. Basic Ship Propulsion by J P Ghose
3. Marine Propellers and Propulsion by John Carlton

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Numerical Methods

Course Code: NAME 363

Level and Term: Level 2, Term 2

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical Course based on different numerical methods applied to solve various problems in the fields of engineering.

Pre-requisite (if any):

Course Synopsis:

Introduction: Errors in Numerical Calculations, Vector and Matrix Objects,

Solution of System of Linear and Nonlinear Equations: Gaussian Elimination with Back-substitution, LU Decomposition, Tridiagonal and Band-Diagonal Systems of equations, Singular Value Decomposition, Sparse Linear Systems, Newton-Raphson Method for Nonlinear Systems of Equations, Globally Convergent Methods for Nonlinear Systems of Equations.

Interpolation and Extrapolation: Polynomial Interpolation and Extrapolation, Cubic Spline Interpolation, Rational Function Interpolation and Extrapolation, Interpolation on Scattered Data in Multi-dimensions, Laplace Interpolation.

Integration of Functions: Improper Integrals, Romberg Integration, Quadrature by Variable Transformation, Gaussian Quadratures and Orthogonal Polynomials, Multi-dimensional Integrals.

Evaluation of Functions: Polynomials and Rational Functions, Evaluation of Continued Fractions, Series and their Convergence, Recurrence Relations, Chebyshev Approximation, Polynomial Approximation from Chebyshev Coefficients, Pade Approximations, Evaluation of Functions by Path Integration.

Sorting and Selection: Straight Insertion, Shell's Method, Quicksort, Heapsort, Indexing and Ranking, Determination of Equivalence Classes.

Root Finding: Secant Method, Bisection, False Position Method, Ridder's Method, Newton-Raphson Method using Derivative, Roots of Polynomials.

Minimization and Maximization of Functions: Golden Section Search in One dimension, Downhill Simplex Method in Multi-Dimensions, Powell's Method, Conjugate Gradient Method, Quasi-Newton Method, Linear Programming: Simplex and Interior-Point Method, Simulated Annealing Methods, Dynamic Programming.

Eigen Systems: Jacobi Transformations of a Symmetric Matrix, Eigenvlaues and Eigenvectors of a Tridiagonal Matrix, Hermitian Matrices, QR algorithm for Real Hessenberg Matrices,

Least Squares, B-splines and Fast Fourier Transform: Least-squares curve fitting, weighted Least-squares approximation, Method of Least-squares for Continuous Functions, Cubic B-splines, Fast Fourier Transform.

Numerical solution of Ordinary differential equations: Solution by Taylor's Series, Euler's Method, Runge - Kutta Methods, Predictor-Corrector Methods, The Cubic Spline Method,

Numerical solution of Partial differential equations: Finite Difference Approximations to Derivatives, Laplace's Equation, Parabolic Equations, Iterative Methods for the Solution of Equations, Hyperbolic Equations.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Explain the consequences of finite precision and the inherent limits of the numerical methods considered,
2. Select appropriate numerical methods to apply to various types of problems in engineering and science considering the mathematical operations involved, accuracy requirements and available computational resources.
3. Demonstrate understanding and implementation of the mathematical concepts and algorithms underlying the numerical methods considered.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO1	Class participation and observation	5%	
	Attendance	5%	
LO 1-3	Home Work/ Class test/ Assignment/Case study/Presentation	20%	
LO 1-3	Final Examination	70%	
Total		100%	

Minimum Attendance:

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						

Text books:

1. Introductory Methods of Numerical Analysis, Sastry, S.S., 4th edition, Prentice Hall of India, 2006.
2. Numerical Recipes: The Art of Scientific Computing, Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flannery, B.P., 3rd edition, Cambridge University Press, 2007.
3. Numerical Methods for Engineers, Chapra and Canale.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classed prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Heat Transfer

Course Code: NAME 369

Level and Term: Level 3, Term II

Credit Hour: Three (03)

Rationale: Compulsory Theoretical course based on heat related equipment design and problem to solve effectively and efficiently.

Pre-requisite (if any): NAME 177 (Thermal Engineering)

Course Synopsis:
Conduction Heat Transfer, Thermal Conductivity, Convection Heat Transfer, Radiation Heat Transfer.
Steady-State Conduction—One Dimension: The Plane Wall Insulation and R Values, Radial Systems, Heat-Transfer Coefficient, Critical Thickness of Insulation, Heat-Source Systems, Cylinder with Heat Sources, Conduction-Convection Systems, Fins, Thermal Contact Resistance.
Steady-State Conduction—Multiple Dimensions: Mathematical Analysis of Two-Dimensional, Heat Conduction, Graphical Analysis, The Conduction Shape Factor, Numerical Method of Analysis, Numerical Formulation in Terms of Resistance Elements, Gauss-Seidel Iteration, Accuracy Considerations, Electrical Analogy for Two-Dimensional Conduction.
Unsteady-State Conduction: Lumped-Heat-Capacity System, Transient Heat Flow in a Semi-Infinite Solid, Convection Boundary Conditions, Multidimensional Systems, Transient Numerical Method, Thermal Resistance and Capacity Formulation.
Principles of Convection: Introduction, Viscous Flow, Inviscid Flow, Laminar Boundary Layer on a Flat Plate, Energy Equation of the Boundary Layer, The Thermal Boundary Layer, The Relation Between Fluid Friction and Heat Transfer, Turbulent-Boundary-Layer Heat Transfer, Turbulent-Boundary-Layer Thickness, Heat Transfer in Laminar Tube Flow, Turbulent Flow in a Tube, Heat Transfer in High-Speed Flow.
Empirical and Practical Relations for Forced-Convection Heat Transfer: Introduction, Empirical Relations for Pipe and Tube Flow, Flow Across Cylinders and Spheres, Flow Across Tube Banks, Liquid-Metal Heat Transfer.
Natural Convection Systems: Free-Convection Heat Transfer on a Vertical Flat Plate, Empirical Relations for Free Convection, Free Convection from Vertical Planes and Cylinders, Free Convection from Horizontal Cylinders, Free Convection from Horizontal Plates, Free Convection from Inclined Surfaces, Non-Newtonian Fluids, Simplified Equations for Air, Free Convection from Spheres, Free Convection in Enclosed Spaces, Combined Free and Forced Convection.
Radiation Heat Transfer: Physical Mechanism, Radiation Properties, Radiation Shape Factor, Relations Between Shape Factors, Heat Exchange Between Non-black bodies, Infinite Parallel Surfaces, Radiation Shields, Gas Radiation, Radiation Network for an Absorbing and Transmitting Medium, Radiation Exchange with Specular Surfaces, Radiation Exchange with

Transmitting, Reflecting, and Absorbing Media, Formulation for Numerical Solution, Solar Radiation, Radiation Properties of the Environment, Effect of Radiation on Temperature Measurement, The Radiation Heat-Transfer Coefficient.
Condensation and Boiling Heat Transfer: Introduction, Condensation Heat-Transfer Phenomena, The Condensation Number, Film Condensation Inside Horizontal Tubes, Boiling Heat Transfer, Simplified Relations for Boiling Heat Transfer with Water, The Heat Pipe.
Heat Exchangers: Introduction, The Overall Heat-Transfer Coefficient, Fouling Factors, Types of Heat Exchangers, The Log Mean Temperature Difference, Effectiveness-NTU Method, Compact Heat Exchangers, Analysis for Variable Properties, Heat-Exchanger Design Considerations.
Heat transfer cases in ship design: insulation in bulkheads, refrigerated spaces, fish holds in trawlers.

Learning Outcomes (LO): On successful completion of this Lesson, students should be able to:

1. Compare why certain materials are better than others for transferring heat.
2. Apply to real-world problems regarding heat transfer and materials.
3. Apply heat transfer principles to design and to evaluate performance of thermal systems.
4. Develop the design of heat exchangers.
5. Evaluate the impacts of initial and boundary conditions on the solutions of a particular heat transfer problem.
6. Evaluate the relative contributions of different modes of heat transfer.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 1	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study/Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						

LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Minimum Attendance: As per the regulation of MIST

Text books:

1. Heat Transfer: Jack Holman
2. Principles of Heat Transfer by Frank Kreith, Raj M. Manglik , Mark S. Bohn
3. Engineering Thermodynamics: Work and Heat Transfer, G.F.C. Rogers & Y. R. Mathew, 1967, English Language Book Society & Longmans Green & Co. Ltd.
4. Fundamentals of Heat and Mass Transfer: C. P. Kothandaraman
5. Fundamentals of Heat and Mass Transfer: Incropera

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc in Naval Architecture and Marine Engineering

Course Title: Dynamics of Marine Vehicles

Course Code: NAME 403

Level and Term: Level - 4, Term -I

Credit Hour: 3.00

Rationale: Compulsory Theoretical Course based on motion, control and seakeeping of marine vehicles in the regular and irregular sea.

Pre-requisite (if any): NAME 213, NAME 253.

Course Synopsis: Introduction to sea keeping. Recapitulation of gravity waves. Wave record analysis. Rayleigh distribution. Gaussian distribution. Spectral representation of the seaway. Directional spectra. Ship motion in regular waves- Response amplitude operators. Motions in irregular sea. Short-time and long-time statistics of waves. Rigid body motion of a floating body in waves extended to several degrees of freedom and coupled motions. Roll motions and coupled motions of floaters. Slamming and deck wetness. Introduction to maneuverability, Motion stability criterion, ITTC maneuvering standards- Design of control surface-Rudder design.

Learning Outcomes (LO): On successful completion of these units, students should be able to:

1. Describe the underlying principle of ship motion in the regular and irregular seaways.
2. Demonstrate numerical methods for linear wave induced motions and loads
3. Develop formulation of the mathematical model for ship's motion in seaways
4. Describe different motion criteria of ship's maneuvering standards.
5. Apply wave dynamics in ship design.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Method	Weightage	Remarks
LO - 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Casestudy/Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	100%	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x						x		x			x
LO 2		x							x			
LO 3	x	x							x			
LO 4	x	x	x	x		x			x			
LO 5	x						x					x

Text books:

1. Dynamics of Marine Vehicles – Bhattacharjya
2. Sea Loads on ship and offshore structure – O.M. Faltinsen

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the concern faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Marine Engineering II

Course Code: NAME 409

Level: Level 4, Term I

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical Course based on marine auxiliary machinery.

Pre-requisite (if any): NAME 309 (Marine Engineering I)

Course Synopsis:

1. Pumps: Types of pump, Characteristics of different pump, NPSH, Head calculation
2. Blowers and compressors, Single stage and multistage compressors, Compressor instability, safety etc.
3. Refrigeration and air-conditioning: Thermodynamics, Principles, Load calculation, Construction details of different types of refrigeration and air-conditioning systems, Refrigerants and their characteristics, Maintenance and repair of units and plants.
4. Deck fittings: Windlasses, Capstan, Winches, Cranes, Cargo access equipment for dry, unitized, liquid and cryogenic cargoes.
5. Steering gear; Systems, Types, Characteristics, Construction details
6. Stabilizer: Types, Description
7. Pipe: Pipe materials, Piping systems and valves, Steam traps, anchors, anchor hawse, chains, etc.
8. Life Saving Apparatus: Types, Operation and use
9. Fire Fighting arrangement: Types of firefighting equipment, Location, Fixed firefighting equipment

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Analyze the characteristics of all ship fitted auxiliary machineries;
2. Compare the characteristics of construction of different auxiliary machinery;
3. Evaluate different design parameters and performance to select auxiliary machineries;
4. Apply the knowledge of firefighting and lifesaving equipment;
5. Make decision about suitable auxiliary machineries for different vessel as a naval architect;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Method	Weightage	Remarks
LO - 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	100%	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x					x	x					
LO 2	x					x	x					
LO 3	x					x	x					
LO 4	x					x	x					
LO 5					x	x			x	x	x	x

Text books:

1. Marine Auxiliary Machinery- H.D Mc George
2. Marine Auxiliary Machinery and System – M. Khetagurov
3. General Engineering Knowledge for Marine Engineers – L. Jackson and T. D. Morton
4. Marine Auxiliary Machinery – H.D. McGeorge
5. Marine Auxiliary Machinery – D.W. Smith
6. Marine Auxiliary Machinery & System – M. Khetagurov
7. Introduction to Naval Engineering – E. F. Gritzen
8. Introduction to Marine Engineering – D. A. Taylor
9. Principles of Naval Engineering – M. A. Carr

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Maritime Economics and Management

Course Code: NAME 457

Level: Level 4, Term 2

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical course based on management tools to handle, men, material and time effectively and efficiently in relation to maritime business.

Pre-requisite (if any): NAME 479.

Course Synopsis:

Overview of global maritime domain and its system; Blue economy and its components.
Understanding the maritime transportation management.
Elements of shipping; Freight market and operating economics; Chartering of ships.
Shipbuilding cost estimation; Maritime related tendering and contracts.
International payment systems and money flow mechanism.
Commercial, marketing, legal and financial aspects of shipbuilding and shipping.
Alternative maritime designs.
Overall optimization for speed size combinations of ships. Relative importance of technical and economic features of marine vehicle design.
Importance and use of ICT in maritime designs. Safety management concept in ships and ports and ISO certifications.
Management practices in maritime projects.
Goal based design, construction and repair/maintenance of marine vehicles, role of IACS, class surveyors and other maritime agencies.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Understand the underlying principles and concepts in global logistics and maritime management
2. Develop cognitive, analytical, and creative skills to analyze consolidate and synthesize knowledge in the global logistics and maritime management domain
3. Perform critical thinking and solve diverse and complex problems in the global logistics and maritime management, incorporating social, ethical, regulatory, and global perspectives
4. Demonstrate responsibility and accountability for self-directed autonomous learning and professional practice in the global logistics and maritime management context in collaboration with others

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x		x		x			x			x
LO 2		x				x			x			x
LO 3				x		x			x	x		
LO 4			x			x				x	x	

Text books:

1. Engineering Economics & Ship Design, I.L. Buxton, 3rd Edition, 1987, British Maritime Technology Ltd.
2. Cost Management in Shipbuilding - Planning, Analyzing and Controlling Product Cost in the Maritime Industry, Jan O. Fischer, GerdHolbach, GKP Publishing.
3. Handbook of Reliability Engineering and Management – W.G. Ireson, C.F. Coombs & R.Y. Moss
4. Economics of Shipping Practice and Management – Alan E. Branch
5. Liner Shipping Economics – J.O. Jansson and D. Shneerson
6. Maritime Economics – Martin Stopford
7. The Blackwell Companion to Maritime Economics – Wayne K. Talley
8. Reeds 21st Century Ship Management – J.K. Shim & J.G. Siegel
9. Elements of Shipping – Alan E. Branch

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Marine Maintenance and Repair Engineering

Course Code: NAME 459

Level: Level 4, Term II

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical course.

Pre-requisite (if any): NAME 205, NAME 215, NAME 309 and NAME 409

Course Synopsis:

1. Maintenance requirements: Corrosion, fatigue, Marine fouling.
2. Failure causes: Fatigue failure of structural members, deformation failures, Failure due to corrosion.
3. Repairs to failures.
4. Measures for failure of structural members due to deformation, corrosion, fatigue, crack detection etc.
5. Prevention of marine growth and removal of marine growth both in dry and wet condition.
6. Design considerations with regard to maintenance.
7. Welding repair decision model.
8. Classification requirements of hull survey, identification of defects, plates and welds.
9. Plate cutting and welding, tolerance requirements, distortion removal.
10. Underwater welding: Dry and wet.
11. Welding Inspection.
12. Impact of preventive maintenance and repair techniques on operation.
13. Maintenance Schedule
14. Machinery Maintenance (Marine Engine and Generator set): Top overhauling, Major overhauling

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Perform the maintenance of ship's hull and machineries;
2. Analyze the aspects of welding, hull survey and paint scheme;
3. Evaluate the various methods of corrosion and corrosion prevention;
4. Apply knowledge in machinery maintenance;
5. Perform as a marine engineer on board;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study/Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x						
LO 2	x	x	x			x						
LO 3	x	x	x			x			x	x		
LO 4			x	x		x			x		x	
LO 5				x	x	x	x	x	x		x	x

Text books:

1. Ship Construction, D.J. Eyres, 5th Edition 2001, Butterworth-Heinemann.
2. Commercial Ship Surveying, Harry Alexander
3. Technology of Ship Repairing, Benkovsky

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Engineering Management

Course Code: NAME 479

Level and Term: Level 4, Term 1

Credit Hour: Three (3.0)

Rationale: Compulsory Theoretical course based on management tools to handle, men, material and time effectively and efficiently.

Pre-requisite (if any):

Course Synopsis:

Principles of management: evolution of management thought; characteristics of good managers; management levels; Philosophical similarities between engineering and management, ethics for engineering profession.

Organization and management: classical quantitative and behavioral schools; interactions between organizations and their environment; management functions; organization structure; development of organization theory; study of various types of organization and management information systems; concepts and scope of application.

Human Resource Management (HRM): Definition, importance, objectives and scope of HRM; HR operative functions (induction, training &development, compensation, integration, maintenance and separation); HR cycle; leadership; group dynamics; job evaluation and merit rating; Incentive systems and performance appraisal; Bangladesh Labour code 2006; ILO guide lines.

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

Motivation: Definition, mechanism, productivity and satisfaction; Maslow's Need Hierarchy Theory; Other theories of motivation.

Financial management: Time value of money; performance analysis of enterprises; capital investment techniques; investment appraisal and schedule; criteria of investment; measures of merits for project evaluation

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

Marketing management: core concept of marketing; marketing mixes (4 Ps and 4 Cs), marketing concept philosophies (Production concept, product concept, selling concept, marketing concept and societal marketing concept), industrial selling, channel decisions, advertising decisions, new product strategy.

Supply chain management: role and importance; forward and backward supply chain; product life cycle.

