MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY (MIST)

SYLLABUS
FOR THE DEGREE
B. Sc. IN NAVAL ARCHITECTURE & MARINE ENGINEERING

Department of Naval Architecture & Marine Engineering

AUGUST – 2012

Applicable for NAME- 02, Session: 2013-14

CHAPTER 1

GENERAL INFORMATION

1.1 Introduction

The necessity of establishing a technical institute for the 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 know how, 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 well 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 civil Engineering. Bachelor degree on Computer Science Engineering course started on January 2001**.** Bachelor courses on Electrical, Electronic & Communication Engineering and Mechanical Engineering started its journey on 08 February 2003. Bachelor of Science program on Aeronautical Engineering (AE) has started from Feb 2009. Master of Science on Civil Engineering is expected to commence from Oct 2012 and Bachelor of Science program on Naval Architecture & marine Engineering (NAME) is expected to start from 2012 -2013 session.

1.2 Aim

The aim of MIST is to conduct undergraduate courses in various disciplines of Engineering for four academic years according to syllabi leading to Bachelor of Science in Engineering (B. Sc Engineering) degree to be conferred by the Bangladesh University of Professionals (BUP) for officers of the armed forces and civil students from home and abroad.

1.3 Objectives

The objectives of MIST are:

- To offer the following courses a view to meeting the increasing demand in the Armed Forces as well as in the country:
    - Four-year bachelor's courses in Civil Engineering (CE), Computer Science and Engineering (CSE), Electrical, Electronic and Communication Engineering (EECE), Mechanical Engineering (ME), Aeronautical Engineering(AE) and Naval Architecture and Marine Engineering (NAME).

- Two-year master's course in different discipline of Engineering.

- To produce skilled, well disciplined, self-motivated and dedicated engineers and professionals.

- To make provisions for research and development and dissemination of knowledge in appropriate fields of science and technology.

1.4 Location

MIST is located at Mirpur Cantonment, northwest edge of the greater Dhaka city, a hub of knowledge for the armed forces. Mirpur Cantonment is a small, calm and quiet education village and free from all possible pollution of a city life. A garland like lake with migratory birds, three sides with extended green fields in the summer and water bodies in the rainy season, whistling birds on the tree branches and overall bounty of nature adds to the already existing splendid academic atmosphere. Other neighboring academic institutions are Bangladesh University of Professionals (BUP), National Defense College (NDC) and Defense Services Command and staff College (DSCSC) – three international standard education centers.

1.5 Eligibility of Students for Admission in MIST

The students must fulfill the following requirements:

- **Bangladeshi Students**

Minimum qualifications to take part in the admission test are as follows:

- Applicants must have passed SSC and HSC (or equivalent) examination both in Science group with minimum GPA of 4.00 in a 5-point scale.

- In HSC (or equivalent) examination, out of four subjects (Mathematics, Physics, Chemistry and English) the applicant must have obtained minimum grade 'A' in any two subjects and 'A–'(A minus) grade in rest two (Two) subjects.

- Candidates who have passed HSC or equivalent exam in the year or one year before the notification for admission can apply. Candidates with more than one year break of study will not eligible to apply.

- Candidates with GCE 'O' Level/ equivalent background must have to qualify minimum five (05) subjects including Mathematics, Physics, Chemistry and English with minimum 'B' grade in average.

- Candidates with GCE 'A' Level/ equivalent background must have to qualify minimum three (03) subjects including Mathematics, Physics and Chemistry with minimum 'B' grades separately.

- Sex category - Male and Female.

- **Foreign Students**

  Maximum 3% of overall vacancies available (6% of civil seats) will be kept reserved for the foreign students and will be offered to foreign countries through Armed Forces Division (AFD) of the Government of the People's Republic of Bangladesh. The candidates must fulfill the following requirements:

  - Educational qualifications like Bangladeshi Students/equivalent.
  - Sex – Male and Female
  - Must have security clearance from respective Embassy/High Commission in Bangladesh.

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

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	80
b.	Physics	60
c.	Chemistry	40
d.	English	20
	Total =	**200**

1.6.2 Final Selection

Students will be selected on the basis of results of the written admission test, GPA of SSC/equivalent examination without 4th subject and GPA of HSC/equivalent examination without 4th subject. Accumulated result will be evaluated according to the weight age of written admission test result -75%, GPA of SSC/equivalent examination without 4th subject-10% and GPA of HSC/equivalent examination without 4th subject.-15%. Individual choice for selection of departments will be given preference as far as possible. Incase 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 Degree Engineering 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.

- Students (Military and Civil) failing in three or more courses/subjects in any level comprising of two regular terms will be allowed to repeat the level once but have to complete the course within six years of registration. For a Military student, repeating a level will be subjected to the approval of the respective Service Headquarters.
- 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 wks.
- Re-examination, after short term, will be conducted at the institution before commencement of the next level.
- 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.
- No student will be allowed to appear more than twice in the re-examinations on a particular course/subject in the whole undergraduate course.
- Students in all levels will be allowed to appear in the re-examination on two courses/subjects including the backlog one.
- Students repeating a level will be granted exemption for those subjects in which they earned ‘B+’ or better grade in the previous academic year.
- Students will be promoted to the second term of each level, irrespective of their results in the first term of the level.
- 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.

