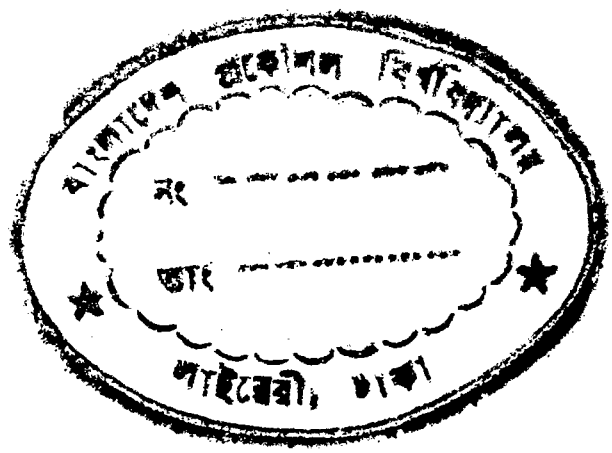
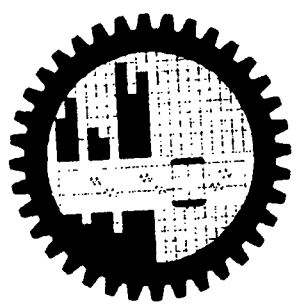
Department of Naval Architecture & Marine Engineering



Information Booklet
January 2006



Bangladesh University of Engineering & Technology

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PREFACE

The department of Naval Architecture and Marine Engineering (NAME) of Bangladesh University of Engineering & Technology, Dhaka is the only department in Bangladesh which plays a significant role in the maritime field. The department has more than thirty years of history of excellence in undergraduate and post-graduate study and research.

This information booklet provides general information about the university, its historical background, faculties, teaching departments, teaching staffs of NAME department etc. Different aspects of the course system, such as, rules and regulations relating to admission, credit structure, course offering instructions, attendance, teacher student contact, grading system, performance evaluation, requirement for degrees etc. are introduced. It describes the course requirements, detail course outline and courses offered in different terms for the undergraduate students of Naval Architecture & Marine Engineering Department.

The new course curriculum described in this booklet is prepared by teachers of the department keeping pace with the present scenarios of this field in other renowned universities of Asia, Europe and America. In curriculum, students can choose their field of specialization from any of the two divisions, i.e., hydrodynamics & structure and design & production in addition to the fundamentals and basic courses of Naval Architecture & Marine Engineering.

Some of the information recorded in this booklet is likely to be updated from time to time. Students are strongly advised to be in touch with their advisors regarding any update approved by the University.

We hope this information booklet will be very much useful to the new undergraduate students and to the student's advisors in the Department of Naval Architecture & Marine Engineering.

Dr. Md. Sadiqul Baree
Professor and Head
Department of Naval Architecture & Marine Engineering
Bangladesh University of Engineering & Technology

Chapter 1

General Information

1.1 Historical Background

Bangladesh University of Engineering and Technology abbreviated as BUET, is the oldest institution for the study of Engineering and Architecture in Bangladesh. The history of this institution dates back to the days of Dhaka Survey School, which was established at Nalgola in 1876 to train surveyors for the then Government of Bengal of British India. As the years passed, the survey school was elevated into the Ahsanullah School of Engineering offering three years' Diploma courses in Civil, Electrical and Mechanical Engineering. In 1948, the school was upgraded to Ahsanullah Engineering College (at the present premises) as a faculty of Engineering under the University of Dhaka offering four-year bachelor's courses in Civil, Electrical, Mechanical, Chemical and Metallurgical Engineering. This was done with a view to meeting the increasing demand for engineers in the newly independent country and to expand the facilities for quicker advancement of engineering education in general. In order to create facilities for postgraduate studies and research, in particular, Ahsanullah Engineering College was upgraded to the status of a University giving a new name of East Pakistan University of Engineering and Technology in the year 1962. After independence of Bangladesh in 1971, it was renamed as the Bangladesh University of Engineering and Technology (BUET).