Technology management: human and technology interaction; technology transfer; adaptation of technology for management.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. perform the Management Functions;
2. compare selected Theories of Management;
3. handle crisis and conflicts for optimum utilization of human resources;
4. make decisions for capital investments;
5. perform the functions in the Marketing Mix;
6. develop and lead effective teams and projects;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1									x			x
LO 2		x				x			x			
LO 3				x		x			x	x		
LO 4			x			x					x	
LO 5						x	x	x	x	x		
LO 6								x	x	x	x	x

Text books:

1. Management Fundamentals: Concepts, Applications, Skill Development – Robert N. Lussier
2. Essentials of Organizational Behavior – by Stephen P. Robins

3. Handbook of Reliability Engineering and Management – W.G. Ireson, C.F. Coombs & R.Y. Moss
4. Financial Management – J.K. Shim & J.G. Siegel
5. Managerial Accounting – R. H. Garrison & E. W. Noreen
6. Corporate Finance – Stephen A. Ross
7. Operations Management – S. A. Kumer & N. Suresh

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

4.5.2 Engineering Theory Courses (Optional)

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Composite Materials

Course Code: NAME 305

Level: Level 3, Term 1/2

Credit Hour: Three (3.0)

Rationale: Optional Theoretical course based on material science to construct ships and craft or associated items using suitable composite materials.

Pre-requisite (if any):

Course Synopsis:

Introduction to composites: Background, characteristics, classifications and uses; Manufacturing processes.

Micro-mechanics and macro-mechanics of composite materials.

Fibrous composites; Reinforcement types; Ply stiffness; Ply strength; Layered laminate; Laminate stiffness; Laminate strength; Residual stress; Thin-walled composite sections; Inter-laminar stresses; Hole in laminates; Buckling of laminates

Stiffness of unidirectional composites; Transformation of stress and strain; Off-axis stiffness of unidirectional composites; In-plane stiffness of symmetric laminates; Flexural stiffness of symmetric sandwich laminates; Behaviour of general laminates; Strength of composite materials and their modes of failure; Failure criteria.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. identify and explain the types of composite materials and their characteristic features
2. describe current and emerging applications of composites in the maritime sectors and industries
3. understand the strengthening mechanism of composite and its corresponding effect on performance and application
4. calculate the elastic and strength properties of unidirectional laminates using micromechanics theory
5. select the most appropriate manufacturing process for fabricating composite components
6. describe the fracture, fatigue and impact performance of composites
7. describe the non-destructive inspection (NDE/NDT) and structural health monitoring of composites
8. develop expertise on the applicable engineering design of composite

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-8	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-8	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x					x	x					
LO 2	x					x	x					
LO 3	x					x	x					
LO 4	x					x	x					
LO 5					x	x			x	x	x	x
LO 6	x					x	x	x				
LO 7	x		x		x	x	x					x
LO 8	x	x		x		x			x			x

Text books:

1. Mechanics of Composite Materials – Auter Kaw
2. Mechanics of Composite Materials – R Jones
3. Principles of Composite Material Mechanics – Ronald F Gibson
4. Mechanics of Composite Materials with MATLAB – George Z. Voyiadjis & Peter I. Kattan
5. Composite Materials: Science and Engineering – Krishan K. Chawla

Grading system: As per approved grading scale of MIST

Student Responsibility: Students may register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Port and Harbor Engineering

Course Code: NAME 315

Level: Level 3, Term 1/2

Credit Hour: Three (3.0)

Rationale: Optional Theoretical course based on Port and Harbor Engineering.

Pre-requisite (if any):

Course Synopsis:

Introduction to Port and Harbour, Port and Harbor characteristics, Ship characteristics and tonnage calculation, Port and Harbor planning, Access channel, Wharf, Quay, Pier and Jetty, **Berthing** (structure, Requirement, Berthing area and Anchorage area).
Cargo Handling in ports (Container, Container Cranes, Bulk Cargo)
Loads (Operational, Environmental)
Natural Phenomenon (Wind, Wave, Tide, Current)
Breakwater (Basic and types, float breakwater)
IMO and Marine Pollution
Ports of Bangladesh (River and Sea Port).

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Analyze the design philosophy and design aspects of different port used worldwide;
2. Evaluate the different design parameter, types and construction of port and harbor;
3. Compare the characteristics of different types of port and harbor structure's layout and design;
4. Apply the knowledge in different port structure design which will help to select a suitable port in Bangladesh;
5. Develop and lead effective design teams and design projects;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study/Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x						
LO 2	x	x	x			x						
LO 3	x	x	x			x			x	x		
LO 4			x	x		x			x		x	
LO 5				x	x	x	x	x	x		x	x

Text books:

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, McGraw-Hill Book Company Ltd.
3. Port Management, Hercules

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Finite Element Method for Ship Structure

Course Code: NAME 321

Level and Term: Level 3, Term 1/2.

Credit Hour: Three (03)

Rationale: Optional Theoretical Course.

Pre-requisite (if any):

Course Synopsis:-

Fundamental Concepts

Introduction, MM (Matrix Structural Analysis), FEM (Finite Element Method), Stresses and Equilibrium, Boundary Conditions, Strain-Displacement Relations, Stress-Strain Relations, Special Cases, Potential Energy and Equilibrium: The Rayleigh-Ritz Method, Galerkin's Method, Saint Venant's Principle, Von Mises Stress, Related Problems.

Matrix Algebra

Introduction to Matrix Algebra, Row and Column Vectors, Addition and Subtraction, Multiplication: Scalar and Vector, Transposition, Differentiation and Integration, Square Matrix, Diagonal Matrix, Identity Matrix, Symmetric Matrix and others Related Problems.

Gauss Elimination

General Algorithm for Gaussian Elimination, Symmetric Matrix, Symmetric Banded Matrices, Solution with Multiple Right Sides, Gauss Elimination with Column Reduction, Related Problems.

One-dimensional Problems

Finite Element Modeling, Coordinates and Shape Function, The Potential Energy Approach, Assembly of Global Stiffness Matrix and Load Vector, The Finite Element Equations: Treatment of Boundary Conditions, Quadratic Shape Function, Related Problems.

Trusses

Plane Trusses, (Local and Global Coordinate Systems, Formulas for calculating l and m, Element Stiffness Matrix, , Stress Calculation), Temperature Effect, Three-Dimensional Trusses, Assembly of Global Stiffness Matrix for Banded ans Skyline Solutions, Related Problems.

Two-Dimensional Problems using Constant strain Triangles

Finite Element Modeling, Constant-Strain Triangle (CST) (Isoparametric Representation, Potential Energy Approach, Element Stiffness, Force Terms, Galerkin Approach, Stress Calculations, Element defects) Related Problems.

Linear Strain Triangle

Properties, Natural Coordinates, Area Coordinates

Two-Dimensional Isoparametric Elements and Numerical Integration

The Four-Node Quadrilateral (Shape Functions, Element Stiffness Matrix, Element Force Vectors), Numerical Integration (Two-Dimensional Integrals, Stiffness Integration, Stress Calculation), Higher Order Elements (Nine node Quadrilateral, Six node Quadrilateral, Six node Triangle), Four Node Quadrilateral for Axisymetric Problems, Related Problems.

Beams and Frames

Introduction (Potential-Energy Approach, Galerkin Approach), Finite Element Formulation, Load Vector, Boundary Conditions, Shear Force and Bending Moment, Beams on Elastic Supports, Plane Frames, Three-dimensional Frames, Related Problems.

Displacement Method

Kinematic Compatibility, Static Equilibrium, Material Law, the Principle of Virtual Work, Procedure to establish Stiffness matrix.

Numerical Integration

Gauss Quadrature rule, Full Integration vs Reduced Integration, Selective Reduced Integration (SRI)

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Explain the theories of FEM.
2. Apply matrix algebra to solve the finite element structures.
3. Solve the issues of supports, truss, brackets etc.
4. Solve the problems of shell and plate elements.
5. Apply FEM theories in structural ship design.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study/Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						

TextBooks:

1. Fundamentals Finite Element Analysis by David Huttons
2. Introduction to Non Linear Finite Element Analysis by Nam Ho Kim
3. Textbook of Finite Element Analysis by P Seshu

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Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Computational Fluid Dynamics (CFD)

Course Code: NAME 373

Level and Term: Level 3, Term 1/2

Credit Hour: Three (3.0)

Rationale: Optional Theoretical Course to promote the knowledge of the students about the characteristics of fluid flow and its implication in the design of Marine Vehicles.

Pre-requisite (if any): NAME 213 (Fluid Mechanics), NAME 253 (Marine Hydrodynamics).

Course Synopsis:

Introduction

Governing equations of fluid flow**:** Finite Control Volume, Substantial Derivative, Physical meaning of gradient of velocity, Conservation and non-conservation form of continuity equation, Conservation and non-conservation form of Navier-Stokes equation, Energy equation.

Boundary integral methods: Discretisation and Interpolation, Boundary Element Method, Green's theorem, Application of Boundary Integral Method to radiation and diffraction problems,

Discretization schemes: finite difference methods, finite volume methods, finite element methods, spectral methods etc.

Finite Volume Method: Diffusion problem, Convection – Diffusion problem, Discretization Schemes, Pressure – Velocity coupling, Solution of Discretized Equations, Unsteady flows, Implementation of Boundary Conditions, Errors and Uncertainty in CFD modeling.

Turbulence modeling: Characteristics of turbulent flow, Transition from laminar to turbulent flow, Reynolds Averaged Navier Stokes Equation (RANS), Turbulence Models, i.e., k-epsilon model, k-omega model, Spalart Almaras model, LES, DES, DNS etc.

Grid generation: Body-fitted coordinate grids for complex geometries, Cartesian vs curvilinear grids, Block-structured grids, Unstructured grids, Discretization in unstructured grids, Staggered vs co-located grid arrangements.

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

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Undertake flow computations using current best practices for numerical model and method selection and assessment of the quality of results obtained.
2. Make physically justified assumptions to simplify and carry out feasible analysis of real-life fluid flow and heat transfer problems.
3. Use powerful computational tools to solve and analyze fluid dynamics and heat transfer related problems.
4. Implement these methods and tools to simulate the resistance and propulsion related flow phenomena in the field of ship hydrodynamics.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/ Assignment/Case study/Presentation	20%	
LO 1-4	Final Examination	70%	
Total		100%	

Minimum Attendance:

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1												
LO 2												
LO 3												
LO 4												

Text books:

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, H.K. Versteeg and W Malalasekera, 2nd edition, Pearson Prentice Hall Editions, 2007.
2. Computational Methods for Fluid Dynamics, Ferziger, J.H. and Peric, M., 3rd edition, Springer-Verlag publishing group, 2002.
3. The Boundary Element Method with Programming for Engineers and Scientists, Beer, G., Smith, I., Duenser, C., Springer-Verlag/Wien publisher, 2008.
4. Computational Fluid Dynamics: An Introduction, John F. Wendt, 3rd edition, Springer Verlag Berlin Heidelberg, 2009.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classed prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. Engineering in Naval Architecture and Marine Engineering

Course Title: Marine Production and Planning

Course Code: NAME 389

Level and Term: Level 3 Term 1/2.

Credit Hour: 3.00

Rationale: Optional Theoretical Course based on foundations and production planning of Marine vessels, shipyard and offshore platforms.

Pre-requisite (if any):

Course Synopsis:

Overview of ship production system; Shipbuilding Process, Shipyard Layout and Shipyard productivity.
Production Planning and Control; Introduction, Forecasting, Inventory, MRP, CPM, PERT, etc.
Design Process, Shipbuilding Process & Methods and Material Management in hull outfit and steel processing.
Shipbuilding production, scheduling, resource allocation and cost estimation.
Product standardization, work simplification, work breakdown and integrated zone engineering.
Linear programming concepts; introduction, requirement, formulations, solutions, etc.
Network analysis; Critical Path Analysis- introduction, advantage, fundamentals, logical sequencing, scheduling computations, etc.
Data Base Management System (DBMS) in production planning and control; overview, architecture, data models, schemas, independence, rules, generalization, specialization & normalization, etc.

Learning Outcomes (LO):

On successful completion of this unit, students should be able to:

1. Perform the Production Planning and control;
2. Analyze ship production methods, shipyard layout & productivity;
3. Apply linear programming, Network analysis and DBMS in shipbuilding;
4. Make decisions for shipbuilding production, scheduling and resource allocation;
5. Develop and lead effective production teams and shipbuilding projects;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
LO 1	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Casestudy/Presentation	20%	
LO 1-5	Final Examination	70%	
Total		100%	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x		x		x				x		x
LO 2	x	x	x			x	x				x	
LO 3	x			x			x			x	x	x
LO 4	x	x	x		x					x		
LO 5	x	x		x	x		x				x	x

Text books:

1. Engineering for Ship Production, Lambs
2. Ship Production, Hammon and Moore

Grading system: As per the regulation of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Ship Hull Vibration

Course Code: NAME 431

Level: Level 4 Term 1/2

Credit Hour: 3.00

Rationale: Compulsory Theoretical Course

Pre-requisite (if any):

Course Synopsis:

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.

Single degree of freedom systems: Free and forced vibrations, clamping, classification and damped systems. Energy methods. Vibration isolation and transmissibility. Vibration n1easuring instruments such as displacen1ent, velocity, acceleration and frequency measurements, Dunkerley's equation.

Two degrees of freedom system. Free, forced, damped and undamped n1otions 1natri.x formulation, matrix method, using of Lagrange's equations to determine equations of motion, Dynamic vibration absorbers, principle of Orthogonality. Semi-definite systems. Combined rectilinear and angular modes. Torsional systems.

Multi degrees of freedom systems: Free and! forced vibrations of Longitudinal torsional and lateral modes. Critical speeds of rotors matrix formulation, stiffness and flexibility influence coefficients. Eigen value problem Matrix method, Matrix interaction technique for eigen values and eigen vectors. Stodola's method,Hozler's method.

Continuous Systems: Axial vibrations of bars, torsional vibrations of shafts, transverse vibrations of strings and bending vibrations of beams. Free and forced vibration of strings classical and energy methods.

Ship vibration: Introduction to ship hull vibration—Mathematical basis of ship vibration - calculation of ship hull vibration.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify different parameters for ship motion
2. Explain the effects of vibration on ships.
3. Make relation between ship motion and ship hull vibration.
4. Apply hull vibration on ship design.

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, class tests, exercise, Assignments and Final Exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x

Minimum Attendance: As per the regulation of MIST

Text books:

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

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Computer Aided Ship Production

Course Code: NAME 435

Level and Term: Level 4 Term 1/2

Credit Hour: 3.00

Rationale: Optional Theoretical Course based on in-depth knowledge on Ship Production by using software.

Pre-requisite (if any):

Course Synopsis:

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.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Develop 3D hull modelling and fit internal structures
2. Produce a limited set of design drawings to industry standards
3. Develop a concept design based on an appraisal of operational requirements
4. Create an assembly of parts, create a detailed drawing, assemble a manufacturing environment.
5. Create basic NC sequences necessary for material removal.
6. Perform ship design, production, management and critically assesses their contribution and effectiveness.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study/Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Text books:

1. Computer aided applications in ship technology, by C.KuoK.J.MacCallum
2. Computer Aided Ship Design and Numerically Controlled Production of Towing Tank Models by D.F. Rogers, F. Rodriguez, S.G. Satterfield
3. Ship Production, Hammon and Moore.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. Engineering in Naval Architecture and Marine Engineering

Course Title: Inland Water Transportation System

Course Code: NAME 437

Level: Level 4 Term 1/2

Credit Hour: 3.00

Rationale: Optional Theoretical Course based on existing and advanced logistics and technologies of dredger & dredging.

Pre-requisite (if any): NAME 307

Course Content:

Inland Water Transport System; Advantage, limitation, Government Strategy, Responsibilities of different Organizations.

Inland waterways & their Peculiarities, Classification, Development Constraint, Recommendation relating to waterway network.

Maintenance of navigational channel; siltation, bank erosion & dredging. Requirements for dredging, dredging technique, disposal of sediments, dredging of fairways.

Inter-modal transportation, Specialized inter-modal transportation vessel. Design of inland waterway transportation system, Design & operational aspects of small craft. Design of specialized inland vessel, tug-barge system. Different type of tug, barge & connection system, Shallow draft tug, inland passenger vessels, research vessel, pontoon, hydrofoil, Ro-ro vessel, etc., Marine Salvage.

Inter-modalism and multi-modalism, advantage and disadvantage, Intermodal Transport Chain, Intermodal Transport Units, Techniques & Costs, Inter-modality at Inland Water Transport, Intermodal Transportation networks, Transport system & network design, SSCA & MEA, Intermodal design process guideline, Framework for intermodal networks design at IWT

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Explain the pattern of inland water transportation.
2. Develop network system for inland water.
3. Identify the suitable vessels and their characteristics for inland transportation.
4. Design of the suitable vessels for inland transportation.
5. Make decisions on the modes of inland water transportation
6. Identify special regulations for inland transportations.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study/Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x		x						x	
LO 2	x	x		x			x					
LO 3	x		x								x	x
LO 4	x	x		x		x	x					
LO 5	x	x	x		x		x				x	x
LO 6	x	x	x		x		x				x	

Text books:

1. Inland Water Transportation Systems Series, Authors: Dr. Sulaiman Olanrewaju Oladokun
2. Inland Waterway Transport: Challenges and Prospects, edited by Bart Wiegmans, Rob Konings
3. UNECE Resolutions
4. CCNR Regulations
5. Inland Shipping Ordinance, 1976 (Ordinance No. LXXII of 1976)
6. European Policy for the Promotion of Inland Waterway Transport – A Case Study of the Danube River: By Svetlana Dj. Mihic and Aleksandar Andrejevic

Grading system: As per the regulation of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. Engineering in Naval Architecture and Marine Engineering

Course Title: Dredger and Dredging Technology

Course Code: NAME 445

Level and Term: Level 4 Term 1/2

Credit Hour: 3.00

Rationale: Optional Theoretical Course based on existing and advanced logistics and technologies of dredger & dredging.