- 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.

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

1.7.2 Withdrawal on Disciplinary Ground

1.7.2.1.1 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 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:

- Communication with fellow students for obtaining help in the examination.
- Copying from another student's script/report/paper.
- Copying from desk or palm of a hand or from other incrimination documents.
- Possession of any incriminating document whether used or not.

1.7.2.2 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.

1.7.2.3 Other Indiscipline Behavior

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.

1.7.2.3 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 permanent withdrawal. A student, if he/she applies, may be allowed to withdraw temporarily from the program, subject to the approval of Academic Council of MIST, but he/she has to complete the whole program within 06 (six) academic years from the date of his/her registration.

CHAPTER 2

THE DEPARTMENT OF NAVAL ARCHITECTURE & MARINE ENGINEERING

2.1 Introduction

Naval Architecture & Marine Engineering plays a vital role in all fields of modern shipbuilding activities. It has established itself as one of the most important branches of engineering. The technical aspects of this branch of engineering are often categorized by terms like shipbuilding, ship production, marine engineering, marine vehicles design etc. The Naval Architecture & Marine Engineering under graduate programme provide excellent technical background for persons who want to work in the field of fluid mechanics, ship building, marine engineering, other disciplines. In addition to lectures and practical session in the classroom, the under graduate programme also include on-site shipyard practices and shipyard visits. The new generation of Naval Architect is encouraged to undertake research and development activities in the above areas and this department is committed to the study and analysis of fundamental as well as applied problems. Problems of military and national importance have consequently received great emphasis in the activities of this department.

In addition to the above, in the future, there will be opportunities for postgraduate studies and research leading to a higher degrees i.e. M. Sc. (Engg), M. Engg, and Ph.D. There are financial assistance program for the poor and meritorious students too.

2.2 Laboratory Facilities of the Department

The department endeavors to provide its faculty members and students adequate laboratory, library and other facilities, departmental undergraduate courses are laboratory intensive and these requirements are catered for by following laboratories:

(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

Students in Level - 1 (fresher) and Level - 2 (sophomore) have to undertake laboratory courses (sessionals) 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.

CHAPTER 3

RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAM

3.1 Number of Terms in a Year (Level)

There will be two regular terms (Term I and Term II) in an academic year. Those who will not be able to clear all the subjects, will require to appear in the re-examination after a short term of about 6 weeks and fulfilling the other conditions as per examination policy.

3.2 Duration of Terms

The duration of each of Term will be as follows:

Events	Durations			
	Academic	Others	Total	
Classes	7 weeks			
Mid Term vacation		1 week		
Classes (7 weeks min), Makeup and Preparatory leave	7 weeks + 2 weeks			
Term Final Examination	2 weeks			
Term End Vacation		2 weeks		May change
Total	18 weeks	3 weeks	**21 weeks**	

The duration for short term examination will be as follows:

Short term/Preparatory Leave	* 6 weeks	* Duration may vary depending on the situation.
Examination	1 week	
Total	**7 weeks**	

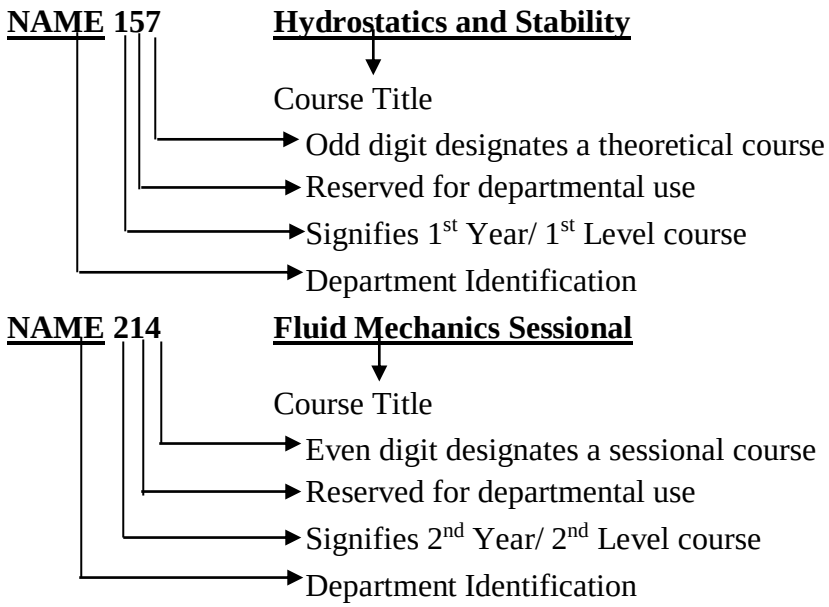
3.3 Course Pattern and Credit Structure

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

3.3.1 Course Designation system

Each course is designated by a two to four letter code identifying the department offering the course followed by a three-digit number having the following interpretation:

- The first digit corresponds to the year/level in which the course is normally taken by the students. The second digit is reserved for departmental use. It usually identifies a specific area/group of study within the department.
- The last digit is an odd number for theoretical courses and an even number for laboratory courses.
- The course designation system is illustrated as follows:



3.3.2 Assignment of Credits

The assignment of credits to theoretical course is different from that of laboratory course, which is stated as follows:

- For theoretical of courses one lecture per week per term is equivalent to one credit.
- For laboratory courses two class hours per week per term is equivalent to one credit.
- Credits are also assigned to project work taken by the students. The amount of credits assigned to such work may vary from one discipline to another.

3.3.3 Types Courses

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

- 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 the entire designated core courses of his/her discipline.

- Prerequisite Courses

- Some of the core courses are identified as prerequisite courses for a specific subject. A prerequisite course is one, which is required to be completed before some other course (s) can be taken.

- Elective Courses

Apart from the core courses, the students can choose from a set of Elective courses. A required number of Elective courses from a specified group have to be chosen.

3.4 The Grading System

3.4.1 The Letter Grade

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 evaluation, class evaluation, class participation, homework assignment and a term final examination. The assessment in laboratory courses is made by evaluating performance of the student at work during the class, viva-voce during laboratory hours and quizzes. Each course has certain number of credits, which describes its corresponding weight ages. A letter grade with a specified number of grade points is awarded in each course for which a student is registered. A student's performance 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 awarded in accordance to the provisions shown below:

Grade	Grade Points	Numerical Markings
A^+	4.0	80% and above
A	3.75	75% to below 80%
A^-	3.50	70% to below 75%
B^+	3.25	65% to below 70%
B	3.00	60% to below 65%
B^-	2.75	55% to below 60%
C^+	2.50	50% to below 55%
C	2.25	45% to below 50%
D	2.00	40% to below 45%
F	0.00	Below 40%
X	-	Continuation (For project/Thesis

- Subject in which the student gets F grades shall not be counted towards credit hours requirements and for the calculation of Grade Point Average (GPA).

3.4.2 Distribution of Marks

Thirty percent (30%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. quizzes, home assignments, class evaluation and class participation. The rest of the marks will be allotted to the Term Final Examination that is conducted centrally by the Dhaka University. There are internal and external examiners for each course in the Term Final Examination of 3-hour duration. Distribution of marks for a given course is as follows:

Class Participation/Observation	5%
Class Attendance	5%
Homework assignment and quizzes	20%
Final Examination (3 hours)	70%
Total	100%

Basis for awarding marks for class participation and attendance will be as follows:

	Marks
90% and above	10(15)
85% to less than 90%	9(13.5)
80% to less than 85%	8((12)
75% to less than 80%	7(10.5)
70% to less than 75%	6(9)
65% to less than 70%	5(7.5)
60% to less than 65%	4(6)
Below 60%	0(0)

The number of quizzes of a course shall be n+1 where n is the number of credits of the course. Evaluation of performance in quizzes will be on the basis of the best n quizzes.

3.4.3 Calculation of GPA

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 $C_1, C_2, \ldots, C_n$ and his grade points in these courses are $G_1, G_2, \ldots, G_n$ respectively then

$$GPA = \frac{\sum_{i=1}^{n} C_i * G_i}{\sum_{i=1}^{n} C_i}$$

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 $TC_1, TC_2, \ldots, TC_n$ and his GPA in these terms are $GPA_1, GPA_2, \ldots, GPA_n$ respectively then

$$CGPA = \frac{\sum_{i=1}^{n} TC_i * GPA_i}{\sum_{i=1}^{n} TC_i}$$

(Example.....

- **A Numerical Example**

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

Course	Credits, C_i	Grade	Grade Points, G_i	C_I*G_i
NAME 160	1.50	A-	3.50	5.250
NAME 165	3.00	A+	4.00	12.00
CHEM 101	3.00	A	3.75	11.25
MATH 141	3.00	B	3.00	9.000
HUM 101	3.00	B-	2.75	8.250
HUM 103	3.00	B	3.00	9.000
PHY 105	3.00	A+	4.00	12.00
CSE 102	1.50	A	3.75	5.625
Total	21.00			72.375

GPA = 72.375/21.00 = 3.45

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

Level	Term	Credit Hours Earned, TC_I	GPA Earned, GPA_i	GPA_i*TC_i
1	1	21.00	3.73	78.330
1	2	20.50	3.93	80.565
2	1	19.75	3.96	78.210
2	2	20.25	4.00	81.000
Total		**81.50**		**318.105**

CGPA = 318.105/81.50 = 3.90

3.4.4 Minimum Earned Credit and GPA Requirement for Obtaining Degree

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 other discipline is 2.20.

3.5 Absence during a Term

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 for any reason 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).