Till today, it has produced around 20,000 graduates in different branches of engineering and has established a good reputation all over the world for the quality of its graduates, many of whom have excelled in their profession in different parts of the globe. It was able to attract students from countries like India, Nepal, Iran, Jordan, Malaysia, Sri Lanka, Pakistan and Palestine.

Undergraduate courses in the faculty of Engineering, Civil Engineering, Electrical & Electronic Engineering and Mechanical Engineering extend over four years and lead to B.Sc. Engineering degrees in Civil, Computer, Electrical & Electronic, Mechanical, Chemical, Material & Metallurgical, Naval Architecture & Marine Engineering and Industrial and Production Engineering. The faculty of Architecture and Planning offers a five years' course for the degree of Bachelor of Architecture and a four-year' course for the degree of Bachelor of Urban and Regional Planning.

Postgraduate studies and research works are the other primary functions of the university. Most of the departments, like computer Engineering, Electrical and Electronic Engineering, Chemical Engineering, Civil Engineering, Water Resource Engineering, Mechanical Engineering, Industrial and Production Engineering, Material & Metallurgical Engineering, Naval Architecture and Marine Engineering, Petroleum Engineering offer M.Sc. Engineering and M.Engg. Degrees and some department have Ph.D. programs. The Faculty of Architecture and Planning offers postgraduate degrees in Architecture (M.Arch) and in Urban and Regional Planning (MURP).

In addition to its own research programs, the university also undertakes research programs sponsored by outside organizations such as United Nations' organization, Commonwealth Foundation, University Grants Commission etc. The expertise of the university teachers and the laboratory facilities of the university are also utilized to solve problems and to provide up-to-date engineering and technological knowledge to various government organizations of the country. The university is persistent in its effort to improve its research facilities, staff position and courses and curricula to meet the growing technological challenges facing by the country.

1.2 The BUET Campus

The BUET campus is situated at the center of the Dhaka city, capital of Bangladesh, with easy access to the Zia International Airport, Kamalapur Railway Station, Bus terminals and Sadarghat River Port. The campus is

compact with five main multistoried buildings housing sixteen departments. It also has several institutes like Institute of Appropriate Technology (IAT), Institute of Information and Communication Technology (IICT), Accident Research Center (ARC) and Energy Center. Students' housing and teachers' residence are at walking distance. There are eight halls of residence for students including one for female students within the campus.

1.1. Teaching Staff of the University

The total number of filled up teaching posts is 500 out of which 387 teachers are in active service and 113 teachers are on leave for higher studies, and teaching and research in various universities/institutes around the world (as on May 11, 2005). The following is lists of teachers in active service including those against leave vacancies.

Sl. No.	Designation	Active	Abroad
1	Professor	128	11
2	Associate Professor	63	9
3	Assistant Professor	79	63
4	Lecturer	117	30
	Total	387	113

Besides these teaching posts, there are Professorships and Chairs namely:

- **Dr. Rashid Chair**

In memory of late Dr. M.A.Rashid, formerly Professor of Civil Engineering and the first Vice-Chancellor of BUET, a chair has been created. The chair is sponsored by the graduates of the year 1961 of BUET (61 club).

- **Professor Emeritus and Supernumerary Professors**

In order to get the benefits from the services of the eminent people of either scholastic and academic brilliance or outstanding professionals in Engineering, Architecture and Planning, the university has established provisions for appointment of such persons as emeritus and supplementary professors.