Pre-requisite (if any): NAME 307

Course Synopsis:

Introduction to Dredging (**a.** Definitions of Dredging, requirements of Dredging, Various purpose of dredging, Dredging requirement areas, Stages of Dredging; **b.** Dredging operation layout, Dredging procedure (Pretreatment, Extraction, and Disposal); **c.** Selection of Dredging Equipment: Criteria/Boundary Conditions, Factors in Selection.)

Dredger Classification (**a**. Mechanical Dredger: application, advantages and limitations, types (Bracket, Grab, Backhoe with description); **b.** General outline of Hydraulic dredger, Suction dredger, Cutter Suction Dredger, Trailing Suction Hopper Dredger, Reclamation Dredger, Barge Unloading Dredger, others (Airlift, Augur suction, pneumatic, amphibious, water injection); **c.** Mechanical vs Hydraulic Dredger)

Cutter Suction Dredger (CSD) (**a.** General Description (Area of application, History, Working Method), **b.** Design (Production Capacity, Dredging Depth, Max/Min Dredging Depth, Width of the cut, type of soil, transport distance, access to site), **c.** Dredging equipment, **d.** The drives, **e.** Spud Systems, **f.** General Layout)

Trailing Suction Hopper Dredger (**a.** General Description (characteristics, application area, history, working method), **b.** The design (Productive capacity, main dimensions, dredge installation, propulsive power, power balance, main layout), **c.** Technical Construction,
d. 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),

Type of accessories, pipes and floaters (**a.** pipeline fittings, rubber hose, ball socket, etc.
b. Pump and pipeline characteristics, **c.** Working point, working range, **d.** Operation of a pump and pipeline system.)

Brief review of dredging need (dredging operation and dredging process for Bangladesh)

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Identify dredging methods, dredging technology and dredging equipment;
2. Explain about different equipment and methods of dredging;
3. Analyze dredging techniques and methods, output and productions, etc.;
4. Estimate the performance and output of various types of dredging and dredgers;
5. Make decisions for use of type of equipment for different type of soil conditions;
6. Develop and lead effective dredging teams and dredging projects;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x		x						x	
LO 2	x	x		x			x					
LO 3	x		x								x	x
LO 4	x	x		x		x	x					
LO 5	x	x	x		x		x				x	x
LO 6	x	x	x		x		x				x	

Text books:

1. Designing Dredging Equipment, Prof.Ir. W.J.Vlasblom. Pagina 14 van 79. May 2005
2. Dredging-A handbook for Engineers by R.N. Bray, A. D. Bates J. M. Land December 1995
3. Fundamentals of Hydraulic Dredging Second Edition, Thomas M. Turner, Published by ASCE Press American Society of Civil Engineers 1801 Alexander Bell Drive Reston, Virginia 20191-4400
4. Hydraulic structures, equipment and water data acquisition systems – vol. ii – Dredging Technology - Rudolf van den Bosch

Grading system: As per the regulation of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Maritime Transportation System

Course Code: NAME 447

Level: Level 4, Term 1/2

Credit Hour: Three (3.0)

Rationale: Optional Theoretical Course based on maritime transportation system and related topics.

Pre-requisite (if any):

Course Synopsis:

The Economic Organization of the Shipping Market, The Shipping Market Cycle, The Shipping Markets, Supply, Demand and Freight rates, Cost, Revenue and Financial Performance, Financing Ships and Shipping Company, The Economic Principles of Maritime Trade, The global pattern of Maritime Trade, Bulk cargo and the economics of bulk shipping, The general cargo and the economics of liner shipping, The economics of ships and ship designs, The regulatory framework of maritime economics, The economics of shipbuilding and scrapping, Maritime forecasting and Market research

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Analyze the working aspects of different types of economic organization of the shipping market;
2. Evaluate the different types of special features of shipping market;
3. Predict the global pattern of maritime trade and freight rate;
4. Perform maritime forecasting and market research;
5. Make decision regarding ship design to fulfill the demand of ship economics;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x		x		x			x			x
LO 2		x				x			x			x
LO 3				x		x			x	x		
LO 4			x			x				x	x	
LO 5												

Text books:

1. Maritime Economics – Martin Stopford
2. Sea Transport - P.M. Alderton,
3. The geography of Transport System – Jean-Paul Rodrigue
4. Maritime Logistics – Dong Wook Song

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Power and Propulsion System

Course Code: NAME 453

Level: Level 4, Term 1/2

Credit Hour: Three (3.0)

Rationale: Optional Theoretical Course based on Power and Propulsion System of ship to be compitant marine engineer as well as naval architect.

Pre-requisite (if any): Marine Engineering I **(NAME 309)** and Theories of Resistance and Propulsion **(NAME 353) Course**

Course Synopsis:

Sources of Propulsion Power: Advances in Diesel Engines for marine applications, Advances in Gas Turbine for marine applications, Fuel cells, Nuclear power, Wind power

Propulsors: Paddle wheel, Types of different propeller (FPP, CPP, Srew propeller etc.), Comparative studies of different propulsors, Ship power and propulsion systems, Special Propulsive devices, Surface piercing, contra rotating and other special propellers

Ship Drive System: Straight drive, Multiple and multistage propulsion drive, Universal drive, Diesel electric drive, Propulsion engine and propeller matching

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Analyze the working aspects of power and propulsion system of a ship;
2. Evaluate the type of ship's drive system and their relevant equipment for marine propulsion;
3. Make decision for suitable types of propeller for different ships;
4. Apply the knowledge in ship propulsion and drive system design;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x					x	x					
LO 2	x					x	x					
LO 3	x					x	x					
LO 4	x					x	x					

Text books:

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

Grading system: As per approved grading scale of MIST

Student Responsibility: Students may register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Ship Performance

Course Code: NAME 463

Level and Term: Level 4, Term 1/2

Credit Hour: Three (3.0)

Rationale: Optional Theoretical course based on ocean engineering concept to comprehend sea effects on the performance of marine vehicles.

Pre-requisite (if any): NAME 253, NAME 403.

Course Synopsis:

Hull roughness: measurement, bottom condition and speed loss, propeller roughness; propeller and hull interaction; various factors for speed loss. Methods of predicting resistance increase due to hull and propeller roughness. Momentum analysis of flow round hull: leading to wave pattern, viscous and induced resistance components; Wave resistance from wave pattern measurements, methods of wave analysis; Measurement of resistance due to surface shear stress and measurement of pressure drag. Maximizing the propulsive efficiency of ships, advances in ship performance, control of the fluid flow around the hull creating resistance, interaction of the hull wake with the propulsor and optimization of the propulsor based on the operational profile of the ship. On-going advances of the International Towing Tank Conference Wake: methods of measurement, detailed wake surveys, mean wake and radial distribution; wake scale effects. Tangential wake components; influence on blade velocity diagram. Influence of tangential wake variations on propeller loading.

Propeller design: Review of theoretical approaches to propeller design including lifting surface approaches, panel methods and blade-element-momentum theories; blade-element-momentum theory; Goldstein correction factors, flow curvature effects and corrections to section design, optimum radial loading; propeller performance at design and the use of computational fluid dynamic based approaches.Wake adapted propellers; Water jet efficiency; Design examples using Cavitation Erosion.Added resistance due to ship motion; wave reflection, wind, yawing and drift; rudder resistance; speed loss of a ship in a seaway.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Understand the manner in which the propulsion power overcomes different components of a ship's resistances
2. Estimate and analyze all the components of resistances
3. Comprehend the effects of hull and propeller roughness on propulsive performance
4. Understand factors affecting the sea keeping and maneuverability of ships in a seaway
5. Demonstrate the speed losses at different sea states and conditions
6. Find out means to cope up with the speed losses at different sea states and conditions

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x									x
LO 2	x	x	x	x	x	x	x					x
LO 3	x	x	x	x	x	x	x					x
LO 4	x	x	x	x	x	x	x					x
LO 5	x	x	x	x	x	x	x		x			x
LO 6	x	x	x	x	x	x	x		x			x

Text books:

1. Ship Performance – C. N. Hughes
2. Ship Performance: Some Technical and Commercial Aspects – C. N. Hughes
3. Ship Design and Performance for Masters and Mates – Bryan Barrass
4. Assessment of Ship Performance in a Seaway – Nordforsk
5. The Maritime Engineering Reference Book: A Guide to Ship Design – Anthony F. Molland

Grading system: As per approved grading scale of MIST

Student Responsibility: Students may register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Marine Safety and Pollution

Course Code: NAME 465

Level and Term: Level 4, Term 1/2

Credit Hour: Three (03)

Rationale: Optional Theoretical Course

Pre-requisite (if any):

Course Synopsis:-

Maritime Organization and Regulatory body and Conventions: IMO and its role, Safety of life at Sea (SOLAS), Law of the Sea (UNCLOS - III), 1982, International Load line Convention (ILLC)
Navigation: Outline of navigation, Navigational aids and aids to navigation.
Safety: Shipping laws and safety rules, Registration and Survey of ships, Marine personnel and collision regulation.
Inland Vessel Safety Rules of Bangladesh: Inland Shipping Ordinance (ISO) of Bangladesh, Lifesaving appliances and firefighting equipment.
Legislations of Marine Pollutions: General concept of marine pollution, types of marine pollution, sources of marine pollution, monitoring of pollution and environmental impact assessment.
Regulation to prevent pollutions: IMO laws and treaties, MARPOL, Hong Kong Ballast Convention, Role of Law of the Sea.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Explain the major laws regarding safety of life at sea & regarding ship design.
2. Recognize different types of navigational aid.
3. Determine the appropriate number of lifesaving appliances fit for various types of vessels.
4. Identify the different types of marine pollutants and ways of monitoring environment pollution

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x					x	x					
LO 2	x					x	x					
LO 3	x					x	x					
LO 4	x					x	x					

Grading system: As per approved grading scale of MIST

Student Responsibility: Students may register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Textbooks:

1. Marine Pollution by R B Clark
2. Marine Pollution by Judith S Weis
3. Prevention of pollution of environment form marine vessel, Saiful Karim

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Control Engineering

Course Code: NAME 477

Level and Term: Level 4, Term 1/2

Credit Hour: Three (3.0)

Rationale: Optional Theoretical course to be chosen by students who like to go for higher study in marine engineering or controls.

Pre-requisite (if any):

Course Synopsis:

Introduction to theory of controls; concepts of mechanical, hydraulic, pneumatic, thermal and electro-mechanical controls; Different modes and methods of control systems and their representation by different equations; Laplace transforms, transfer functions and characteristic functions, stability, Routh's criterion for stability;

Block diagrams and signal flow graphs, physical systems modeling, root locus analysis; Time domain and frequency domain analysis of control systems;

Useful problem and solution of a simple level control, flow control, pressure control and temperature control of a physical system

Analog computer solution of system equations, system response, control action and system types; System compensation, analogues of control system, application of servomechanisms onboard systems for steering, stabilizer etc;

Introduction to digital computerized control and simple control development using software.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

5. demonstrate an understanding of the fundamentals of control systems
6. determine and use models of physical systems to use in the analysis and design of control systems
7. express and solve system equations in state-variable form
8. determine the time and frequency-domain responses of first and second-order systems to step, sinusoidal and ramp inputs
9. determine the stability of a closed-loop control system
10. apply root-locus technique to analyze and design control systems
11. apply concepts to continuous and discrete time systems
12. implement and test dynamic system models and control designs in computer software

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-8	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-8	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x					x	x					
LO 2	x					x	x					
LO 3	x					x	x					
LO 4	x					x	x					
LO 5					x	x			x	x	x	x
LO 6	x					x	x	x				
LO 7	x		x		x	x	x					x
LO 8	x	x		x		x			x			x

Text books:

1. Modern Control Engineering – Ogata, Katsuhiko.
2. Control Engineering: Theory and Practice – Bandyopadhyay, M N
3. Control Engineering – V U Bakshi and U A Bakshi
4. Control Engineering: An Introduction with the Use of MATLAB – Derek Atherton
5. Reed's Marine Engineering Series : Volume 10 : Instrumentation and Control Systems – Jackson, Leslie

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Optimization Methods in Ship Design

Course Code: NAME 481

Level and Term: Level 4 Term 1/2

Credit Hour: 3.0

Rationale: Optical Theoretical Course.

Pre-requisite (if any):

Course Synopsis:

Introduction to linear programming: construction of the LP model, graphical LP solution, slack, surplus and unrestricted variables. The simplex method: standard LP form, the simplex algorithm, the M-method, the two phase method, special cases in simplex method application. Duality and sensitivity analysis: Definition of the dual problem, relationship between the optimal primal and dual solutions, dual simplex method, Integer linear programming: B & B algorithm, cutting plane algorithm, Nonlinear Programming: unconstrained problem, constrained problem: Jacobian method, Lagrangean method, Kuhn-Tucker conditions.

Numerical techniques for unconstrained optimization: The Newton-Raphson method, direct search method, steepest ascent method. Numerical techniques for constrained optimization: sequential linear programming (SLP), sequential quadratic programming (SQP), sequential unconstrained minimization techniques (SUMT)

Modern methods of optimization: Genetic algorithm, simulated annealing, particle swarm optimization, ant colony optimization.

Project scheduling: project development, critical path method, optimum scheduling by critical path method.

Course Objectives:

1. To introduce methods of optimization to engineering students, including linear programming, nonlinear programming, and modern methods of optimization
2. To present numerous applications in different branches of engineering including naval architecture.
3. To maintain a balance between theory, numerical computation, problem setup for solution by optimization software, and applications to engineering systems.
4. To determine the advantages and disadvantages of applying different optimization techniques for a specific problem

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Understand the basic theoretical principles in optimization;
2. Model and formulate optimization problems in standard form and assess the optimality of a solution
3. Construct computer programs to determine the optimal solution for unconstrained and constrained probem
4. Apply the knowledge to a wide range of engineering problems

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x			x							x
LO 2	x	x			x							
LO 3	x	x	x	x								
LO 4	x	x			x				x		x	x

Text books:

1. Hamdy A Taha: Operations Research: An Introduction, Tenth Edition, Prentice Hall of India, 2016.
2. P. Venkataraman: Applied Optimization with MATLAB Programming, John Wiley & Sons, Inc. New York, 2002
3. Singiresu S. Rao: Engineering Optimization: Theory and Practice, Fourth Edition, John Wiley & Sons, Inc. New York, 2009.
4. S. R. Yadav and A. K. Malik: Operations Research, Oxford University Press, 2014.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Theory of Hydrofoils

Course Code: NAME 483

Level and Term: Level 4, Term 1/2

Credit Hour: 3.00

Rationale: Optional Theoretical Course based on in-depth analysis on hydrofoil shapes chosen by student who would like to go for higher studies on Hydrodynamics and CFD.

Pre-requisite (if any):

Course Synopsis:

Introduction to the fundamentals of lifting surfaces related to the selection, design, experimental and numerical modeling, as well as optimization of hydrofoils, propellers, and turbines, 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.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify and explains type of hydrofoils and their characteristic features;
2. Explain existing and modern theories of hydrofoil;
3. Demonstrate how shape of hydrofoils dictates regular and irregular flows past the hydrofoil.
4. Analyze different flow pattern and make comment on it.
5. Develop the ideas how the interaction of lift and drag can improve the efficiency of the propeller, turbine and rudder;

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, class tests, exercise, Assignments and Final Exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x		x							
LO 2	x	x	x	x								x
LO 3	x	x	x	x			x					
LO 4	x	x			x				x		x	x
LO 5	x	x	x	x	x				x			x

Text books:

1. Hydrofoils, Design,Build, Fly – Ray Vellinga
2. Theory of wing section – Abbott and Doenhoff
3. Hydrofoil without formula series – Hook and Karmode
4. Lift and drag of hydrofoils: Application of theory to experimental results – Korvin-Kroukovosky

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Introduction to Offshore Structure

Course Code: NAME 489

Level: Level 4, Term 1/2

Credit Hour: Three (3.0)

Rationale: Optional Theoretical Course based on basic of Offshore Structure.

Pre-requisite (if any):

Course Synopsis:

History of Offshore Structures (used in various countries of the world) Wind, wave & current loads on offshore structures, Types at platform's TLPs, Jackets, Semisubmersibles, Jack-ups, Concrete gravity etc, Floating platform's 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 moods, Calculation of mooring load**,** Suitability of Offshore Structures for Bangladesh

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Analyze the design aspects of offshore structure used worldwide;
2. Evaluate the types and suitability of offshore structure;
3. Compare the characteristics of different types of offshore structure's layout and design;
4. Estimate the values of mooring and required safety;
5. Apply the knowledge in practical offshore structure design and construction;
6. Develop and lead effective teams and design project;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x						
LO 2	x	x	x			x						
LO 3	x	x	x			x			x	x		
LO 4			x	x		x			x		x	
LO 5				x	x	x	x	x	x		x	x
LO 6					x	x	x	x	x	x	x	x

Text books:

1. Eliminator of ocean Engineering. Dr. AshokeBhar
2. Introduction to offshore structures, Design, fabrication, Installation, W.J.Geatt
3. Construction of marine and offshore structure, Ben C Gerwick

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Marine Acoustics

Course Code: NAME 493

Level and Term: Level 4 Term 1/2

Credit Hour: 3.00

Rationale: Optional Theoretical Course with main objective of this course is to provide the ocean engineering student an understanding of how sound propagates through the ocean environment and how to use that information to observe the ocean

Pre-requisite (if any):

Course Synopsis:

Fundamentals: Simple propagation, rays, sources and receivers, radiated sound, bioacoustics, waveguides, scattering by bubbles, interior fluctuations, and rough surfaces
The near surface ocean: upper ocean boundary layer and rain precipitation
Bioacoustics: sensing of plankton and nekton; passive acoustics and marine animals, marine mammals
Ocean Dynamics: tomography, time reversal, turbulence
Ocean Bottom: imaging hydrothermal vents, large scale mapping, mesoscale mapping
Other topics: noise from pile driving, ocean energy devices, etc.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Explain the fundamentals of sound propagation, sound of seismics, ships, wind and rain, bioacoustics;
2. Identify the effects of sound in ocean dynamics, and imaging and mapping the seafloor
3. Develop the skill to formulate the combined forward/inverse problem, from tracing rays
4. Estimate sound levels to solve equations for rainfall or current velocity

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Class Tests, Project Development, Assignments and Final Exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	

LO 1-4	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x		x		x	x					
LO 2	x	x	x	x			x			x		
LO 3	x	x	x	x			x		x	x		
LO 4		x	x	x								

Text books:

1. Sound in the Sea, Medwin, Cambridge University Press, 2005
2. Principles of Sonar Performance Modeling, Ainslie, Springer, 2010
3. Underwater Acoustics: Analysis, Design and Performance of Sonar, Hodges, Wiley, 2010
4. Inverse Problems in Underwater Acoustics, Taroudakis and Makrakis, Springer, 2001
5. Fundamentals of Acoustical Oceanography, Medwin and Clay, Associated Press, 1998
6. Ocean Acoustic Tomography, Munk, Worcester, and Wunsch, Cambridge University Press, 1995

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Shipyard Management

Course Code: NAME 499

Level and Term: Level 4, Term 1/2

Credit Hour: Three (03)

Rationale: Optional Theoretical Course based on management of shipbuilding to handle men, material and time effectively and efficiently.