CHAPTER 4

COURSE CONTENT OF THE DEPARTMENT OF NAVAL ARCHITECTURE & MARINE ENGINEERING

4.1 Introduction

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

Summary of Course Curriculum

	Total	**Departmental**
Theory Subjects	40	23
Sessional Subjects	28	18
Theory (Credit hours/Contact Hours)	120/120	69/69
Sessional (Credit Hours/Contact Hours)	41.25/82.50	28.5/57
Total Credit Hours	**161.25**	97.5
Total Contact Hours	**202.50**	126.0

Contact hours and credit hours in eight terms in NAME department

Level-Term	**Credit hours or Contact hours for Theory courses**	**Credit hours/ Contact hours for Sessional courses**	**Cumulative contact hours**	**Cumulative credit hours**
1-I	14.0	5.25/10.5	24.5	19.25
1-II	15.0	4.5/9.0	48.5	38.75
2-I	15.0	4.5/9.0	72.5	58.25
2-II	15.0	5.25/10.5	98	78.50
3-I	15.0	5.25/10.5	123.5	98.75
3-II	16.0	4.5+1.5/9.0+3.0*	151.5	120.75
4-I	15.0	6.0/12.0	178.5	141.75
4-II	15.0	4.5/9.0	202.5	161.25
Total	**120.0**	**41.25/82.50**	**202.5**	**161.25**

*** 04 Weeks Industrial/Shipyard Training course**

Distribution of credit hours for different categories of courses in NAME dept							
Level Term	Humanities (credit hr)	Mathematic (Credit hr	Basic Sciences (credit hr.)	Departmental Engineering (credit hr.)	Allied Engineering (credit hr.)	Optional courses (credit hr.)	Total
1-I	2+0	3+0	6+1.5	3+0	0+3.75	-	14+5.25=19.25
1-II	-	3+0	3+1.5	3+1.5	6+1.5	-	15+4.5=19.50
2-I	0+0.75	3+0	-	6+2.25	6+1.5	-	15+4.5=19.50
2-II	3+0	3+0	-	3+3	6+2.25	-	15+5.25=20.25
3-I	3+0	-	-	9+5.25	-	3+0	15+5.25=20.25
3-II	-	4+0	-	9+4.5+1.5*	-	3+0	16+6=22
4-I	-	-	-	6+6	3+0	6+0	15+6=21
4-II	-	-	-	9+4.5	-	6+0	15+4.5=19.5
Total	8+0.75	16+0	9+3	48+28.5	21+9	18+0	120+41.25 =161.25

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

Level-1 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Chem 101	Chemistry-1	3	3
Hum 101	English	2	2
Math 161	Differential Calculus and Integral Calculus	3	3
NAME 107	Basic Naval Architecture & Marine Engg	3	3
Phy 105	Structure of Matter, Electricity, Magnetism and Modern Physics	3	3
Sessional Courses			
ME 160	Mechanical Engineering Drawing-1	3	1.5
Chem 102	Chemistry Sessional-1	3	1.5
Shop 160	Foundry and Welding Shop Sessional	3	1.5
Shop 170	Machine Shop Sessional	1.5	0.75
	Total (5T + 4S)	**24.50**	**19.25**

Level-1 Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
EECE 181	Electrical Engineering Principles	3	3
Phy 107	Waves and Oscillations, Geometrical Optics and Wave Mechanics	3	3
Math 163	Ordinary Differential Equation and Partial Differential Equation	3	3
ME 171	Basic Thermal Engineering	3	3
NAME 157	Hydrostatics and Stability	3	3
Sessional Courses			
NAME 158	Ship Design Studio 1	3	1.5
ME 172	Basic Thermal Engineering Sessional	3	1.5
Phy 108	Physics Sessional	3	1.5
Total (5T + 3S)		**24.00**	**19.50**

Level-2 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
ME 213	Fluid Mechanics	3	3
Math 261	Vector Analysis and Coordinate Geometry	3	3
NAME 205	Shipbuilding Materials	3	3
NAME 229	Marine Engines and Fuels	3	3
ME 219	Engineering Mechanics	3	3
Sessional Courses			
ME 214	Fluid Machanics Sessional	3	1.5
NAME 206	Shipbuilding Materials Sessional	1.5	0.75
NAME 208	Ship Design Studio - II	3	1.5
Hum 202	English Sessional	1.5	0.75
Total (5T + 4S)		**24**	**19.50**

Level-2 Term- II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Hum 223	Economics	3	3
EECE 281	Electrical and Electronic Technology for Marine Application	3	3
Math 263	Statistics, Laplace transform and Matrices	3	3
NAME 253	Marine Hydrodynamics	3	3
ME 227	Mechanics of Structure	3	3
Sessional Courses			
EECE 282	Electrical and Electronic Technology for Marine Engineering Sessional	3	1.5
NAME 254	Marine Hydrodynamics Sessional	3	1.5
NAME 258	Ship Design Studio -III	3	1.5
ME 228	Mechanics of Structure Sessional	1.5	0.75
	Total (5T + 4S)	**25.50**	**20.25**