1.4 Faculties, Teaching Departments and Institutes

Sl. No.	Faculty	Degree/Program
1	**Faculty of Mechanical Engineering**	
	Department of Naval Architecture & Marine Engineering	Both UG and PG
	Department of Mechanical Engineering	Both UG and PG
	Department of Industrial & Production Engineering	Both UG and PG
2	**Faculty of Civil Engineering**	
	Department of Civil Engineering	Both UG and PG
	Department of Water Resources Engineering	Both G and PG
3	**Faculty of Electrical and Electronic Engineering**	
	Department of Electrical and Electronic Engineering	Both UG and PG
	Department of Computer Science & Engineering	Both UG and PG
4	**Faculty of Engineering**	
	Department of Chemical Engineering	Both UG and PG
	Department of Material & Metallurgical Engineering	Both UG and PG
	Department of Petroleum and Mineral Resources Engineering	PG only
	Department of Chemistry	PG only
	Department of Mathematics	PG only
	Department of Physics	PG only
5	**Faculty of Architecture and Planning**	
	Department of Architecture	Both UG and PG
	Department of Urban & Regional Planning	Both UG and PG
	Department of Humanities	No Degree offered
6	**Institutes**	
	Institute of Information and Communication Technology	PGDIP and PG
	Institute of Water and Flood Management	PG only

Note: UG – Undergraduate; PG – Postgraduate

1.5 University Administration

Chancellor :	Begum Khaleda Zia, Honorable Prime Minister of the Government of the Peoples Republic of Bangladesh
Vice-Chancellor:	Professor Dr. Md. Alee Murtuza

Chapter 2

The Department of Naval Architecture and Marine Engineering (NAME)

2.1 Introduction

The program of study in Naval Architecture and Marine Engineering covers the diversified range starting from ships hulls to exploration of opportunities for harnessing all kinds of resources from the sea. Such topics as the form, strength, stability, sea keeping qualities, resistance and propulsion of ships, economic aspects of ship design and ship operation and many courses of mechanical engineering, electrical engineering, civil engineering, industrial & production engineering and metallurgical engineering are covered. Other subjects of concerns are fundamentals of the physical sciences and mathematics, humanities and social sciences. Since the design of modern ship or many marine system of whatever configuration or function encompasses many engineering fields, graduates of this department are called upon to handle diverse professional responsibilities.

Undergraduate students seeking the degree (Bachelor of Science in Naval Architecture and Marine Engineering) must complete a series of subjects. In addition to the undergraduate course, there are post-graduate programs available in which the students get the opportunity to specialize in certain areas in greater depth.

The department is in constant touch with the country's ship design offices, shipyards and ship operators, including the cognizant governmental agencies and organizations concerned with various phases of ships, rivers and ocean development.

2.2 List of Teaching Staff of the Department

Head of the Department

Prof. Dr. Md. Sadiqul Baree	B.Sc. Engg. (NAME), BUET; Ph.D. (UK). (Ship Motion and Added Resistance)

Professors

Dr. Gazi Md. Khalil	B. Tech. (Hons.) (Aeronautical Engg.), I.I.T., (India); M.Sc. Engg. (ME), BUET; Ph.D. (ME), BUET. (Marine Hydrodynamics)
Dr. Md. Refayet Ullah	B.Sc. Engg. (NAME), BUET; Ph.D., (UK). (Marine Propulsion)
Dr. Md. Reaz Hasan Khondoker (on leave)	B.Sc. Engg. (NAME), BUET; M. Engg. (IPE), BUET; D.Engg., (Japan). (Offshore Dynamics and Safety)

Associate Professors

Khabirul Haque Chowdhury	B.Sc. Engg. (NAME), BUET; M.Sc. (NAME), Uni. of Newcastle Upon Tyne, (UK). (Marine Transportation Design and Planning)
Dr. Abdur Rahim	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (ME), BUET; Ph.D., (BUET). (Marine Engineering, Dredger, Country Boats , Stability, LCA , Alternative Boat Building Materials, Ship Safety)
Dr. Md. Mashud Karim	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D.Engg., (Japan). (Computational Geometry, Hydrodynamics, Resistance, Propulsion & Stability of Ship, Design Optimization)

Dr. Md. Rafiqul Islam	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D.Engg., (Japan). (Dynamics of Floating Structures, Non-linear Ship Motion)