Pre-requisite (if any):

Course Synopsis:
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.

Learning Outcomes (LO): On successful completion of this Lesson, students should be able to:

1. Compare main affecting factors on the shipbuilding process
2. Develop different phases of the shipbuilding process
3. Apply to the preparation of production plan
4. Perform group working – critical thinking – independence and responsibility
5. Handle crisis and conflicts for optimum utilization of human resource in the yard from the ship design to delivery.
6. Develop the work planning on the basis of man, material and equipment

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-6	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-6	Final Examination	70%	
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Text books:

1. Shipyard Project Management Paperback – August 24, 2017, by Fernando Remolina
2. Workshop process, Practice and Materials by Bruce J. Black
3. Shipboard Accident Response By Eric Murdoch BSc, MSc, C. Eng
4. Fisher Maritime Consulting Group Florham Park, New Jersey, USA
5. Cost Management in Shipbuilding, By Fischer, Jan O.; Holbach, Gerd

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

4.5.3 Engineering Sessional Courses

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Computer Programming Lab

Course Code: NAME 116

Level and Term: Level 1 Term II

Credit Hour: 1.5

Rationale: Compulsory Sessional Course based on Learning how to program with C and C++ language and how to think about the problems, their solutions and translating it to programming language.

Pre-requisite (if any):

Course Synopsis: Introduction, Structured programming language, Introduction to C and C++ Programming Language, Data types, Variable declaration, Program Statements, Operators, Expressions, Problem solving approaches, Basic Input / Output, Control Structure: if else, switch case, Control Structures: loop (different types), nested Loop, Array and its uses, Array Operations, 2D Array, Strings, Function, Recursion, Pointer, File Access, Object Oriented Programming, Introduction to C++(Object Oriented), Class & Object, Application of the programming language in solving ship related problems.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Solve problems with the aid of computer language;
2. Understand the problems at hand and translate the ideas into the computer language.
3. Develop ideas and schemes to solve complicated problems and ways and means to transform the problem into a computer solvable program.
4. Apply computer tools in future problem solving and assignments.
5. Express ideas by solving the same problem in the multiple ways and demonstrate the methods with the least computational cost.

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-5	Lab test/Report Writing/Project Work /Assignment/Presentation		

LO 1-5	Quiz Test		
LO 1-5	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x			x							x
LO 2	x	x			x							
LO 3	x	x	x	x								
LO 4	x	x			x				x		x	x
LO 5	x	x	x		x				x			x

Text books:

1. Teach Yourself C, Herbert Schildt (Latest Ed.).
2. Teach Yourself C++, Herbert Schildt (Latest Ed.).
3. C, The Complete Reference, Herbert Schildt (Latest Ed.).
4. C++, The Complete Reference, Herbert Schildt (Latest Ed.).
5. C++ Computer Language – Robert Lafore (9th Edition)
6. Beginning Programming With C++ For Dummies By Stphen R Davis

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Mechanical Engineering Drawing

Course Code: NAME 150

Level and Term: Level 1 Term I

Credit Hour: 1.5

Rationale: Compulsory Sessional Course

Pre-requisite (if any):

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

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Use common drafting tools to construct engineering drawings.
2. Apply dimensions on engineering drawings.
3. Construct, read, and understand the Title and Revision Block.
4. Justify the need for sectional views and Auxiliary views.
5. Create 2D drawings, construct and Interpret views and sectional views.
6. Build orthographic projections using three view drawings.
7. Create isometric and oblique sketches and identify standard features such as hole, slots.
8. Produce simple assembly drawings and produce freehand sketch.

Teaching-learning and Assessment Strategy: Class lectures, Class works, Class Evaluation, Quizzes, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-8	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-8	Quiz Test		
LO 1-8	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x
LO 7												
LO 8												

Text books:

1. Mechanical Engineering drawing By Dr. Md. Quamrul Islam
2. Textbook of Engineering Drawing By K. Venkata Reddy

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Ship Design and Drawing I

Course Code: NAME 158

Level and Term: Level 1 Term II

Credit Hour: 1.5

Rationale: Compulsory Sessional Course

Pre-requisite (if any):

General Arrangement (GA) plan, Lines Plan Drawing, Bonjean curves, Hydrostatic Calculation, Stability and Cross curves, Trim Calculations.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify & have knowledge of different type of vessels.
2. Perceive concepts regarding specification of ships dimensions and forms.
3. Describe General arrangement (GA) & lines plans.
4. Understand Bonjean curves, Cross curves & Hydrostatic properties.
5. Calculate Hydrostatic properties & trim caused by loading, discharging or moving of weights on board of a ship.
6. Calculate the change in stability caused by loading, discharging or moving of weights on board of a ship

Teaching-learning and Assessment Strategy: Class lectures, Class works, Class Evaluation, Quizzes, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Text books:

1. Reed's Naval Architecture for Marine Engineers, E.A. Stoked, 2003, Thomas Reed Publications.
2. Ship Stability for Masters and Mates, D. R Derrett.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Thermal Engineering Sessional

Course Code: NAME 178

Level: Level 1, Term II

Credit Hour: 1.5

Rationale: Compulsory Sessional Course.

Pre-requisite (if any):

Course Synopsis:

This course provides an introduction to the essential theoretical basis of engineering thermodynamics and its application to a range of problems of relevance to practical engineering. The course aims to equip students with basic tools and methodologies for carrying out thermodynamic analyses of engineering systems.

Key topic areas are: Determination of Flash Point of Liquid Fuel, Study of Sling Psychrometer.Viscosity Test of Liquid Substance. Determination of Carbon Residue of a Given Fuel. Proximate Analysis of Coal.

Study of Different Speed Measuring Devices. Study of a Refrigeration and Air Conditioning Unit. Study and Calibration of pressure Gauge by Dead Weight Tester. Determination of the Calorific Value of Fuel. Determination of Calorific value of Gaseous Fuel by Gas Calorimeter. Concept of pressure and pressure sensor Behavior.

Course Objective:

1. This course objective is to contribute in the following areas of learning: Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
2. Knowledge of contextual factors impacting the engineering discipline.
3. Fluent application of engineering techniques, tools and resources.

Learning Outcomes (LO):

1. Apply understanding of the nature and operating principles of energy flows to systems encountered in engineering
2. Describe and apply basic thermodynamic principles and laws of physics to analyzing and predicting performance of idealized forms of thermodynamic systems
3. Describe and assess benefits of improvements to thermodynamic systems
4. Relate idealized thermodynamic system models to corresponding real systems

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-4	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-4	Quiz Test		
LO 1-4	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x						
LO 2	x	x	x			x						
LO 3	x	x	x			x			x	x		
LO 4			x	x		x			x		x	

Text books:

1. Thermodynamics: An Engineering Approach - Yunus A. Cengel,Michael A. Boles

2. Fundamentals of Engineering Thermodynamics- Michael J. Moran &Howard N. Shapiro.
3. Fundamentals of Thermodynamics – R E Sonntag, C. Borgnakke, G J. Van Wylen.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Workshop Practice (Foundry, Welding and Machine Shop Sessional)

Course Code: SHOP 180

Level: Level 1 Term I

Credit Hour: 1.5

Rationale: Compulsory Sessional Course.

Pre-requisite (if any):

Course Synopsis:

The main objective of the course is to provide students with the theoretical and practical skills needed to develop their future professional activity in the areas of foundry and/or welding, on production management, casting design and product control, areas of safety, speed and feed calculations, layout equipment, cutting tools, and machine tool equipment. Attention is given to the methodologies of casting design, as well as to the techniques of identification, characterization and resolution of product defects. Also introduces and studies the more technical shop operations of threading, tapping, boring, carbide tooling, and principles of metal cutting. Principles of metal cutting include the machining ability of metals and how it relates to chip formation.

Key topic areas are: Foundry: Introduction to foundry, tools and equipment; Patterns: function, pattern making; Molding: molding materials sand preparation, types of mold, procedure; Cores: types, core making materials; Metal melting and casting; Inspection of casting and casting defects.

Welding: Metal joints: riveting, grooving, soldering, welding; Welding practice: electric arc - steel, aluminum; Types of electrode; Welding defects: visual, destructive and non-destructive tests of welding. Gas welding and equipment; Types of flame; Welding of different types of materials; Gas welding defects; Test of gas welding.

Tools: common bench and hand tools, marking and layout tools, measuring tools, cutting tools, machine tools; Bench work on jobs; Practices on machine tools: drilling machine, lathe machine, shaper machine, milling machine, grinding machine

Course Outcome:

1. Provide students with the theoretical and practical skills needed to develop their future professional activity in the areas of foundry and/or welding, on production management
2. Casting design and product control.
3. Acknowledge the safety precautions required to run an abrasive grinding machine
4. Recognize surface grinder types, grinding wheel care, grinding wheels and abrasive products, mount a grinding wheel, true and dress a grinding wheel

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Design simple patterns and pattern plates for the casting process.
2. Specify and select foundry and welding equipment.
3. Identify and establish correcting measures to eliminate casting and welding defects.
4. Select casting and welding processes.
5. Identify the characteristics of an abrasive grinding machine, drilling machine, lathe machine, shaper machine, milling machine

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-5	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-5	Quiz Test		
LO 1-5	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x			x							x
LO 2	x	x			x							
LO 3	x	x	x	x								
LO 4	x	x			x				x		x	x
LO 5	x	x	x		x				x			x

Text books:

1. Manufacturing Technology Volume 1 (Foundry, Forming & Welding) (3rd Edition) PN RAO
2. Machining Fundamentals-John R Walker
3. Principles of Foundry Technology- P. L. Jain.
4. Machine Tool Practices-Richard R Kibbe.
5.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Ship Building Materials Sessional

Course Code: NAME 206

Level and Term: Level 2 Term I

Credit Hour: 0.75

Rationale: Compulsory Sessional Course based on experiments of inspection and composition of materials.

Pre-requisite (if any):

Course Synopsis:

Introduction to Metallographic and Metallographic Sample Specimen Preparation ,Study of Phase Diagrams, Microstudy of steels, Heat treatment of steels-1, Heat treatment of steels-2, Microstudy of cast irons-1, Microstudy of cast irons-2, Composition analysis of different materials by X-ray, Surface crack detection by Magnetic particle test for NDT

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify different kinds of material composition;
2. Discuss about the different phase stage of materials;
3. Relate the theoretical knowledge with the practical experiment;
4. Demonstrate and study of different materials and material composition.
5. Apply different materials in ship construction

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-5	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-5	Quiz Test		
LO 1-5	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x			x							x
LO 2	x	x			x							
LO 3	x	x	x	x								
LO 4	x	x			x				x		x	x
LO 5												

Text books:

1. Introduction of Physical Metallurgy, S.H. Avner, 2nd edition, McGraw-Hill International Editions, Materials Science and Metallurgy Series, 2000.
2. Essentials of Materials Science and Engineering, D.R. Askeland and P.P. Fulay, 2nd edition, Cengage Learning Publishers, Nelson Education Ltd., 2010.
3. Chemistry of Engineering Materials, R.B. Leighou, 1942.
4. Engineering Materials 2: An Introduction to Microstructures, Processing and Design, M.F. Ashby and D.R.H. Jones, 2nd edition, Butterworth-Heinemann publishers ltd., 1998.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Ship Design and Drawing - II

Course Code: NAME 208

Level and Term: Level 2 Term I

Credit Hour: 1.5

Rationale: Compulsory Sessional Course

Pre-requisite (if any):

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

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Explain concepts regarding specification of ships dimensions and forms.
2. Work with modern computer programs (CAD programs)
3. Draw general arrangement (GA), Lines Plan, Mid-ship section drawing, longitudinal construction & shell expansion drawings with the aid of CAD Software.
4. Understand & have knowledge of using Rule Book.
5. Calculate Scantling calculations & Capacity of a ship.

Teaching-learning and Assessment Strategy: Class lectures, Class works, Class Evaluation, Quizzes, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-5	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-5	Quiz Test		
LO 1-5	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						

Text books:

1. Ships & Naval Architecture, R. Munro-Smith, 1973, Institute of Marine Engineers.
2. Basic Ship Theory, K.J. Rawson & E. C. Tupper, Vol. 1 & 2., Longman Group Limited.
3. Rule Book: Lloyd's Register, DNV-GL, NKK

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Fluid Mechanics Sessional

Course Code: NAME 214

Level: Level 2 Term II

Credit Hour: 1.5

Rationale: Compulsory Sessional Course.

Pre-requisite (if any):

Course Synopsis: Determination of the location of the center of pressure for a submerged plane surface, Verification of Bernoulli's Equation, Determination of Center of Gravity, Metacenter and Center of Buoyancy of a Floating Body, Study of flow through an Orifice meter, Study of flow through a Venturi meter, Development of Air flow in pipe apparatus, Calibration of a rectangular and triangular notch, Introduction to Centrifugal pump characteristics.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Solve basic hydrostatics problems involving manometers and submerged surfaces;
2. Describe qualitatively and categorize fluid flow regimes, including laminar vs turbulent flows, boundary layers and velocity profiles, separation and wakes;
3. Understand the concept of continuity and be able to use the continuity equation to calculate the flow rate in a duct using an appropriate velocity profile;
4. Understand physical basis of Bernoulli's equation and apply it in flow measurement and to a variety of problems involving area change and height change;
5. Solve basic problems involving pressure losses through pipes and pipe bends and fittings;
6. Understand the basic operating principle of a Centrifugal pump.

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1												
LO 2												
LO 3												
LO 4												
LO 5												
LO 6												

Text books:

1. A Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines, R.S. Khurmi, 19th Edition, S. Chand & Company Ltd., 2004.
2. Fluid Mechanics: Fundamentals and Applications, Y.A. Cengel and J.M. Cimbala, 1st edition, McGraw Hill Publishers Ltd., 2006.
3. A Textbook of Fluid Mechanics and Hydraulic Machines, R.K. Bansal, 2005.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Computer Aided Design (CAD)

Course Code: NAME 226

Level and Term: Level 2 Term I

Credit Hour: 1.50

Rationale: Compulsory Sessional course which is based on introduction to design softwares.

Pre-requisite (if any):

Course Synopsis:

AutoCAD: 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).

Solid Works: Introduction to solid works. Drawing tools and working in 2-D and 3-D interfaces.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Use the software for 2D and 3D design;
2. Develop the ideas how software inter related to engineering complex design process.
3. Demonstrate the design spiral of complex ship design procedure;
4. Analyze the output from the software and make comment on it;
5. Apply the knowledge about the software in the future research works;

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Exercises, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-5	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-5	Quiz Test		
LO 1-5	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x		x	x							x
LO 2	x	x			x				x			
LO 3	x	x	x	x								x
LO 4	x	x		x	x				x		x	x
LO 5	x	x	x		x				x			x

Text books:

1. 3D CAD with Autodesk 123D: Designing for 3D Printing, Laser Cutting, and Personal Fabrication, Emily Gertz
2. CAD/CAM: Computer-Aided Design and Manufacturing, Mikell Groover

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Mechanics of Structure

Course Code: NAME 202

Level: Level 2 Term II

Credit Hour: 0.75

Rationale: Compulsory Course

Pre-requisite (if any):

Course Synopsis: Tension & Compression, 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.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Make structural design for different materials
2. Apply force systems on structure and to compute geometrical properties
3. Classify materials and characterise them
4. Analyse various structural elements subjected to different types of force systems
5. Design an appropriate machine element using allowable load, required element life, manufacturing considerations
6. Analyse failure and decide on appropriate failure model

Teaching-learning and Assessment Strategy: Class lectures, Class works, Class Evaluation, Quizzes, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x			x							x
LO 2	x	x			x							
LO 3	x	x	x	x								
LO 4	x	x			x				x		x	x
LO 5	x	x	x		x				x			x
LO 6												

Text books:

1. Fundamentals of Machine Design – Andrzej Golenko_
2. Theory of Machine – R.S. Khurmi and J. K. Gupta.
3. Theory of Machine and Mechanisms – Joseph E. Shigley, John Joseph Uicker
4. Standard Handbook of Machine Design – Joseph E. Shigley, Charles R. Mischke, Thomas H.Brown
5. Design of Machine Elements – Sharma, C.S.
6. Theory and Problems of Machine Design –Hall, Holowenco and Laughlin

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Marine Hydrodynamics Sessional

Course Code: NAME 254

Level and Term: Level 2 Term II

Credit Hour: 1.5

Rationale: Compulsory Sessional Course based on theoretical and experimental learning of marine Hydrodynamics.