Level-3 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Hum 313	Principles of Accounting	3	3
NAME 301	Ship Structure	3	3
NAME 305	Shipbuilding Technology	3	3
NAME 307	Design of Marine Vehicles	3	3
Optional Courses (any one **)			
NAME 315	Port and Harbor Engineering	3	3
NAME 321	Finite Element Method for Ship Structure	3	3
NAME 347	Marine Pollution and Prevention	3	3
Sessional Courses			
NAME 300	Ship Design Project and Presentation	3	1.5
NAME 302	Ship Structure Sessional	1.5	0.75
NAME 308	Ship Design Studio IV	3	1.5
NAME 326	Computer Aided design (CAD) -1	3	1.5
	Total (5T + 4S)	**25.50**	**20.25**

Level-3 Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Math 361	Fourier Analysis, Harmonic Function and Complex Variable	4	4
NAME 353	Resistance and Propulsion of Ships	3	3
NAME 359	Marine Engineering 1	3	3
NAME 369	Heat Transfer	3	3
Optional courses (any one)**			
NAME 357	Design of Special Ships	3	3
NAME 367	Economic and Social Aspects of Marine Transportation System	3	3
NAME 373	Computational Fluid Dynamics (CFD)	3	3
Sessional Courses			
NAME 300	Ship Design Project and Presentation	3	1.5
NAME 354	Resistance and Propulsion of Ships Sessional	3	1.5
NAME 360	Marine Engineering Sessional 1	3	1.5
Training course/Internship *			
NAME 350	Shipyard Practice/Industrial Training (4 Weeks)	4 Weeks	1.5
	Total (5T + 3S+ Training course)	**25.00 +** 4 Weeks	**22.00**

*** 04 Weeks Industrial/Shipyard Training course**

Level-4 Term-I

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

Level-4 Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
NAME 457	Ship Economics and Management	3	3
NAME 459	Ship Hull Maintenance and Repair	3	3
NAME 465	Navigation and Maritime Regulations	3	3
Optional courses (any two)**			
NAME 453	Power and Propulsion System	3	3
NAME 463	Ship Performance	3	3
NAME 469	Marine Production and Planning	3	3
NAME 477	Control Engineering	3	3
NAME 489	Introduction to Offshore Structure	3	3
Sessional Courses			
NAME 400	Project and Thesis	6	3
NAME 460	Marine Engineering Sessional	3	1.5
	Total (5T + 2S)	**24.00**	**19.50**

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

4.3.1 Compulsory Courses

NAME 107: Basic Naval Architecture and Marine Engineering
3.00 Credit, 3 hrs. /wk

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

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

Reference Book

1. 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.

NAME 157: Hydrostatics and Stability
3.00 Credit, 3 hrs. /wk

Prereq. NAME 107

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

Reference Book

1. Ship Stability for Master and Mates, Captain D.R Derrett, Butterworth Heineman.
2. Theoretical Naval Architecture, E.L. Attwood & H.S. Pengelly, 1962, Longmans Green & Co. Ltd.
3. Reed's Naval Architecture for Marine Engineers, E.A. Stoked, 2003, Thomas Reed Publications.

4. Basic Ship Theory, K.J. Rawson & E. C. Tupper, Vol. 1 & 2., Longman Group Limited.
5. Naval Architecture: Examples and Theory, B. Baxter, Second Impression 1977, Charles Griffin & Company Ltd.

NAME 158: Ship Design Studio I
1.50 Credit, 3 hrs /wk

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

NAME 205: Shipbuilding Materials
3.00 Credit, 3 hrs /wk

Metals as materials of construction; Industrially significant properties of metallic materials; Production, properties and uses of Pig Iron, Cast Iron and Carbon Steels; Nonferrous alloys; Protective Coatings; Ferrous ally: Plan carbon, alloy, tool, stainless, heat-resisting and creep resisting steels etc.; The Fe-Fe_3C equilibrium; Different types of heat treatment operations; Case hardening of steels, Cement, Ferro-cement, Timber, Rubber, Glass and Plastics.

Reference Book

1. Introduction to Physical Metallurgy, Sidney H Anvers.

NAME 206: Shipbuilding Materials Sessional
0.75 Credit, 1.50 hrs./wk.

Experiments based on NAME 205

NAME 229: Marine Engines and Fuels
3.0 Credit, 3 hrs /wk
Prereq. ME 171, NAME 107

Study of internal combustion engines. Fuels and combustion. Internal combustion engine systems: introduction, fuel oil, injection, intake, exhaust etc. Engine components: crankshaft, bearings, connecting rod, piston, liner, ring , thrust bearing etc. Marine fuel: types, grading, testing, treatment methods, blending, catalytic cracking etc. HSD, IFO and heavy fuel engines. Gas turbines. Nuclear power plants. Types of engine and various systems.
Introduction to combustion chamber: open and divided, combustion chamber in marine diesel engines. Turbo-charging: thermodynamics, principle, types and design limitations. Vessel type and engine choice.