Assistant Professors

Dr.Kho. Shahriar Iqbal (on leave)	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; Ph.D, (Japan). (Marine Environment, Transportation, LCIA)
Dr. Shahajada Tarafder	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (ME), BUET; D.Engg., (Japan). (Ship Resistance and Hull Form Optimization)
Dr. Mir Tareque Ali	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D.Engg., (Japan). (Dynamics of Offshore Structure, Design of Mooring/Towing Systems)
Md. Shah Alam (on leave)	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET. (Fracture Mechanics)
Dr. Goutam Kumar Saha	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D.Engg., (Japan). (Wave Making Resistance & Hull Form Optimization)
Dr. Nayeb Md. Golam Zakaria	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET. D. Engg., (japan). (Seakeeping Performance of ships with forward speed)
Dr. Md. Shahidul Islam	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; M.Sc. Engg. (ME), Wayne State University, USA; D.Engg., (Japan). (FEM, Mesh Generation, Composite Materials)

Lecturer

Md. Mashiur Rahaman	B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; M.Phil. (Infrastructure Management), Yokohama National University, (Japan). (Marine Infrastructure Design & Planning, Port & Harbor Engineering, Mathematical Hull Form Design)

2.3 Laboratory Facilities of the Department

The department endeavors to provide its faculty members and students adequate laboratory, library and other facilities. The departmental undergraduate courses are laboratory intensive and this requirement is catered by the following laboratories at present:

i. Marine Hydrodynamics Laboratory
ii. Ship Design Laboratory
iii. Computer Aided Design (CAD) Laboratory

Besides these, students in different level/term have to undertake sessional classes in the laboratories of physics, chemistry, mechanical, electrical and electronic, civil and metallurgical engineering department and also in different workshops. If necessary, undergraduate and post graduate students can access the laboratory facilities of other departments, institutes and centers during their project, thesis and research works.

2.4 Industrial Training of the Department

Department emphasizes the importance of practical knowledge gained through industrial/shipyard practice and visits. These types of practices are well planned and structured so that the students are adequately exposed to the real industrial environment. For this purpose, the course curriculum contains two 1.5 credit hours courses titled "Shipyard

Practice-I" & "Shipyard Practice-II". The students have to undertake three weeks of shipyard training for each course.

During Shipyard Practice-I & Shipyard Practice-II, the students will be actively involved in the activities involving ship design and construction. At the end of the course the performance of the students will be evaluated jointly by the faculty and industry executives.

Chapter 3

Rules and Regulations for Undergraduate Program under Course System

3.1 Introduction

From the academic session 1990-91, Bangladesh University of Engineering and Technology (BUET) is following a course system for undergraduate studies. Given below an extract from the report of the committee for framing recommendations for implementation and administration of course system of instruction at undergraduate level as approved in the meetings of the Academic Council held on September 24 and 30, 1992, and October 4 and 19, 1992. Only relevant sections of the report and the amendments that were subsequently made to it are included so that the students can have a clear understanding about course system. The rules and regulations administering undergraduate curricula through Course System began applicable for students admitted to this university in First Year classes in Engineering and Architecture in 1990-91 and subsequent sessions.

3.1.1 The Course System

The undergraduate curricula at Bangladesh University of Engineering & Technology (BUET) are based on the course system. The salient features of the course system are:

(i) Reduction of the number of theoretical courses and examination papers around five in each term,
(ii) The absence of a pass or a fail on an annual basis,
(iii) Continuous evaluation of student's performance,
(iv) Introduction of Letter Grades and Grade Points instead of numerical grades,
(v) Introduction of some additional optional courses and thus enable students to select courses according to his interest as far as possible,
(vi) Opportunity for students to choose fewer or more courses than the normal course load depending on his/her capabilities and needs,

(vii) Flexibility to allow the student to progress at his own pace depending on his ability or convenience, subject to the regulations on credit and minimum grade point average (GPA) requirements, and

(viii) Promotion of teacher-student contact.

In the curriculum for the undergraduate programs, besides the professional courses pertaining to each discipline, there is a strong emphasis on acquiring a thorough knowledge in the basic sciences of Mathematics, Physics and Chemistry. Due importance is also given for the study of several subjects in Humanities and Social Sciences which, it is expected will help the student to interact more positively with the society in which he lives. Thus the course contents of the undergraduate programs provide a harmonious blend of basic sciences and their applications as well as their social relevance.