Pre-requisite (if any):

Course Synopsis:

Determination of the exact section of the one tube, Determination of the flow speed profiles in a tube, Measure error determination using the pitot tube, Determination of ship stability, Cavitation Phenomenon Demonstration, Determination of Impact against a flat, curve and semispherical surface, Study of forced vortex without discharge orifice, Observation of laminar, transition and turbulent flow, Ideal flow around a submerged flow, To demonstrate the phenomenon associated to the flow in an open channel

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify different kinds of flow patterns;
2. Discuss about the different hydrodynamic features;
3. Relate the theoretical knowledge with the practical experiment;
4. Demonstrate the flow past different shapes and structure;

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-4	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-4	Quiz Test		
LO 1-4	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x

Text books:

1. Applied Hydrodynamics, H.R. Valentine, Newnes-Butterworth; Student international edition, 1969.
2. Newman, John N. (1977), Marine Hydrodynamics, The MIT Press, 432 pp., ISBN: 978-0262140263
3. Theoretical Hydrodynamics, Milne-Thomson, 4th edition, 1962.
4. Fluid Mechanics: Fundamentals and Applications, Y.A. Cengel and J.M. Cimbala, 1st edition, McGraw Hill Publishers Ltd., 2006.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Ship Design and Drawing - III

Course Code: NAME 258

Level and Term: Level 2 Term II

Credit Hour: 1.5

Rationale: Compulsory Sessional Course
Pre-requisite (if any):

Course Synopsis: Rudder Design, Steering arrangement, Shafting Design, Propeller drawing and propeller arrangement, Main engine foundation.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Demonstrate methodological knowledge and understanding in ship's rudder, steering shafting and propeller design.
2. Develop critically, independently and creatively make the design of a ship
3. Plan and carry out advanced engineering tasks within given frames using appropriate methods and to evaluate this work;
4. Analyze existing theories, methods and interpretations in the field of marine technologies.
5. Perform with modern computer programs (cad programs)
6. Contribute to new thinking and innovation processes.

Teaching-learning and Assessment Strategy: Class lectures, Class works, Class Evaluation, Quizzes, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x			x							x
LO 2	x	x			x							
LO 3	x	x	x	x								
LO 4	x	x			x				x		x	x
LO 5	x	x	x		x				x			x
LO 6												

Text books:

1. Mechanical Engineering drawing By Dr. Md. Quamrul Islam
2. Textbook of Engineering Drawing By K. Venkata Reddy

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering.

Course Title: Electrical and Electronic Technology for Marine Application.

Course Code: NAME 282

Level and Term: Level 2, Term II

Credit Hour: 1.5

Rationale: A compulsory sessional course based on application of electrical and electronic technology on related equipments in an effective and efficient manner.

Pre-requisite (if any): Electrical and Electronic Technology for Marine Application (EECE 281).

Course Synopsis:

Three phase induction motors: Basic Theory, Principle of operation, Types, construction, Equivalent circuit, Starting, speed control, Maintenance, applications, Single phase induction motors: Basic Theory, Principle of operation, Equivalent circuit, types, starting, Maintenance, applications, AC generators: Basic Theory, Principle of operation, Construction, excitation system, generator on load, voltage regulation, synchronization, Maintenance and applications, Synchronous motor: Principle of operation, Starting, application, maintenance, Diodes, BJTs, diode and BJT circuits. IC, MOSFET and SCR as power switching devices, Controlled rectifiers and inverters, Radar and wireless equipment: Principle, block diagram, different parameters, Maintenance, Navigational and Electronic navigational aids (GPS, Gyro compass. Echo sounder, speed log, LORAN, RDF and Decca Chain), Power generation and distribution (PGT).

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Evaluate the basic principles of electrical machinery fitted on a vessel;
2. Describe and apply working idea about the electrical and electronic equipment fitted on a vessel;
3. Develop the idea about the space requirement for electrical and electronic equipment in a vessel;
4. Identify the basic principles about repair and maintenance of electrical and electronic equipment which will help them to work on board as a marine engineer;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Lab tests, Assignments and Quiz test.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-4	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-4	Quiz Test		
LO 1-4	Viva Voce		
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x

Minimum Attendance: As per the regulation of MIST**.**

Text books:

1. Electric Machinery Fundamentals- Stephen J. Chapman;
2. A Text book of Electrical Technology (V-II) - B.L. Theraja and A. K. Theraja;
3. Electronic Devices & Circuit theory-Robert L. Boylestad.
4. Principles Of Electronics : V.K. Mehta

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Ship Design Project

Course Code: NAME 300

Level and Term: Level 3, Term I & II

Credit Hour: 3.0

Rationale: Compulsory Sessional course which is intended to assist the reality of accepting a design brief from a client/owner, researching the requirements, coming up with the design of a vessel which will meet those requirements, and preparing the documentation (drawings, calculations and specification of outfit items) to describe the vessel so that it may be built. These courses also provide a solid grounding in the overall ship design process.

Pre-requisite (if any):

Course Synopsis:

Design of a particular ship: principal particulars, General Arrangement (GA), Lines plan with offset table, Lightship, deadweight and displacement calculation, freeboard, volume, scantling, Mid-ship section drawing, Profile, Longitudinal Drawing, Deck & Bottom, Shell Expansion Drawings, Detailed LWT & DWT calculation, Resistance & Power Calculation, machinery, endurance, outfit, approximate trim and cross curves, Stability for different loading conditions, power, engine selection, Engine Foundation, Rudder design & Steering Arrangement, Shafting & Propeller Design, Wind heel criteria for different loading conditions.
[Presentation will be made before teachers and students of the department minimum twice in a term]

Learning outcomes (LO): on successful completion of this course, student should be able to:

1. Analyze to decide on a set of principal particulars to meet the requirements of the design brief.
2. Develop a hull form suitable for the operation in maxsurf and translate to a lines plan and a general arrangement drawing in autocad.
3. Assess the stability of the vessel
4. Make decision of selecting engine and propeller
5. Perform the scantlings of the structural elements of the vessel
6. Contribute to new thinking and innovation processes of ship design.

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Exercises, Assignments, quiz and presentation.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6	x	x		x	x							x

Text books:

1. Ship Stability for Master and Mates, Captain D.R Derrett, Butterworth Heineman.
2. Reed's Naval Architecture for Marine Engineers, E.A. Stokoe, 2003, Thomas Reed Publications.
3. Theoretical Naval Architecture, E.L. Attwood & H.S. Pengelly, 1962, Longmans Green & Co. Ltd.
4. Basic Ship Theory, K.J. Rawson & E. C. Tupper, Vol. 1 & 2., Longman Group Limited.
5. Introduction to marine engineering, D.A. Taylor.
6. A Text Book of Thermal engineering, R.S. Khurmi, & J.K. Gupta
7. Ship Stability for Master and Mates, Captain D.R Derrett, Butterworth Heineman.
8. Theoretical Naval Architecture, E.L. Attwood & H.S. Pengelly, 1962, Longmans Green & Co. Ltd.
9. Naval Architecture: Examples and Theory, B. Baxter, Second Impression 1977, Charles Griffin & Company Ltd.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Ship Structure

Course Code: NAME 302

Level and Term: Level 3, Term I

Credit Hour: 0.75

Rationale: Compulsory Sessional Course.

Pre-requisite (if any): Ship Structure Course (NAME 301)

Course Synopsis:-

Introduction to Ship Structure, Calculation of centroid, Moment of Inertia, Section Modulus of various structural member of ship, Longitudinal Strength of Ship Structure, Stresses in the Structure, Calculation of Deflection, Local Strength Problems, Buckling of Structures, Dynamic Effects

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Identify structural elements ships and craft;
2. Explain the application of loads on structural elements;
3. Calculate the stress, strain, displacement, deflection and bending moment;
4. Apply loading and wave effects on ship design;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Lab tests, Assignments and Quiz test.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-4	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-4	Quiz Test		
LO 1-4	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x

Textbooks:

1. Strength of Ship Structures – Muckle
2. Ship Structure - Baxter
3. Ship Structural Analysis and Design by Owen F Huges
4. Buckling of Ship Structure by Shama
5. Design of Ship Hull Structure by Yasuhisa Okumoto
6. Design Principles of Ships and Marine Structures by S C Misra

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Application of ship design software

Course Code: NAME 308

Level: Level 3 Term I

Credit Hour: 1.5

Rationale: Compulsory Sessional Course based on application of computer software in ship designs

Pre-requisite (if any):

Course Synopsis:

AutoCAD: Production of lines plan in 2-D. Transform 2-D lines plan into 3-D lines plan.

Rhinocereos: Introduction about the Rhinocereos software. Use of surface and solids. Use of 3-D lines generated in AutoCAD into Rhinocereos and develop hull surface.

Maxsurf: Introduction about the Maxsurf software. Use of generated hull in Rhinocereos into the Maxsurf and analysis of hydrostatics, stability parameters.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Use the software for 2D and 3D design;
2. Develop the ideas how software inter related to engineering complex design process.
3. Demonstrate the design spiral of complex ship design procedure;
4. Analyze the output from the software and make comment on it;
5. Apply the knowledge about the software in the future research works;

Teaching-learning and Assessment Strategy: Class lectures, Class works, Class Evaluation, Quizzes, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-5	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-5	Quiz Test		
LO 1-5	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						

Text books:

1. Manuals of Maxsurf
2. Manuals of Rhinoceros
3. Manuals of Napa

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Resistance and Propulsion Sessional

Course Code: NAME 354

Level and Term: Level 3, Term I

Credit Hour: 0.75

Rationale: Sessional Course.

Pre-requisite (if any): Theories of Resistance and Propulsion (NAME 353)**.**

Course Synopsis:-

Calculation of: a) Residual Resistance using Taylor's Standard Table.
b) Frictional Resistance using ITTC formulation for smooth hull.
Calculation of wind resistance by IWAI&YAJIMA procedure
Propulsion & powering calculation-1:-
a) Calculation of Total resistance & effective power b) To find 'Speed resistance-effective power ' relationship for a particular shallow water condition c)following solution of problem 3(a) & 3(b)
Draw the Speed-resistance curve; Draw the Speed-effective power curve.

Calculation of: a) Taylor wake fraction, b) Thrust deduction fraction, c) Hull efficiency, d) Relative rotative efficiency
Propulsion & powering calculation-2: Prop. Open water efficiency, Prop. Advance coefficient, Prop. Pitch, Prop. Revolution, Propeller efficiency, Quasi-propulsive efficiency, Shaft power calculation.
To determine the geometry of blade sections for B-series propeller, To calculate wake of a ship.
Resistance & power calculation of high speed planning hull using Savisky's method, Resistance & power calculation of high speed planning hull using Holtrop and Mennen's method, To design screw propeller using circulation theory, Calculation of 2D and 3D extrapolation using ITTC methods, Calculation of cavitation.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Identify the components of ship resistance;
2. Calculate the frictional and residual resistance;
3. Perform 2D and 3D extrapolation using ITTC methods;
4. Identify geometric parameters of a propeller;

5. Calculate cavitation and relevant characteristics;
6. Apply cavitation minimization;

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Lab tests, Assignments and Quiz test.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
	Total	**100%**	

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x		x								x	x
LO 2	x	x								x		x
LO 3	x		x			x						
LO 4	x	x					x			x		x
LO 5	x	x	x			x						
LO 6												

Textbooks:

1. Ship Resistance and Propulsion by Anthony F Molland
2. Basic Ship Propulsion by J P Ghose
3. Marine Propellers and Propulsion by John Carlton

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Marine Engineering Sessional

Course Code: NAME 360

Level and Term: Level 3 Term II

Credit Hour: 1.5

Rationale: Compulsory Course based on study, observation and surveying of different kinds of marine engine and auxiliary components.

Pre-requisite (if any):

Course Synopsis:

From this course we shall learn about the construction (assembling and disassembling), functions and performance test of different engine and its associated components. Course outcome also includes operation and overhauling of studies engines and components through industrial visit at related industries.
Dismantling and assembling of Automotive SI and Diesel engines. Performance test of a high speed engine. Study of automotive transmission system. Study of boiler. Study of Gas turbine engine.

Course Outcome:

To give an overview and idea about all the machineries used in marine vessels and shipbuilding industries. The course will also be comprehended with an industrial visit to a reputed shipyard and shipbuilding industry.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Learn about the different kinds of engines;
2. Discuss about the working principle and construction;
3. Relate the theoretical knowledge with the practical experiment;
4. Demonstrate the workability of the engines and associated parts through industry visit;

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-4	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-4	Quiz Test		
LO 1-4	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x			x							x
LO 2	x	x			x							
LO 3	x	x	x	x								
LO 4	x	x			x				x		x	x

Text books:

1. Marine Auxiliary Machinery- H.D Mc George
2. Marine Auxiliary Machinery and System – M. Khetagurov
3. General Engineering Knowledge for Marine Engineers – L. Jackson and T. D. Morton
4. Marine Auxiliary Machinery – H.D. McGeorge

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Numerical Methods Sessional

Course Code: NAME 364

Level: Level 4, Term 2

Credit Hour: 1.5

Rationale: Compulsory Sessional Course.

Pre-requisite (if any):

Course Synopsis:

Bisection method, Cubic Equation, Interpolation, Non Linear Equation, Numerical Differentiation, Numerical Error Analysis, Quadratic Equation, Numerical Integration, Regression Analysis, Secant Method.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Select appropriate numerical methods to apply to various types of problems in engineering and science considering the mathematical operations involved, accuracy requirements and available computational resources.
2. Demonstrate understanding and implementation of the mathematical concepts and algorithms underlying the numerical methods considered.
3. Implement the knowledge gained in this course in future research endeavors.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-3	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-3	Quiz Test		
LO 1-3	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x						
LO 2	x	x	x			x						
LO 3	x	x	x			x			x	x		

Text books:

1. Introductory Methods of Numerical Analysis, Sastry, S.S., 4th edition, Prentice Hall of India, 2006.
2. Numerical Recipes: The Art of Scientific Computing, Press, W.H., Teukolsky, S.A., Vetterling, W.T., Flannery, B.P., 3rd edition, Cambridge University Press, 2007.
3. Numerical Methods for Engineers, Chapra and Canale.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Thesis

Course Code: NAME 400

Level: Level 4, Term 1/2

Credit Hour: Six (6.0)

Rationale: Compulsory course based on research in the field of engineering and technology.

Pre-requisite (if any):

Course Synopsis:

1. Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process.
2. Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance.
3. Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.
4. Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.
5. Use of tools / techniques for Research and Interpretation of Data
6. Report Writing – Layout of a Research Paper
7. Ethical issues related to publishing, Plagiarism and Self-Plagiarism.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Be aware of the ethical principles of research, ethical challenges and approval processes
2. Describe quantitative, qualitative and mixed methods approaches to research
3. Identify the components of a literature review process
4. Critically analyze published research
5. Judge the reliability and validity of experiments
6. Use parametric and non-parametric hypothesis tests, and write good thesis paper.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1								x	x			x
LO 2		x				x			x			
LO 3				x		x			x	x		
LO 4			x			x					x	
LO 5						x	x	x	x	x		
LO 6								x	x	x	x	x

Text books:

1. Research Methodology – C.R.Kothari
2. Research design: Qualitative, quantitative and mixed methods approaches – Creswell
3. Practical Research: Planning and Design – Leedy

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: B.Sc. in Naval Architecture and Marine Engineering

Course Title: Computer Programming for Ship Design

Course Code: NAME 430

Level: Level 4 Term I

Credit Hour: 1.5

Rationale: Compulsory course which is intended to assist undergraduates in learning the basics of programming in general and programming MATLAB in particular. Only the very basics of programming in MATLAB will be covered, with the goal of having students become comfortable enough to continue learning MATLAB and other programming languages on their own.

Pre-requisite (if any):

Course Synopsis:

The Basics: What is Programming, Command prompt and expressions, Lists, vectors and Matrix, Variables
Root Finding: Newton's Methods, Secant Method, More sub indexing.
Basic Plotting: Basics of Attraction
Vectorization: Complex Numbers, User defined function, Scope
Fractals and Chaos: Logistic Equation, Loops, terminating loops prematurely, truth statement and logical indexing.
Debugging with MATLAB.

Learning Outcomes (LO): On successful completion of this course, student should be able to:

1. Learn MATLAB from a programming viewpoint to a mathematical one;
2. Develop ideas by thinking about mathematical problems and then prodded into learning MATLAB for the purpose of solving the problem at hand
3. Apply computer tools in future problem solving and assignments.
4. Develop skills to use MATLAB in their own work, and be prepared to deepen their MATLAB programming skills and tackle other languages for computing, such as Java, C++ or Python.
5. Determine and formulate the solution of the problem based MATLAB knowledge with keeping the computational cost to a minimum.

Teaching-learning and Assessment Strategy: Class lectures, Class Evaluation, Quizzes, Project Development, Exercises, Assignments and Final quiz.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-5	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-5	Quiz Test		
LO 1-5	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x		x	x							x
LO 2	x	x			x				x			
LO 3	x	x	x	x								x
LO 4	x	x		x	x				x		x	x
LO 5	x	x	x		x				x			x

Text books:

1. Introduction to MATLAB- Ross L. Spencer
2. MATLAB: An Introduction with Applications by Amos Gilat
3. Basics of MATLAB and Beyond by Andrew Knight
4. A Guide to MATLAB for Beginners and Experienced Users by Brian R. Hunt, Ronald L. Lipsman

Grading system: As per approved grading scale of MIST

Student Responsibility: Students need to register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program: Bachelor of Science in Naval Architecture and Marine Engineering
Course Title: Industrial Training
Course Code: NAME 450
Level: Level 4, Term 1
Credit Hour: 1.5
Rationale: Compulsory sessional course based on practical industrial attachment.
Pre-requisite (if any):
Course Synopsis:

1. Attachment with shipyard /dockyard to practically see the design development of a ship, construction procedures/methods, phases of production, docking and undocking, machinery and automation required for ship construction etc.
2. Attachment with marine work shops/institutes to see their practical work pattern and procedures.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Be aware of the people involved in design, construction and repair of ships.
2. Identify required skills for shipbuilding industries.
3. Use management tools to handle different categories of work forces.
4. Manage the crisis and resolve the conflicts amongst subordinates.
5. Carry out construction and repair works for a ship.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-5	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-5	Quiz Test		
LO 1-5	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1								x	x			x
LO 2		x				x			x			
LO 3				x		x			x	x		
LO 4			x			x					x	
LO 5						x	x	x	x	x		

Text books:

1. Dockyard Manual
2. Technology of ship repair – Benkovsky, Galver

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Marine Engineering Sessional II

Course Code: NAME 460

Level: Level 4, Term 2

Credit Hour: 0.75

Rationale: Compulsory Sessional Course.