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

Reference Book

1. Engineering Fundamentals of the Internal combustion Engine - Willard W. Pulkrabek
2. Marine Internal combustion Engine – A. B. Kane.

3. Marine Diesel Engine- Divehi Arana.
4. Pounder's Marine Diesel Engine and Turbine- Doug woodland.
5. Internal Combustion Engines and Air Pollution, Edward Frederic Obert

NAME 208: Ship Design Studio II
1.50 Credit, 3 hrs /wk
Prereq. NAME 107, NAME 157, NAME 158

Hydrostatic calculation, stability and cross curves, trim calculations.

NAME 253: Marine Hydrodynamics
3.00 Credit, 3 hrs /wk
Prereq. ME 213

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

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

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

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

Reference Book

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

NAME 254: Marine Hydrodynamics Sessional
1.50 Credit, 3 hrs /wk

Prereq. ME 213, ME 214

Experiments based on NAME 253

NAME 258: Ship Design Studio-III
1.50 Credit, 3 hrs /wk
Prereq. NAME 208

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

NAME 300: Ship Design Project and Presentation
3.00 Credit, 3 hrs /wk
Prereq. NAME 258
[Presentation will be made before teachers and students of the department twice in a term]

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

NAME 301: Ship Structure
3.00 Credit, 3 hrs /wk
Prereq. ME 219

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

Reference Book

1. Strength of Ship Structures, W. Muckle, 1967, Edward Arnold Publishers Ltd. London.
2. Merchant Ship Construction, D.A. Taylor, 1980, Butterworth's& Co. Publishers Ltd
3. Ship Structural Design: A Rationally – Based Computer Aided Optimization Approach, O.F. Hughes, 1983, John Wiley & Sons Inc.
4. Design of Ship Hull Structures: A practical Guide for Engineers, Y. Komodo; Y. Takeda; M. Mano & T. Okada, 2009, Springer-Verlag Publishing Co.

NAME 302: Ship Structure Sessional
1.50 Credit, 3 hrs /wk

Prereq. NAME 206

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

NAME 305: Shipbuilding Technonogy
3.00 Credit hrs, 3 hrs /wk

Different types of welding and their equipment. Welding principle, methods: MMAW, GMAW, SAW, Electro slag welding, TIG and SS welding, MIG and aluminium welding. Types of welding joints. Welding symbols. Welding sequence in shipbuilding, Common

defects in ship welding: welding distortion monitoring and control, inspection and testing of welded specimen. Non destructive testing.

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

Reference Book

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

NAME 307: Design of Marine Vehicles
3.00 Credit, 3 hrs /wk
Prereq. NAME 157

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

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

Reference Book

1. Principles of Naval Architecture, Vol. 1, 2 &3,
2. Practical Ship Design, D.G.M. Watson, 1998, Elsevier Science Ltd.

NAME 308: Ship Design Studio IV
1.50 Credit, 3 hrs /wk

Prereq. NAME 258

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

NAME 326: Computer Aided Design (CAD) I
1.50 Credit, 3 hrs /wk

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

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

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

NAME 350: Shipyard Practice/ Industrial Training
1.50 Credit,

Practical Works concentrated in 4 weeks.

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

NAME 353: Resistance and Propulsion of Ships
3.00 Credit, 3 hrs /wk
Pre req. NAME 253

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

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

Reference Book

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

NAME 354: Resistance and Propulsion of Ships Sessional
1.50 Credit, 3 hrs /wk

Sessional based on NAME 353

NAME 359: Marine Engineering -I
3.00 Credit, 3 hrs /wk

Pre req. NAME 229

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

Reference Book

1. Engineering Fundamentals of the Internal combustion Engine - 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.

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

Sessional based on NAME 359

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

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

Reference Book

1. 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.

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

Major field of project and thesis are as follows: (a) ship design (b) ship construction (c) strength of ship (d) material testing and fracture problems (e) ship motion (f) resistance and propulsion of ships (g) marine engines and ship vibration (h) marine transportation system (i) marine engineering (j) dynamics of ship/floating bodies/structures (k) Environmental impact assessment (I) Life cycle assessment (LCA) (J) Shipbuilding practice of Bangladesh (K) Ship

recycling industry of Bangladesh (L) Potential of Bangladeshi shipyards (M) Local ship design capability (N) Prospect of Bay of Bangle (O) Off shore installation and prospect of sea resource of Bangladesh (P) Local and International Ship/Shipbuilding market analysis etc.

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

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

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

Reference Book

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

NAME 409: Marine Engineering -II
3.00 Credit, 3 hrs /wk

Prereq. NAME 359

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

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

Reference Book

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

NAME 426: Computer Aided Design (CAD)-II
1.50 Credit, 3 hrs /wk

Pre req: NAME 326

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

NAME 430: Computer Programming in Ship Design
1.50 Credit, 3 hrs /wk

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

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

NAME 457: Ship Economics and Management
3.00 Credit, 3 hrs /wk

Prereq. NAME 307

Shipbuilding cost estimation. Tendering and contracts. Freight market and operating economics. Chartering of ships. Alternative maritime designs. Overall optimization for speed size combinations of ships. Relative importance of technical and economic features. Importance and use of ICT in maritime designs. Safety management concept in ships and ports and ISO certifications.
Management practices in maritime projects. Commercial, marketing, legal and financial aspects of shipbuilding and shipping.