Pre-requisite (if any):

Course Synopsis:

1. Preparation of technical specification and corresponding designing a propulsion system for a specific vessel.
2. Preparation of technical specification and selection of an air compressor for sand blasting purpose in a ship yard.
3. Preparation of technical specification and selection of a CNC machine to be used in a ship yard.
4. Preparation of technical specification and selection of pump to be used in a dry dock for floating and submerging purpose.
5. Preparation of technical specification and selection of an air conditioning unit for a specific vessel.
6. Preparation of technical specification and selection of a refrigeration unit to be used for storage purpose in a specific vessel.
7. Preparation of technical specification, selection and design of steering system of a specific vessel.
8. Preparation of technical specification, selection and design of storage unit of a fishing vessel.
9. Preparation of technical specification and selection of diesel generator unit to be used for specific vessel.
10. Preparation of technical specification and selection of engine analyzer unit to be used for specific vessel.
11. Preparation of comparative statement.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Prepare technical specification of various marine machineries.
2. Design different auxiliary systems of marine vehicles.
3. Calculate the requirements for selection of various marine auxiliary systems.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-3	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-3	Quiz Test		
LO 1-3	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x	x			x						
LO 2	x	x	x			x						
LO 3	x	x	x			x			x	x		
LO 4			x	x		x			x		x	
LO 5				x	x	x	x	x	x		x	x

Text books:

1. Marine Auxiliary Machinery- H.D Mc George
2. Marine Auxiliary Machinery and System – M. Khetagurov
3. General Engineering Knowledge for Marine Engineers – L. Jackson and T. D. Morton
4. Marine Auxiliary Machinery – H.D. McGeorge
5. Marine Auxiliary Machinery – D.W. Smith
6. Marine Auxiliary Machinery & System – M. Khetagurov
7. Introduction to Naval Engineering – E. F. Gritzen
8. Introduction to Marine Engineering – D. A. Taylor
9. Principles of Naval Engineering – M. A. Carr

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Science Theory Courses

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Engineering Chemistry

Course Code: Chem 121

Level: Level 1, Term 1

Credit Hour: Three (3.0)

Rationale: Compulsory course to provide understanding chemistry for onward learning of engineering materials.

Pre-requisite (if any):

Course Synopsis:

Inorganic Chemistry:
Importance of Chemistry for Engineers and its application in industries, Modern concept of Atomic Structure, Different atom models, Quantum numbers, Electronic configuration (in s, p, d, and f notation), Advanced concepts of chemical bonds and molecular structure, Crystal structures, Modern periodic table, Chemistry of Transition metals, Properties and uses of noble gases, Acids and Bases.

Organic Chemistry:
Selected topics on organic chemistry, Introduction to organic polymer, Basic concepts of dyes color and constitution.

Physical Chemistry:
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.
General metallurgical operations, Concentration of metal ore, Roasting, Calcinations, Smelting, refining of metals, Extraction of Iron, Aluminium and Copper.
Introduction, Importance, Classification and uses of alloys with examples.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Identify internal energy levels and its effects due to different atomic structure and chemical bonding.
2. Apply the periodic table to define properties of engineering chemicals.
3. Develop methods to produce various chemicals, metals or alloys for industrial use.
4. Substitute metals with conducting polymers or other non-metallic products.
5. Apply the means for protection of different metals from corrosion.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-5	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-5	Final Examination	70%	
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x							x			x
LO 2		x				x			x			
LO 3				x		x			x	x		
LO 4			x			x					x	
LO 5						x			x	x		

Text books:

1. A text book of Engineering Chemistry – by N.Krishna Murthy N.Y.S.Murthy Dr.V.Anuradha.
2. A text book of Engineering chemistry –II by D.Srinivasulu, Srivastava, Roliverma.
3. A text book of Engineering chemistry by JAIN & JAIN.
4. A text book of Engineering chemistry by C.P.Murthy, C.V.Agarwal. Andra Naidu.

Grading system: As per approved grading scale of MIST

Student Responsibility: Students must register the course at the beginning of the semester and attend the classes from day one. They need to collect course materials from the teaching faculty member and appear the classes prepared from the previous class. They must submit assignments on time.

Prepared By	Supervised By	Checked By	Approved By

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Structure of Matter, Electricity & Magnetism and Modern Physics
Course Code:	Phy- 121
Level:	Level -1, Term-I
Credit Hour:	3.0
Rationale:	Basic Physics Course
Pre-requisite (if any):	None
Course Synopsis:	This course is planned to extend the basic physics in the field of materials structure, Electricity and modern physics. The different laws, explanation of laws and derivation regarding the course will be introduced. Applications of different laws will be studied. **Structure of Matter** Crystalline and non-crystalline solids, crystal systems& crystal structure, Co-ordination number, Crystal plane and direction, 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) and its applications, Capacitors and capacitance, Capacitors with dielectrics, Dielectrics-an atomic view, current & resistance, Ohm's Law, atomic view of Ohm's law, Faradays Law of electromagnetic induction, Lenz's Law, Self-induction, Mutual induction, Magnetic properties of matter, Hysteresis curve. **Modern Physics** Michelson-Morley's experiment, Galilean& Lorentz transformation, Special theory of relativity and its consequences, Photo-electric effect, Compton effect, de Broglie mater wave, Bohr's atomic model, classification of nucleus, nuclear transformation/Radioactive decay, , Nuclear reactions, Fission, Fusion, Chain reaction, Nuclear reactor
Course Learning Outcomes (CLO):	After completing this course students will be able to (Structure of Matter) 1. **Define** the different parameter regarding crystal structure and crystal system, crystal defects, XRD. 2. **Explain and classify** the crystal structure and crystal system of materials, crystal defects. 3. **Apply** Bragg's law to evaluate crystal structure of materials. (Electricity & Magnetism) 4. **State** the different laws regarding electricity such as Coulomb's law, Gauss's law. Ampere's law, Faraday's law etc.

	5. **Describe** the techniques of applying the different laws regarding electricity such as Coulomb's law, Gauss's law, Ampere's law, Faraday's law etc. 6. **Calculate** the charge, electric field, potential, resistance, capacitance, dielectric, current, inductance, magnetic field related to engineering study. 7. **Distinguish** materials according to magnetic and electric properties of materials. (Modern Physics) 8. **Recognize** the different phenomena regarding modern physics such as photoelectric effect, Compton effect, matter wave, atomic model, radioactive decay, fusion, fission etc. 9. **Explain** different theory regarding modern physics such as special theory of relativity, Compton theory etc. 10. **Solve** analytical problems regarding different phenomena observed in the field of modern physics. 11. **Categorize** different nuclei, nuclear transformation, nuclear reaction etc.
Teaching-learning and Assessment Strategy:	Lecture, Class Performance, Homework, Assignment, Class test, Final examination
Linkage of LO with Assessment Methods & their Weights:	

LO	Assessment Method	%
	Class Assessment	
1-11	Class Participation and Observation	05
1-11	Class Attendance	05
1-11	Home Work / Class test / Assignment / Case Study/Presentation/	20
1-11	Final Exam	70
	Total	**100**

Minimum Attendance:	75% class attendance is mandatory for a student in order to appear at the final examination.

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓	✓										
CLO 2	✓	✓	✓									
CLO 3	✓	✓	✓									
CLO 4	✓	✓										
CLO 5	✓	✓	✓									
CLO 6	✓	✓	✓									

CLO 7	✓	✓										
CLO 8	✓	✓										
CLO 9	✓	✓	✓									
CLO 10	✓	✓	✓									
CLO 11	✓	✓										

Text/Ref books:	1. Introduction to solid State Physics by C. Kittle. 2. Fundamental of Physics by Resnick, Halliday& Walker 3. Concept of Modern Physics by Arthur Beiser 4. Lecture Series: Physics for Engineers by M. Z. Ahsan
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • Be regular in classes and bring a separate note every class. • Submit assignment/home work on time. • Practice group study for doing assignment but not copy from other. • Aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Waves and Oscillations, Geometrical optics and Wave mechanics
Course Code:	Phy- 123
Level:	Level -1, Term- II
Credit Hour:	3.0
Rationale:	Basic Physics Course
Pre-requisite (if any):	None
Course Synopsis:	This course is planned to extend the basic physics in the field of Waves and Oscillations, Geometric optics and Wave mechanics. The different laws, explanation of laws and derivation regarding the course will be introduced. Applications of different laws will be studied. **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 and compound 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. **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 and time independent Schrodinger equation, Schrodinger equation for one-electron atom and its solution, potential barrier and Tunnel effect.
Course Learning Outcomes (CLO):	After completing this course students will be able to (Waves and Oscillations) 1. **Define** the different parameter regarding Waves and Oscillations such as periodic motion, simple harmonic motion, damped and undamped oscillations. 2. **Explain** the wave motion for different systems along with energy. 3. **Solve** problems regarding wave motion for different systems to

<table>
<tr><td></td><td>engineering study.

(Geometrical optics)
4. Identify the different parameters regarding geometrical optics such as different lenses and instrument etc.
5. Describe the techniques to derive different formula for lenses and optical instrument.
6. Calculate problems regarding different optical systems related to engineering study.
7. Distinguish different defects of optical systems.

(Wave mechanics)
8. Recognize the different statistics regarding Wave mechanics such as classical and quantum statistics etc.
9. Explain different theory regarding Wave mechanics such as Maxwell statistics, Fermi-Dirac statistics, Bose-Einstein statistics, Schrodinger wave theory etc.
10. Solve analytical problems regarding Wave mechanics related to engineering study.</td></tr>
<tr><td>Teaching-learning and Assessment Strategy:</td><td>Lecture, Class Performance, Homework, Assignment, Class test, Final examination</td></tr>
<tr><td>Linkage of LO with Assessment Methods & their Weights:</td><td>
<table>
<tr><th>LO</th><th>Assessment Method</th><th>%</th></tr>
<tr><td></td><td colspan="2">Class Assessment</td></tr>
<tr><td>1-10</td><td>Class Participation and Observation</td><td>05</td></tr>
<tr><td>1-10</td><td>Class Attendance</td><td>05</td></tr>
<tr><td>1-10</td><td>Home Work / Class test / Assignment / Case Study/Presentation/</td><td>20</td></tr>
<tr><td>1-10</td><td>Final Exam</td><td></td></tr>
<tr><td></td><td>Total</td><td>100</td></tr>
</table>
</td></tr>
<tr><td>Minimum Attendance:</td><td>75% class attendance is mandatory for a student in order to appear at the final examination.</td></tr>
</table>

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓	✓										
CLO 2	✓	✓	✓									
CLO 3	✓	✓	✓									
CLO 4	✓	✓										
CLO 5	✓	✓	✓									

CLO 6	✓	✓	✓									
CLO 7	✓	✓										
CLO 8	✓	✓										
CLO 9	✓	✓	✓									
CLO 10	✓	✓	✓									

Text/Ref books:	1. Waves & Oscillationby Brijlal and Subramanyam. 2. A text book of Optics by Brijlal and Subramanyam 3. Physics for Engineers-I&IIby DrGaisUddin 4. Lecture Series: Physics for Engineers by M. Z. Ahsan
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • Be regular in classes and bring a separate note every class. • Submit assignment/home work on time. • Practice group study for doing assignment but not copy from other. • Aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Differential Calculus and Integral Calculus
Course Code:	Math - 151
Level:	Level 1, Term I
Credit Hour:	3.0
Rationale:	Basic Mathematics Course
Pre-requisite (if any):	None
Course Synopsis:	This course is intended to develop skills in differential and integral calculus. As well, it is intended to illustrate various applications of calculus to technical problems. The rules of differentiation will be introduced, and methods of differentiating various algebraic and transcendental functions will be developed. Applications of differential calculus to finding roots of equations, to finding maxima and minima, and to developing power series representation for functions will be studied. Methods of algebraic integration will also be introduced, with both definite and indefinite integrals being determined for a variety of functions. Various applications of integration will be studied including length, area, volume, average value etc . **Differential Calculus**: Introduction to Differential Calculus, Limit, continuity and differentiability, successive differentiation of various types of functions, Leibnitz's theorem, Rolle's theorem, Mean value theorem, expansion in finite and infinite forms, Lagrange's form of remainder, Cauchy's form of remainder, indeterminate form, Partial differentiation, Euler's theorem, tangent and normal, sub tangent and subnormal in Cartesian and polar coordinates, maxima and minima of functions of single variables, curvature, asymptotes. **Integral Calculus**: Introduction to integral calculus. Methods of integration: integration by the method of substitution, integration by parts, standard integrals, integration by the method of successive reduction. Definite integrals: Evaluation of definite integrals, properties of definite integral and its use, summing series, Walli's formula, improper integrals, Beta function and Gamma function, double integral and multiple integral with its application. Application of integration: length of curves, area under a plane curve, area of the region enclosed by two curves, volume of solid of revolution.
Course Learning Outcomes (CLO):	After completing this course students will be able to (Diff. Cal) 1. **Define** the limit, continuity and differentiability of functions 2. **Identify** the rate of change of a function with respect to independent variables. (Int. Cal) 3. **Describe** the techniques of evaluating indefinite and definite integrals. 4. **Calculate** the length, area, volume, center of gravity and average

	value related to engineering study.
Teaching-learning and Assessment Strategy:	Lecture, Class Performance, Homework, Assignment, Class test, Final examination
Linkage of LO with Assessment Methods & their Weights:	

LO	Assessment Method	%
	Class Assessment	
1-4	Class Participation and Observation	05
1-4	Class Attendance	05
1-4	Home Work / Class test / Assignment / Case Study/Presentation/	20
1-4	Final Exam	
	Total	**100**

Minimum Attendance:	75% class attendance is mandatory for a student in order to appear at the final examination.

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓	✓										
CLO 2	✓	✓										
CLO 3	✓	✓										
CLO 4	✓	✓										

Text books:	1. Calculus, by Haward Anton, Stephen Davis 2. Differential and Integral Calculus by Matin Chakraborty 3. A Text Book on Integral Calculus, Mohammad, Bhattacharjee & Latif
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • be regular in classes and bring a separate khata at every class. • submit assignment/home work on time. • practice group study for doing assignment but not copy from other. • aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Ordinary and Partial Differential Equations
Course Code:	Math - 153
Level:	Level 1, Term II
Credit Hour:	3.0
Rationale:	Basic Mathematics Course
Pre-requisite (if any):	Calculus, Math-151
Course Synopsis:	This course is designed to develop skills of the learners in the field of differential equations. Differential equations of various types and their solution procedures are discussed here. The ordinary differential equations of first order and first degree, higher order first degree are elaborately discussed with their applications in engineering fields. Solution procedures and applications of higher order differential equations of variable coefficients is a part of this syllabus. 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 are discussed along with their various solution procedures. **Ordinary Differential Equations:** Degree and order of ordinary differential equation, formation of differential equation, solutions of first order differential equations by various methods, solution of general linear equations of second and higher orders with constant co-efficient, solutions of homogeneous linear equations of higher order, solution of Euler's linear homogeneous equation, solution of differential equation by the methods based on factorization of the operator. **Partial Differential Equations:** 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.
Course Learning Outcomes (CLO):	After completing this course students will be able to (ODE) 1. identify differential equations of various types 2. solve different types of differential equations (PDE) 3. analyze the classifications of partial differential equations. 4. apply the boundary value problems in Naval Architect and Marine Engineering fields.
Teaching-learning and Assessment Strategy:	Lecture, Class Performance, Homework, Assignment, Class test, Final examination

Linkage of LO with Assessment Methods & their Weights:	**LO**	**Assessment Method**	**%**
		Class Assessment	
	1-4	Class Participation and Observation	05
	1-4	Class Attendance	05
	1-4	Home Work / Class test / Assignment / Case Study/Presentation/	20
	1-4	Final Exam	
		Total	**100**
Minimum Attendance:	75% class attendance is mandatory for a student in order to appear at the final examination.		

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓	✓										
CLO 2	✓	✓										
CLO 3	✓	✓										
CLO 4	✓	✓										

Text books:	1. Ordinary and Partial Differential Equations by M.D. RAISINGHANIA 2. Differential Equations by Shepley L. Ross 3. Differential Equations by Glen R. Hall
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must • be regular in classes and bring a separate lecture note for each course. • submit assignment/home work on time. • practice group study for doing assignment but not copy from other. • aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By
Maj Md. Amirul Islam	Wg Cdr Md. Nurul Huda		

Military Institute of Science and Technology

Department of Science and Humanities

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Vector Analysis and Co-ordinate Geometry
Course Code:	Math – 251
Level:	Level 2, Term I
Credit Hour:	3.0
Rationale:	Basic Mathematics Course
Pre-requisite (if any):	Math – 151 (Diff & Int Calculus)
Course Synopsis:	This course is intended to develop skills in vector analysis and coordinate geometry. As well, it is intended to illustrate various applications of vector and geometry to technical problems. The rules of vector differentiation and integration will be introduced, and calculation of length, volume and area of objects related to engineering study by using vector are taught. Moreover, the concept of coordinate geometry is upgraded. The problems of the pair of straight lines, circles, system of circles, parabola, ellipse etc. are solved. The aim of this course is to prepare the students to apply vector and geometry effectively in their engineering study. **Vector Analysis:** Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Scalar and vector product of two vectors and their geometrical interpretation: Triple products and multiple products; Linear dependence and independence of vectors. Differentiation and integration of vectors along with elementary applications; vector geometry; Definition of line, surface and volume integrals; Gradient, divergence and curl of point functions, Green's theorem, Gauss's theorem, Stoke's theorem and their applications. **Co-ordinate Geometry:** Introduction to geometry, transformation of coordinates, pair of straight lines; general equation of second degree and reduction to it's standard forms and find the properties; circles (tangents, normal, chord of contact, pole and polar); system of circles (radical axes, coaxial circles, limiting points); equation of conies, parabola, ellipse (conjugate diameters) and hyperbola.
Course Learning Outcomes (CLO):	After completing this course students will be able to (Vector) 1. Explain differentiation and integration of vector valued functions in cartesian, cylindrical and spherical geometry. 2. Calculate length, volume and area of objects related to engineering study by using vector. (Geometry) 3. Solve the problems of the pair of straight lines, circles, system of circles, parabola, ellipse etc. 4. Apply the knowledge of geometry in engineering study.

Teaching-learning and Assessment Strategy:	Lecture, Class Performance, Homework, Assignment, Class test, Final examination
Linkage of LO with Assessment Methods & their Weights:	
Minimum Attendance:	75% class attendance is mandatory for a student in order to appear at the final examination.

LO	Assessment Method	%
	Class Assessment	
1-4	Class Participation and Observation	05
1-4	Class Attendance	05
1-4	Home Work / Class test / Assignment / Case Study/Presentation/	20
1-4	Final Exam	
	Total	**100**

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓	✓										
CLO 2	✓	✓										
CLO 3	✓	✓	✓									
CLO 4	✓	✓										

Text books:	1. Vector Analysis, 2nd Edition, Schaum's outlines, Seymour Lipschutz, Dennis Spellman and Murray R. Spiegel. 2. Elementary Linear algebra, 10th Edition, Wiely, Howard Anton and Chris Rorres. 3. A Text Book on Co-ordinate Geometry with Vector Analysis, Rahman & Bhattacharjee. 4. A Textbook of Coordinate Geometry for JEE Main & Advanced, S. K. Goyal.
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must be regular in classes and bring a separate khata at every class, submit assignment/home work on time and practice group study for doing assignment but not copy from other.

Prepared By	Supervised By	Checked By	Approved By

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Statistics, Laplace transform and Matrices
Course Code:	Math - 253
Level:	Level 2, Term II
Credit Hour:	3.0
Rationale:	Advance Mathematics Course
Pre-requisite (if any):	Math 151, Math 261, and Math 261
Course Synopsis:	This course is designed to develop skills in Statistics, Laplace transform and Matrices.The main purpose of this subject is to introduce the integral transform, matrix algebra and some basic concepts of statistics. **Statistics:** Intention of this course is to make understand the concept of a frequency distribution, mean, median, mode and other measures of central tendency, standard deviation and other measures of dispersion. Also it is emphasis the principles of probability and the concept of probability distributionsas well as their characteristics. Elementary sampling theory, estimation, hypothesis testing and regression analysis are helping to understand the engineering statistics. **Laplace Trans form:**The Laplace transform is a powerful tool for understanding differential equations of various practical problems such as heat equation, wave equation, mechanics, electric circuits and so on. This part of the course are included the Laplace transform and inverse transform of different functions which goals to solve n-th order linear differential equations with coefficients with having initial conditions. These two transformscan be used to solve integral equationsinvolving step functions, discontinuous forcing functions, and impulse functions. **Matrices: T**his course would help in developing understanding on Matrix Algebra. It starts with a lecture on Introduction to matrices to build(brush) up fundamentals and then progresses towards discussing intermediate levels topics including Algebra of matrix, Transpose and Determinants of a matrix, Adjoint and Inverse of matrix.Throughout the course, emphasis is on learning Matrix Algebra using practice problems. Practical applications of theoretical concepts is of paramount importance too. There is a section dedicated in applying Matrix Algebra constructs for solving system of linear equations.
Learning Outcomes (LO):	After completing this course students will be able to. **Statistics** 1. Describe the concept of a frequency distribution and probability distributions for sample data, and be able to summaries the distribution by diagrams and statistics, 2. Explain the binomial, Poisson, normal and log-normal probability distributions 3. Distinguishthe sample preparation error within a geo-statistical sampling context. **Laplace Transform and Matrices** 4. State the definition and prove the existence of the Laplace transform. 5. Solve differential equation using Laplace transform.

<table>
<tr><td></td><td><u>Matrix</u>
6. Solvethe system of linear equation using matrix method.
7. Determine eigenvalues and eigenvectors; diganonability;
8. Apply theory of eigenvalues to Caley-Hamilton theorem.</td></tr>
<tr><td>Teaching-learning and Assessment Strategy:</td><td>Lecture, Class Performance, Homework, Assignment, Class test, Final examination</td></tr>
<tr><td>Linkage of LO with Assessment Methods & their Weights:</td><td>
<table>
<tr><th>LO</th><th>Assessment Method</th><th>%</th></tr>
<tr><td></td><td colspan="2">Class Assessment</td></tr>
<tr><td>1-8</td><td>Class Participation and Observation</td><td>05</td></tr>
<tr><td>1-8</td><td>Class Attendance</td><td>05</td></tr>
<tr><td>1-8</td><td>Home Work / Class test / Assignment / Case Study/Presentation/</td><td>20</td></tr>
<tr><td>1-8</td><td colspan="2">Final Exam</td></tr>
<tr><td></td><td>Total</td><td>100</td></tr>
</table>
</td></tr>
<tr><td>Minimum Attendance:</td><td>75% class attendance is mandatory for a student in order to appear at the final examination.</td></tr>
<tr><td>Course Content</td><td><u>Statistics</u>: 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.

<u>Laplace Transforms</u>: Definition of Laplace transforms, Elementary transformation and properties, Convolution, Solution of differential equation by Laplace transforms, evaluation of integrals by Laplace transforms.

<u>Matrices</u>: 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.</td></tr>
</table>

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	√	√										
LO 2	√	√										
LO 3	√	√										
LO 4	√	√										
LO 5	√	√										
LO 6	√	√										
LO 7	√	√										
LO 8	√	√										

Text books:	1. Elementary Linear Algebra, 10th Edition,by Haward Anton. 2. Schaum's Outlines: Laplace Transforms,1st Edition; by Murray R. Spiegel. 3. Schaum's Outline of Probability and Statistics, 4th Edition; By John J. Schiller Jr,John J. Schiller Jr and Murray R. Spiegel.
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • be regular in classes and bring a separate lecture note every class. • submit assignment/home work on time. • practice group study for doing assignment but not copy from other. • aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Science and Humanities

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Fourier Analysis, Harmonic Function and Complex Variables
Course Code:	Math - 351
Level:	Level 3, Term II
Credit Hour:	4.0
Rationale:	Mathematics Course
Pre-requisite (if any):	Differential Equations, Math-153
Course Synopsis:	This course is intended to develop skills of the learners in expansion of different types of functions. Also, it will help the learner to analysis the functions. Harmonic property is a special property for functions and it is briefly discussed here. There is a brief discussion on harmonic conjugate in this content. The limit, continuity, differentiability and analyticity are the basic properties of complex functions. In this course, these properties are elaborately discussed. The integration techniques of complex functions through line integral, Cauchy's integral theorems and Cauchy's residue theorem are explained here. Various types of singularities are illustrated here. The expansions of complex functions in Taylor and Laurent series are discussed in his course. **Fourier analysis:** Real and complex form, Finite transform, Fourier integral, Fourier transforms and their uses in solving boundary value problems. **Harmonic Function:** Definition of harmonic functions, 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.
Course Learning Outcomes (CLO):	After completing this course students will be able to (Fourier Analysis and Harmonic Functions) 1. Recognize periodic functions with various periods, 2. Classify and expand different types of functions in fourier series and analyze them, (Complex Variables) **3.** Apply the concept of limit, continuity, differentiability and analyticity of complex functions**,** 4. Categorize and integrate the complex functions by line integrals Cauchy's integral formulae and Cauchy's residue theorem.
Teaching-learning and	Lecture, Class Performance, Homework, Assignment, Class test, Final examination

Assessment Strategy:			
Linkage of LO with Assessment Methods & their Weights:	**LO**	**Assessment Method**	**%**
		Class Assessment	
	1-4	Class Participation and Observation	05
	1-4	Class Attendance	05
	1-4	Home Work / Class test / Assignment / Case Study/Presentation/	20
	1-4	Final Exam	
		Total	**100**
Minimum Attendance:	75% class attendance is mandatory for a student in order to appear at the final examination.		

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓	✓										
CLO 2	✓	✓										
CLO 3	✓	✓										
CLO 4	✓	✓										

Text books:	1. Fourier Analysis With Applications to Boundary Value Problems by Murray R. Spiegel, Schaum's Outline Series 2. Complex Variables by Murray R. Spiegel, Schaum's Outline Series 3. Harmonic Function Theory by Sheldon Axler
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must be regular in classes and bring a separate khata at every class, submit assignment/home work on time and practice group study for doing assignment but not copy from other.

Prepared By	Supervised By	Checked By	Approved By

4.5.4 Science Sessional Courses

Military Institute of Science and Technology

Department of Science and Humanities

<table>
<tr><td>Program:</td><td>Bachelor of Science in Naval Architecture and Marine Engineering</td></tr>
<tr><td>Course Title:</td><td>Engineering Chemistry Sessional</td></tr>
<tr><td>Course Code:</td><td>Chem- 122</td></tr>
<tr><td>Level:</td><td>Level 1, Term I</td></tr>
<tr><td>Credit Hour:</td><td>1.5</td></tr>
<tr><td>Rationale:</td><td>Basic, Qualitative and Quantitative Inorganic Chemistrybased on Chem 121</td></tr>
<tr><td>Pre-requisite (if any):</td><td>None</td></tr>
<tr><td>Course Synopsis:</td><td>This course is planned to extend the basic experimental inorganic chemistry in the field of acid and base neutralization, complexometric titration, iodometric titration, redox titration etc. The quantitative analyses focus the estimation of copper (Cu), ferrous (Fe), calcium (Ca), zinc (Zn) and hardness of water from different samples.</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>After completing this course students will be able to:
1. Define the different parameters regarding acid and base neutralization, titration and quantitative analysis of metals etc. and others key words like primary standard substances, secondary standard substances, molarity, normality, indicator, equivalent weights and so on.
2. Explain the different phenomena regarding Iodimetric and Iodometric method, Complexometric Titration etc.
3. Experiment different phenomena regarding acid and base neutralization, determination and estimation of Zinc, Ferrous content etc. by using various titrimetric methods.
4. Analyze the results of different experiment regarding acid and base neutralization, determination of Zinc, Ferrous content etc by using various titrimetric methods.
5. Find true results with errors of different experiment in basic Inorganic chemistry.
6. Write a report of any project work and apply in real life.</td></tr>
<tr><td>Teaching-learning and Assessment Strategy:</td><td>Lecture, Class Performance, Teamwork, Report writing, Quiz test, Viva Voce, Final examination</td></tr>
<tr><td>Linkage of LO with Assessment Methods & their Weights:</td><td>
<table>
<tr><th>Learning Outcome</th><th>Assessment Methods</th><th>Weightage</th><th>Remarks</th></tr>
<tr><td>LO 1</td><td>Class participation and observation</td><td></td><td></td></tr>
<tr><td></td><td>Attendance</td><td></td><td></td></tr>
<tr><td>LO 1-6</td><td>Lab test/Report Writing/Project Work /Assignment/Presentation</td><td></td><td></td></tr>
</table>
</td></tr>
</table>

	LO 1-6	Quiz Test		
	LO 1-6	Viva Voce		
		Total	**100%**	
Minimum Attendance:	75% class attendance is mandatory for a student in order to appear at the final examination.			

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓	✓										
CLO 2	✓	✓	✓									
CLO 3	✓	✓	✓									
CLO 4	✓	✓										
CLO 5	✓	✓	✓									
CLO 6	✓	✓	✓									

Text books:	1. Quantitative Chemical Analysis by Vogel's. 2. Analytical Chemistry by Gary D. Christian. 3. Analytical Chemistry: Theory and Practice by R.M. Verma
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • Be regular in classes and bring a separate note every class. • Submit daily experiment report on time. • Do experiment in group but not copy from other. • Aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By

Military Institute of Science and Technology

Department of Science and Humanities

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Physics Sessional
Course Code:	Phy- 124
Level:	Level 1, Term II
Credit Hour:	1.5
Rationale:	Basic Physics Course based on Phy-121 and Phy-123
Pre-requisite (if any):	None
Course Synopsis:	This course is planned to extend the basic physics experimental course in the field of Waves and Oscillations, optics Mechanics, electricity and Heat etc. The different basic experiment, explanation regarding the coursewill be introduced. Applications of different laws will be studied.
Course Learning Outcomes (CLO):	After completing this course students will be able to 1. **Define** the different parameters regarding Waves and Oscillations, optics Mechanics, electricity and Heat etc. 2. **Explain** the different phenomena regarding Waves and Oscillations, optics Mechanics, electricity and Heat etc. 3. **Experiment** different phenomena regarding Waves and Oscillations, optics Mechanics, electricity and Heat etc 4. **Analyze** theresults of different experiment regarding Waves and Oscillations, optics Mechanics, electricity and Heat etc 5. **Find errors**of different experiment regarding Waves and Oscillations, optics Mechanics, electricity and Heat etc 6. **Write** a report of any project work.
Teaching-learning and Assessment Strategy:	Lecture, Class Performance, Teamwork, Report writing, Quiz test, Viva Voce, Final examination

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
		100%	

Minimum Attendance:	75% class attendance is mandatory for a student in order to appear at the final examination.		
Course Content	Different experiments related to course Phy-121 and Phy-123		

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓	✓										
CLO 2	✓	✓	✓									
CLO 3	✓	✓	✓									
CLO 4	✓	✓										
CLO 5	✓	✓	✓									
CLO 6	✓	✓	✓									

Text books:	1. Practical Physics by DrGiasuddin and Md. Sahabuddin. 2. B.Sc. Practical Physicsby C. L Arora 3. Practical Physicsby S.L. Gupta and V. Kumar
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • Be regular in classes and bring a separate note every class. • Submitdaily experiment report on time. • Do experiment in group but not copy from other. • Aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By

4.5.5 Humanities Theory Courses

Military Institute of Science and Technology

Department of Naval Architecture and Marine Engineering

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	English (Theory)
Course Code:	HUM - 131
Level:	Level 1, Term I
Credit Hour:	3.0
Rationale:	Basic English Language Course (Compulsory)
Pre-requisite (if any):	None
Course Synopsis:	**General Discussion:** Definition and Function of language, Various Approaches to Learning English. **Grammatical Problems:** Construction of Sentences, Grammatical Errors, Sentence Variety and Style, Conditionals, Vocabulary and Diction. **Reading Skill:** Discussing Readability, Scan and Skim Reading, Generating Ideas Through Purposive Reading, Reading of Selected Stories. **Writing Skill:** Principles of Effective Writing; Organization, Planning and Development of Writing; Composition, Précis Writing, Amplification. **General Strategies for The Writing Process:** Generating Ideas, Identifying Audiences and Purposes, Constructing Arguments, Stating Problems, Drafting and Finalizing. **Approaches to Communication:** Communication Today, Business Communication, Different Types of Business Communication. **Listening Skill:** The Phonemic Systems and Correct English Pronunciation. **Speaking Skill:** Practicing Dialogue; Story Telling; Effective Oral Presentation. **Report Writing:** Defining a Report, Classification of Reports, Structure of a Report, Writing Report on Different Topics.
Course Learning Outcomes (CLO):	Upon completion of the course, the students will be able to: 1. **Organize** themselves within the shortest possible time to present their ideas and opinions, 2. **Understand** and speak English quickly and smartly using the technics learnt in the class 3. **Apply** the technics to find out the main points of any long article within a very limited time as well as know the technics of any effective writing. In short with consistent practice they

<table>
<tr><td></td><td>will be able to overcome language barrier.</td></tr>
<tr><td>Teaching-learning and Assessment Strategy:</td><td>Lecture, Class Performance, Homework, Assignment, Class test, Presentation, Final examination</td></tr>
<tr><td>Linkage of LO with Assessment Methods & their Weights:</td><td>
<table>
<tr><td>Learning Outcome</td><td>Assessment Methods</td><td>Weightage</td><td>Remarks</td></tr>
<tr><td>LO 1</td><td>Class participation and observation</td><td>5%</td><td></td></tr>
<tr><td></td><td>Attendance</td><td>5%</td><td></td></tr>
<tr><td>LO 1-3</td><td>Home Work/Class test/Assignment/Case study /Presentation</td><td>20%</td><td></td></tr>
<tr><td>LO 1-3</td><td>Final Examination</td><td>70%</td><td></td></tr>
<tr><td colspan="2">Total</td><td>100%</td><td></td></tr>
<tr><td colspan="2"></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Minimum Attendance:</td><td>75% class attendance is mandatory for a student in order to appear at the final examination.</td></tr>
<tr><td>Course Content</td><td>LANGUAGE</td></tr>
<tr><td></td><td>Introduction to Language
Definition & Function</td></tr>
<tr><td></td><td>Methodologies/Approaches of English Teaching-Learning Process
All of the approaches will be shown with merits and demerits</td></tr>
<tr><td></td><td>Introduction to Phonetics
English Vowels and consonant sounds. Phonemes and their classifications</td></tr>
<tr><td></td><td>GRAMMAR</td></tr>
<tr><td></td><td>Types of Sentences:
According to mood, clause, structure, and use of verbs
Conditionals
Emphatic
*All these types of sentences will be shown with examples.</td></tr>
<tr><td></td><td>Introduction to Tense
broad classifications and subdivisions
Use of present, Past & Future tense</td></tr>
<tr><td></td><td>Use of Main Verbs:
• Missing main verb
• Verbs that require an infinitive in the complement
• Verbs that require an –ing form in the complement
• Verb phrases that require an –ing form in the complement
• Problems with subject – verb agreement</td></tr>
<tr><td></td><td>Auxiliaries, Modals & Semi modals</td></tr>
<tr><td></td><td>Causatives: Make, Get, Have, Let, Help – usage and wrong usage</td></tr>
<tr><td></td><td>Conditionals:
Zero, first, second and third conditions</td></tr>
</table>

	Active / Passive Sentences: Structure / formation of active and passive sentences
	Forming Questions: WH, Yes / No & Tag Questions
	Problems with **Adverbs** and Adverb related structures
	Adjectives: Determiners, comparatives and other adjectives
	Conjunction: Use of and, or, but, …. and correlative conjunctions
	Prepositions: Place, time, addition, exception, replacement, example, condition and unexpected results, cause, purpose, means
	READING
	Skimming, and Scanning Technics of skimming, scanning and generating ideas through purpose reading How to increase analytical ability
	Reading Comprehension
	Selected short Stories: Meeting in the Mosque (A selected part from A Passage to India by E M Forster) : Critical Analysis
	The Old Man & the Sea by Earnest Hemingway (An abridged form) : Critical Analysis
	WRITING
	Writing Strategies: Principles of effective & creative writing Paragraph Writing, Analytical / Creative writing
	Technics of writing Précis and Amplifications
	GENERAL CORRESPONDENCE & COMMUNICATION/TECH WRITING
	Introduction to General Correspondence • Purpose and Principles • How to write formal letters: format and elements of structure
	Formal Communication: Simple official letters Formal & informal emails
	Report Writing: Purpose, classification & elements of structure.