Reference Book

1. Engineering Economics & Ship Design, I.L. Buxton, 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,

NAME 459: Ship Hull Maintenance and Repair
3.00 Credit, 3 hrs /wk
Prereq. NAME 409

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

Reference Book

1. Ship Construction, D.J. Eyres, 5th Edition 2001, Butterworth-Heinemann.

NAME 460: Marine Engineering Sessional
1.50 Credit, 3 hrs /wk

Sessional based on NAME 409.

NAME 465: Navigation and Maritime Regulations
3.00 Credit, 3 hrs /wk

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

Reference Book

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

4.3.2 Optional Courses

NAME 315: Port and Harbor Engineering
3.00 Credit, 3 hrs /wk

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

Reference Book

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

NAME 321: Finite Element Method for Ship Structure
3.00 Credit, 3 hrs /wk

Prereq. ME 219, ME 227

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

Reference Book

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

NAME 347: Marine Pollution and Prevention
3.00 Credit, 3 hrs /wk

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

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

Reference Book

1. Marpol annex, regulations.

NAME 357: Design of Special Ships
3.00 Credit, 3 hrs /wk

Prereq. NAME 307

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

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

High speed crafts and multi-hull vessels.

Reference Book

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

NAME 367: Economic and Social Aspects of Marine Transportation System
3.00 Credit, 3 hrs /wk

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

Reference Book

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

NAME 373: Computation Fluid Dynamics
3.00 Credit, 3 hrs /wk

Prereq. NAME 213, NAME 253

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

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

Reference Book

1. Computational Methods for Fluid Dynamics, J.H. Ferziger& M. Peric, 3rd Edition 2002, Springer-Verlag Publishing Co. Ltd.

2. An Introduction to Computational Fluid Dynamics: The Finite Volume Method (2nd Edition) by H. Versteeg and W. Malalasekera

NAME 425: Shipbuilding Practice in Bangladesh
3.00 Credit, 3 hrs /wk

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

NAME 431: Ship Hull Vibration
3.00 Credit, 3 hrs /wk

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

Reference Book

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

NAME 435: Computer Aided Ship Production
3.00 Credit, 3 hrs /wk

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

NAME 437: Fishing Vessel Technology
3.00 Credit, 3 hrs /wk

Prereq. NAME 307

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

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

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

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

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

Prereq. NAME 353

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

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

Reference Book

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

NAME 463: Ship Performance
3.00 Credit, 3 hrs /wk

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

Reference Book

1. A guide to ship design Anthony F. Molland

NAME 469: Marine Production and Planning

3.00 Credit, 3 hrs /wk

Overview of ship production system. Information for shipbuilding production. Product standardization and work simplification. Product work breakdown and integrated zone engineering. Linear programming concepts. Network analysis. Scheduling and resource allocation. Data Base Management System (DBMS) in production planning and control.

Reference Book

1. Introduction to Operation Research – Hamdy A Taha

NAME 477: Control Engineering
3.00 Credit, 3 hrs /wk

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

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

Reference Book

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

IPE 479/ NAME 479: Engineering Management
3.00 Credit, 3 hrs /wk

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

Management principles, Management functions. The management team, management by objectives.
Organizational structures; co-ordinations and spans of control, the informal organization, authority delegation and decentralization, groups and committees, managing organizational change and conflict.

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

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

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

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

Reference Book

1. Management (6th edition) James A.F. Stoner.

NAME 481: Optimization Method in Ship Design
3.00 Credit, 3 hrs /wk

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

Reference Book

1. Introduction to Operation Research – Hamdy A Taha

NAME 489: Introduction to Offshore Structure
3.00 Credit, 3 hrs /wk

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

Reference Book

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

4.3.3 Detail Syllabus of undergraduate Courses offered by other departments

EECE 181: Electrical Engineering Principles
3.00 Credit, 3 hrs /wk

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

Reference Book

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

EECE 281: Electrical and Electronic Technology for Marine Application
3.00 Credit, 3 hrs /wk

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

Reference Book

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

EECE 282: Electrical and Electronic Technology for Marine Application Sessional
1.50 Credit, 3 hrs/wk

Laboratory experiments based on EECE 261

Chem 101: Chemistry-I
3.00 Credit, 3 hrs /wk

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

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

Chem 102: Chemistry Sessional
1.50 Credit, 3 hrs./ wk.

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

Hum 101 : English
2.00 Credit, 2 hrs./wk.