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1									✓			✓
CLO 2										✓		✓
CLO 3		✓							✓	✓		✓

Reference books:	1. Introduction to Linguistics – Prof Dr. Maniruzzaman. 2. A Guide to Correct Speech – S M Amanullah 3. Oxford Advanced Learners' Dictionary 4. English Grammar in Use – Raymond & Murphy 5. Prose of Our Time by Ahsanul Hoque, Serajul Islam Chowdhury and M Shamsuddoha. 6. From Paragraph to Essay - Maurice Imhoof and Herman Hudson 7. Headway Series – Advanced Level (2 parts with CDs): Oxford University Press Ltd.
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • be regular in classes and bring a separate khata at every class. • submit assignment/home work on time. • practice group study for doing assignment and presentation but not copy from other. • aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By
Asst Prof Selin Yasmin English Division Dept of Sc & Hum	Head English Division Dept of Sc & Hum	Head Dept of Sc & Hum	Dean Faculty of Sc & Hum

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Economics and Sociology
Course Code:	HUM - 223
Level:	Level 2, Term II
Credit Hour:	3.0
Rationale:	To develop an understanding of a range of theoreticaland practical techniques used in accounting (Compulsory)
Pre-requisite (if any):	None
Course Synopsis:	**Economics:** Basic economic principles, economic activities of production, distribution, exchange, and consumption at both the micro and macro level. Besides developing an understanding of the functioning of a free market system. Microeconomices: 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) **Sociology:** Concept of Sociology, Sociological Imagination, Sociology and Social sciences, sociology and common sense, Major Theoretical perspectives, Sociological approach, Culture, cultural universals, ethnocentrism, cultural relativism, Cultural variation, subculture, counter culture, cultural shock, Role of language, Norms and values, Role of Socialization, Agents of Socialization, Organizations, Sociological perspectives on media, Social control, Deviance, Crime. Government and the economy, Capitalism, Socialism, Informal Economy, Types of Government, Monarchy, Oligarchy, Dictatorship, Democracy, Modern technology and Social change. Industrial revolution, Globalization, Population and society, oriental and occidental societies , Human migration, Urbanization and Urbanism, Environment and social change, co-operative and socialist movements, rural sociology.

Course Learning Outcomes (CLO):	Upon completion of the course, the students will be able to: 1. To gain an understanding of core economic principles and how they apply to a wide range of real-world issues. 2. To master the theoretical and applied tools necessary to critique and create economic research. 3. To learn how to articulate pragmatic, principles-based policies to enhance economic well-being and promote social justice. 4. To become familiar with salient developments in the world economy, in both present-day and historical contexts.
Teaching-learning and Assessment Strategy:	Lecture, Class Performance, Homework, Assignment, Class test, Final examination

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation	5%	
	Attendance	5%	
LO 1-4	Home Work/Class test/Assignment/Case study /Presentation	20%	
LO 1-4	Final Examination	70%	
	Total	**100%**	

Minimum Attendance:	75% class attendance is mandatory for a student in order to appear at the final examination.

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓											
CLO 2		✓	✓									
CLO 3				✓	✓	✓						
CLO 4							✓	✓	✓	✓	✓	

Reference books:	1. Economics by Samuelson. 2. Economics by John Sloman 3. Economics Development by Michael Todaro

	4. Money and Banking by Dudly g Luckett Banking (Bangla Version)-MonoranjanDey. 5. Banking (Bangla Version)-Zahirul Islam Shikde. 6. An introduction to Sociology- Ritchard T Schaefer
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • be regular in classes and bring a separate khata at every class. • submit assignment/home work on time. • practice group study for doing assignment and presentation but not copy from other. • aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By
Asst Prof Masud Jahan Accounting Division Dept of Sc & Hum	Head Accounting Division Dept of Sc & Hum	Head Dept of Sc & Hum	Dean Faculty of Sc & Hum

Program:	Bachelor of Science in Naval Architecture and Marine Engineering
Course Title:	Principles of Accounting (Theory)
Course Code:	HUM - 413
Level:	Level 4, Term I
Credit Hour:	2.0
Rationale:	To develop an understanding of a range of theoretical and practical techniques used in accounting (Compulsory)
Pre-requisite (if any):	None
Course Synopsis:	Definition of Accounting, users of accounting information, accounting concepts and principles, accounting equation, measuring and recording of business transactions, adjusting entries, completing the accounting cycle, classified financial statements, depreciation, inventories, managerial accounting basics, cost behavior, cost volume-profit and its analysis and budgeting. **Overview of the course:** Explain what is accounting, identify the users and uses of accounting, and explain the conceptual framework of accounting assumption, principles and constraints in accounting. **Accounting in action:** Basic accounting equation and the meaning of assets, liabilities, and owners' equity, analyzing business transactions and its effects on basic accounting equation, understanding the four financial statements etc. **The recording process:** What is an account, define debits and credits, identify the basic steps in accounting process, journal and its recording process, ledger and its recording process, preparation of trial balance etc. **Adjusting the accounts:** Explain the time period assumption, explain accrual basis of accounting, adjusting entries, adjusting entries for prepayments and accruals, purpose of adjusted trial balances. Review for mid-term exam. **Completion of the accounting cycle:** Preparing a work sheet, processing of closing the books, describe the content and purpose of post-closing trial balance, the required steps in accounting cycle, correcting entries, reversing entries, classified balance sheet. **Inventories and concept of depreciation:** Steps in determining inventory quantities, inventory cost flow methods, financial statements and tax effects of inventory cost flow methods; concept of depreciation, depreciation by using different methods. **Accounting information systems** Basic concepts of accounting information systems; special journals sales journal, cash receipts journal, purchase journal, cash payment journal and effects of special journals on the general journal; subsidiary ledger. **Managerial Accounting Basics**: Distinguishing features of Managerial Accounting, functions of management, defining classes of manufacturing costs, product & period cost.

<table>
<tr><td></td><td>Cost concepts and classification: Three classes of manufacturing costs, difference between merchandising & manufacturing Income Statement & Balance Sheet, determining cost of goods manufactured, cost Terms & Concept, Cost behavior, Cost driver & cost estimation etc.
Cost behavior and CVP analysis: Cost behavior and its pattern; types of variable and fixed costs; contribution margin ratio; application of CVP concepts; break-even analysis; target profit analysis; the margin of safety; operating leverage.
Variable costing: Absorption costing and variable costing; income comparison of absorption costing and variable costing; effect of changes in production on net income</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>Upon completion of the course, the students will be able to:

1. understand the use and users of accounting information;
2. analyze, record and process financial data to produce accounting information;
3. prepare financial statements for merchandising concern as well as for service concern;
4. identify the areas where management accounting can play an important decision making role;
5. apply management accounting techniques in planning, control and decision making situations.</td></tr>
<tr><td>Teaching-learning and Assessment Strategy:</td><td>Lecture, Class Performance, Homework, Assignment, Class test, Final examination</td></tr>
<tr><td>Linkage of LO with Assessment Methods & their Weights:</td><td>
<table>
<tr><td>Learning Outcome</td><td>Assessment Methods</td><td>Weightage</td><td>Remarks</td></tr>
<tr><td>LO 1</td><td>Class participation and observation</td><td>5%</td><td></td></tr>
<tr><td></td><td>Attendance</td><td>5%</td><td></td></tr>
<tr><td>LO 1-5</td><td>Home Work/Class test/Assignment/Case study /Presentation</td><td>20%</td><td></td></tr>
<tr><td>LO 1-5</td><td>Final Examination</td><td>70%</td><td></td></tr>
<tr><td></td><td>Total</td><td>100%</td><td></td></tr>
</table>
</td></tr>
<tr><td>Minimum Attendance:</td><td>75% class attendance is mandatory for a student in order to appear at the final examination.</td></tr>
</table>

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1	✓											
CLO 2			✓									
CLO 3				✓	✓					✓		
CLO 4								✓	✓			
CLO 5										✓	✓	

Reference books:	Required text: "Principles of Accounting", Jerry J. Weygandt, Doland E. Keiso, Paul de Kimmel; 12th Edition; Wiley & Sons, Inc. Reference text: 1. "Managerial Accounting", Ray H. Garrison, Eric W. Noreen & Peter C. Brewer, Twelfth edition, McGraw-Hill Irwin. 2. "Fundamental of Accounting Principles", K.D. Larson & P.D. Miller, Sixth Edition, Irwin 3. Financial Accounting; Roger H. Hermanson, James D. Edwards & L.G. Rayburn; Third Edition; Business Publishing Inc.
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • be regular in classes and bring a separate khata at every class. • submit assignment/home work on time. • practice group study for doing assignment and presentation but not copy from other. • aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Approved By
Asst Prof Masud Jahan Accounting Division Dept of Sc & Hum	Head Accounting Division Dept of Sc & Hum	Head Dept of Sc & Hum	Dean Faculty of Sc & Hum

4.5.6 Humanities Sessional Courses

Military Institute of Science and Technology

Department of Science and Humanities

<table>
<tr><td>Program:</td><td>Bachelor of Science in Naval Architecture and Marine Engineering</td></tr>
<tr><td>Course Title:</td><td>English (Sessional)</td></tr>
<tr><td>Course Code:</td><td>HUM - 132</td></tr>
<tr><td>Level:</td><td>Level 1, Term I</td></tr>
<tr><td>Credit Hour:</td><td>.75</td></tr>
<tr><td>Rationale:</td><td>English Sessional Course (Compulsory)</td></tr>
<tr><td>Pre-requisite (if any):</td><td>None</td></tr>
<tr><td>Course Learning Outcomes (CLO):</td><td>Upon completion of the course, the students will be able to:

1. Organize themselves within the shortest possible time to present their ideas and opinions,
2. Understand and speak english quickly and smartly using the technics learnt in the class
3. Apply the technics to find out the main points of any long article within a very limited time as well as know the technics of any effective writing. Students will be able to prepare report on any issue and present it in front of others. They will be able to speak fluently on any topic. In short with consistent practice they will be able to overcome language barrier.</td></tr>
<tr><td>Teaching-learning and Assessment Strategy:</td><td>Lecture, Class Performance, Assignment, Group Work, Group/Individual Presentation, Debate/Public Speaking</td></tr>
<tr><td>Linkage of LO with Assessment Methods & their Weights:</td><td>
<table>
<tr><th>LO</th><th>Assessment Method</th><th>%</th></tr>
<tr><td></td><td colspan="2">Formative Assessment</td></tr>
<tr><td>1-3</td><td>Class Participation</td><td>05</td></tr>
<tr><td>1-3</td><td>Class Assessment</td><td>05</td></tr>
<tr><td>1-3</td><td>HW / Assignment / Presentation</td><td>20</td></tr>
<tr><td>1-3</td><td>Testing Listening Skill</td><td>10</td></tr>
<tr><td>1-3</td><td>Testing Speaking Skill</td><td>30</td></tr>
<tr><td>1-3</td><td>Testing Reading Skill</td><td>15</td></tr>
<tr><td>1-3</td><td>Testing Writing Skill</td><td>15</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Minimum Attendance:</td><td>75% class attendance is mandatory for a student in order to appear at the final examination.</td></tr>
</table>

Course Content	Language, Phonetics, Difference between different accents, Self-Introduction, Situational talks / dialogues, Speaking, Describing picture/any situation/any incident/event, Group discussion, Brain storming, Facing any problem, Individual/Group presentation, Skimming, Scanning & Analytical Ability, Reading, Listening and understanding, Speaking, Public speaking, Academic writing
	Introducing basic skills of language. Primary and secondary skills
	English Vowel and consonant sounds
	British and American accents
	How a speaker should introduce himself to any stranger / unknown person / a crowd. Name, family background, education, experience, any special quality/interest, likings/disliking, etc.
	Talking in peers / in a group on some given situations/ Story telling
	IELTS speaking - Part 1 Asking about a person's home, work, studies, and other familiar social topics
	Describing any incident they witnessed, describe any picture shown by the teacher
	Taking participation in any discussion and drawing conclusion and giving recommendation
	Principles of brain storming. How to think logically.
	Trying to find out possible solutions, drawing conclusion and giving recommendation
	Good presentation skills: How to be ready for presentation, prepare script for good speech, preparing power point slides, etc.
	Technics of skimming, scanning and generating ideas through purpose reading. How to increase analytical ability.

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes (Appendix-1)											
	1	2	3	4	5	6	7	8	9	10	11	12
CLO 1									✓			✓
CLO 2										✓		✓
CLO 3		✓							✓	✓		✓

Recommended books:	1. Introduction to Linguistics – Prof Dr. Maniruzzaman. 2. A Guide to Correct Speech – S M Amanullah 3. Oxford Advanced Learners' Dictionary 4. English Grammar in Use – Raymond & Murphy 5. From Paragraph to Essay - Maurice Imhoof and Herman Hudson

	6. Headway Series – Advanced Level (2 parts with CDs): Oxford University Press Ltd. 7. IELTS and TOEFL practice book – Cambridge University Press
Grading system:	As per the approved grading scale of MIST
Student Responsibility:	Students must … • be regular in classes and bring a separate khata at every class. • submit assignment/home work on time. • practice group study for doing assignment and presentation but not copy from other. • aware of CLO and try to achieve it.

Prepared By	Supervised By	Checked By	Appıoved
Asst Prof Selin Yasmin English Division Dept of Sc & Hum	Head English Division Dept of Sc & Hum	Head Dept of Sc & Hum	Dean Faculty of Sc & Hum

Program: Bachelor of Science in Naval Architecture and Marine Engineering

Course Title: Bangladesh Studies for Naval Architect

Course Code: NAME 490

Level: Level 4, Term 2

Credit Hour: 0.75

Rationale: Compulsory sessional course to provide understanding on the national issues of motherland to be patriotic citizen of Bangladesh.

Pre-requisite (if any):

Course Synopsis:

Political history of Bangladesh: ancient period, Muslim period, British period, Pakistan period; emergence of Bangladesh: proclamation of independence, liberation war, nation-building in the new state; Bangladesh politics: the ideals, philosophy and amendments of Bangladesh constitution, Socio-economic aspects of pre-independent and post liberation era, comprehensive idea about the history, culture and heritage of Bangladesh, challenges and potentials of Bangladesh in shaping its peaceful and sustainable future..

Administrative procedures in Bangladesh, relevant issues of the past and the present; economy, society, politics, diplomacy and foreign policy of Bangladesh.

Roles and contribution of Bangladesh in the regional and international bodies.

Learning Outcomes (LO): On successful completion of this unit, students should be able to:

1. Communicate about own national prides wherever possible.
2. Explain the historical and socio-economic aspects of Bangladesh.
3. Adhere with the customs and traditions of Bangladesh.
4. Identify issues of prospect and means to augment them.
5. Identify issues of national challenges and ways to overcome.
6. Contribute nation building programs.

Teaching-learning and Assessment Strategy: Class lectures, Case studies, Industry evaluation, Class tests, Assignments and Final exam.

Linkage of LO with Assessment Methods & their Weights:

Learning Outcome	Assessment Methods	Weightage	Remarks
LO 1	Class participation and observation		
	Attendance		
LO 1-6	Lab test/Report Writing/Project Work /Assignment/Presentation		
LO 1-6	Quiz Test		
LO 1-6	Viva Voce		
	Total	**100%**	

Minimum Attendance: As per the regulation of MIST

Mapping of Course LO and Program Outcomes (PO):

Learning Outcomes (LOs) of this course	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
LO 1	x	x							x			x
LO 2		x				x			x			
LO 3				x		x			x	x		
LO 4			x			x					x	
LO 5						x			x	x		
LO 6								x	x	x	x	x

Text books:

1. Bangladesh Studies – Shamsul Kabir Khan
2. Habits of Highly Effective People – Stephen R Covey
3. India Wins Freedom – Maulana Abul Kalam Azad
4. The History of Bengal – Charles Stewart
5. A History of Bangladesh – Willem van Schendel
6. History of Bangladesh: A Sub-continental Civilisation – Abul Maal A. Muhith
7. Bangla bhasha o oitihasik bhasha andolan – Mohammad Matiur Rahman
8. Breakup of Pakistan : Background & Prospects of Bangladesh – Kabir Uddin Ahmed
9. Bangladesh: Quest for Freedom and Justice – Kamal Hossain

Prepared By	Supervised By	Checked By	Approved By

TABLE OF CONTENT