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

References:

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

Hum 202: English Sessional
1.50 Credit, 3 hrs/wk

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

Writing: Sentence structure; Vocabulary and diction; Presenting ideas in an organized way; Knowledge on genre based writing; Writing Paragraph and essay; Writing formal letters (tender, quotation, sales letter, letter of complain, adjustment letter, writing in print media); Writing different types of reports.
Listening: Predicting, understanding native speaker's English from audio and video; Listening for correct pronunciation through audio and video; Distinguish between important and unimportant information during listening; Listening to recorded text for understanding main idea, specific information, speaker's point of view.

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

References:

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

Hum 223 : Economics
3.00 Credit, 3 hrs./wk.

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)

Text and Ref Books:

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

Hum 313 : Principles of Accounting
3.00 Credit, 3 hrs./wk.

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

Text and Ref Books:

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

Math 161 : Differential Calculus and Integral Calculus

3.00 Credit, 3 hrs /wk

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

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

Math 163: Ordinary Differential Equation and Partial Differential Equation

3.00 Credit, 3 hrs /wk

Ordinary Differential Equation: Degree and order of ordinary differential equation, Formation of differential equation, Formation of differential equations, Solutions of first order differential equations by various methods, Solution of general linear equations of 2^{nd} and higher orders with constant co-efficient, Solutions of homogeneous linear equations of higher order when the dependent and independent variables are absent, Solution of Euler's linear homogeneous equation, Solution of differential equation by the methods based on factorization of the operator.

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

Math 261: Vector Analysis and Co-ordinate Geometry
3.00 Credit, 3 hrs /wk

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

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

Math 263: Statistics, Laplace Transform and Matrices
3.00 Credit, 3 hrs /wk

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

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

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

Math 361: Fourier Analysis, Harmonic Function and Complex Variable
4.00 Credit, 4 hrs/wk

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

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

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

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

Sec A

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

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

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

Sec B

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

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

Phy 107: Waves & Oscillations, Geometrical Optics and Wave Mechanics
3.00 Credit, 3 hrs /wk

Sec A
Waves & Oscillations: Differential equation of a simple harmonic oscillator, Total energy and average energy, Combination of simple harmonic oscillations, Lissajous figures, Spring-mass system, Calculation of time period of torsional pendulum, Damped oscillation,

Determination of damping coefficient, Forced oscillation, Resonance, Two-body oscillations, reduced mass, Differential equation of a progressive wave, Power and intensity of wave motion, Stationary wave, Group velocity and phase velocity, Architectural acoustics, Reverberation and Sabine's formula.

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

Sec B

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

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

Phy 108: Physics Sessional

1.50 Credit, 3 hrs /wk

Laboratory Experiments Based on Phy 105 and 107.

ME 160: Mechanical Engineering Drawing-1

1.50 Credit, 3 hrs./wk.

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

ME 171: Basic Thermal Engineering

3.00 Credit, 3 hrs /wk.

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

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

Reference Book

1. A textbook of Thermal Engineering, R. S. Khurmi; J. K. Gupta.
2. Fundamentals of classical thermodynamics, Gondon J. Van Wylen, John Wiley, New York
3. Engineering Thermodynamics: Work and Heat Transfer ,G.F.C. Rogers& Yon Mayhew, Prentice Hall

ME 172: Basic Thermal Engineering Sessional
1.50 Credit, 3hrs./wk.

Sessional based on ME 171

ME 213: Fluid Mechanics
3.00 Credit, 3 hrs./wk

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

Reference Book

1. Hydraulics, Fluid Mechanics and Hydraulic Machines, R. S. Khurmi.
2. Fluid mechanics with Engineering application, E. Finnemore and Joseph Franzini.

ME 214: Fluid Mechanics Sessional
1.50 Credit, 3 hrs /wk

Experiments based on ME 213

ME 219: Engineering Mechanics
3.00 Credit, 3 hrs /wk

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

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

Reference Book

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

ME 227: Mechanics of Structure
3.00 Credit, 3 hrs /wk

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

Reference Book

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

ME 228: Mechanics of Structure Sessional
1.50 Credit, 3 hrs /wk

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

ME 479 : Engineering Management
3.00 Credit, 3 hrs /wk

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

Management principles, Management functions. The management team, management by objectives.
Organizational structures; co-ordinations and spans of control, the informal organization, authority delegation and decentralization, groups and committees, managing organizational change and conflict.

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

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

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

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

Reference Book

1. Management (6th edition) James A.F. Stoner.

Shop 160: Foundry and Welding Shop Sessional
1.50 Credit, 3 hrs./wk

Foundry: Introduction to Foundry: Tools and equipments, Patterns: Definition and function, Types and pattern making, Molding: Definition, Molding materials, Sand Preparation, Types of mould and moldings procedure, Cores: Types of cores, Core making, Core materials, Casting: Metal melting, Pouring and casting, Furnaces, Fuels, Casting of cast iron, Steel making processes, Non-ferrous metal casting procedure, Inspection of casting and casting defects.

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

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

Shop 170: Machine shop Sessional
0.75 Credit, 1.5 hrs./wk

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