The first two terms of bachelor's degree programs consist of courses in basic sciences, mathematics, humanities and social sciences, basic engineering and architecture subjects. The third and subsequent terms build directly on the knowledge of the basic subjects gained in the first two terms and go on to develop competence in specific disciplines.

3.2 Student Admission

Students will be admitted in undergraduate curricula in the Departments of Architecture, Urban and Regional Planning, Chemical Engineering, Civil Engineering, Computer Science and Engineering, Electrical and Electronic Engineering, Mechanical Engineering and Production Engineering, Materials and Metallurgical Engineering, Water Resources Engineering and Naval Architecture and Marine Engineering as per existing rules of the university. The Registrar's Office will continue to serve as Admissions Office and will deal with course registration in addition to student admission

3.3 Number of Terms in a Year

There will be two terms (Term I and Term II) in an academic year. In addition to these two regular terms there may be a Short Term in the intervening period between end of Term II and commencement of Term I. During this term students, those who need, may take additional courses

either to make up deficiencies in credit and GPA requirements or to fulfill the credit requirements for bachelor's degree spending less time than the normal duration; and other students may take vacation.

3.3.1 Duration of Terms

The duration of each of Term I and Term II will be 18 weeks, which will be used as follows:

Classes	14 weeks
Recess before Term Final Examination	2 weeks
Term Final Examination	2 weeks
Total	**18 weeks**

The duration of a Short Term will be around 8 weeks of which about 7 weeks will be spent for class lectures and one week for Term Final Examination.

3.4 Course Pattern and Credit Structure

The entire undergraduate program is covered through a set of theoretical and laboratory/sessional/studio courses.

3.4.1 Course Designation and Numbering System

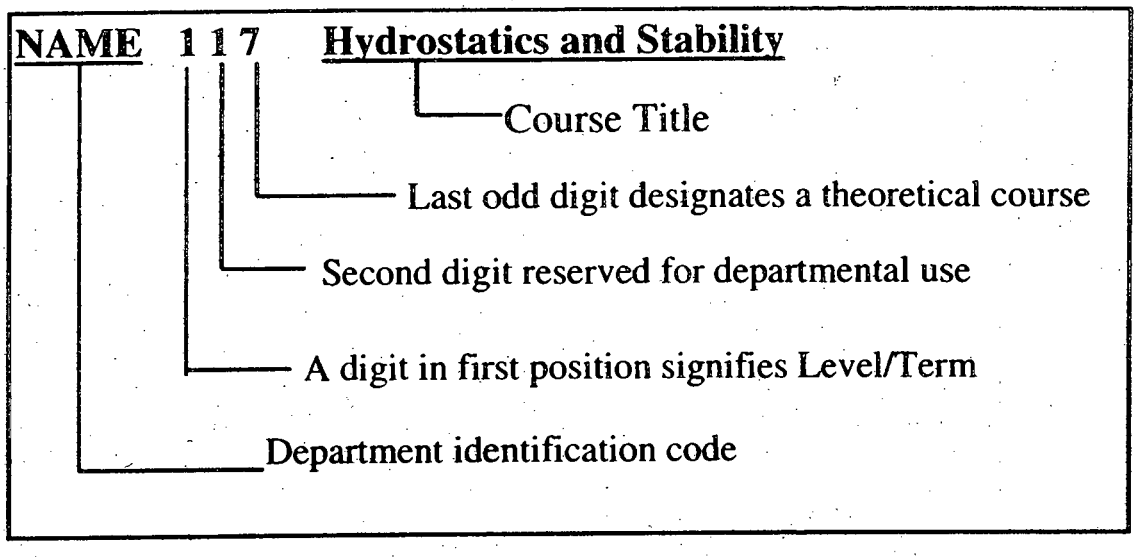
Each course is designated by a two to four letter word identifying the department, which offers it following by a three-digit number with the following criteria:

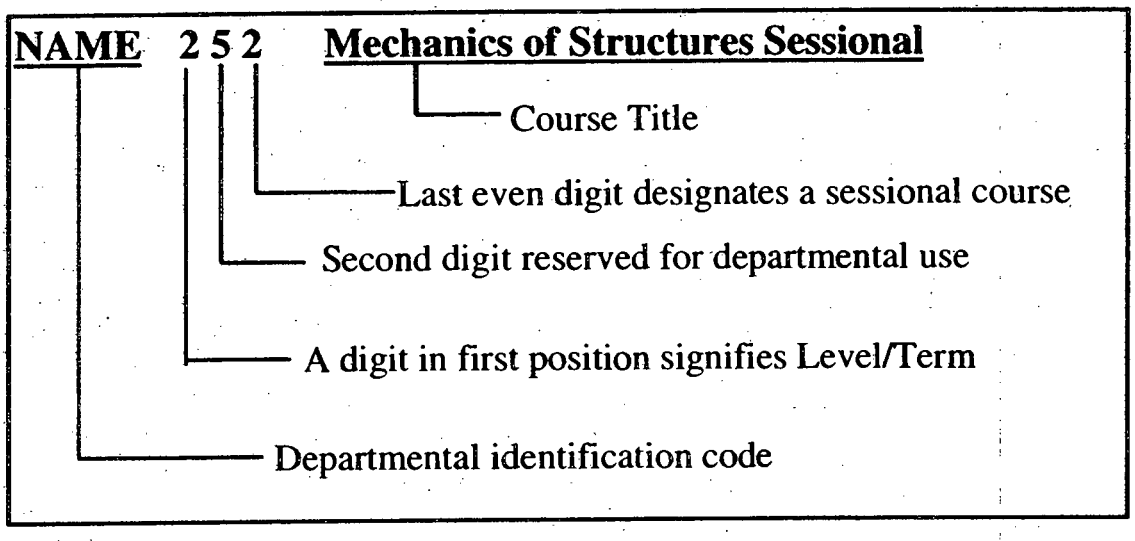
(a) The first digit will correspond to the year/level in which the students normally take the course.

(b) The second digit will be reserved for departmental use for such things as to identify different areas within a department.

(c) The last digit will usually be odd for theoretical and even for laboratory or sessional courses.

The course designation system is illustrated by two examples.





3.4.2 Assignment of Credits

(i) Theoretical Courses: One lecture per week per term will be equivalent to one credit

(ii) Laboratory/Sessional/Design: Credits for laboratory/sessional or design courses will be half of the class hours per week per term

Credits are also assigned to project and thesis work taken by students. The amount of credits assigned to such work may vary from discipline to discipline.

The curriculum does not demand the same rate of academic progress from all students for obtaining the degree but only lays down the pace expected of a normal student. A student whose background or capacity

for assimilation is lower will be permitted to complete the program at a slower pace by studying a lesser number of courses during a given term (subject to a minimum course load). He may keep pace with his class by taking during the Short Term those courses, which he had dropped during the Regular Terms, or by covering the entire degree program over an extended period without developing any feeling of inferiority complex.

3.5 Types of Courses

The courses included in undergraduate curricula are divided into several groups as follows:

3.5.1 Core Courses

In each discipline a number of courses will be identified as core courses, which form the nucleus of the respective bachelor's degree program. A student has to complete all of the designated core courses for his discipline.

3.5.2 Pre-requisite Courses

Some of the core courses are identified as pre-requisite courses. A pre-requisite course is one, which is required to be completed before some other course(s) can be taken. Any such course, on which one or more subsequent courses build up, may be offered in each of the two regular terms.

3.5.3 Optional Courses

Apart from the core courses, students will have to complete a number of courses, which are optional in nature in that students will have some choice to choose the required number of courses from a specified group/number of courses.

3.6 Course Offering and Instruction

The courses to be offered in a particular term will be announced and published in the Course Catalog along with a tentative Term Schedule before the end of the previous term. Whether a course is to be offered in any term will be decided by the respective BUGS. Respective

departments may arrange to offer one or more pre-requisite or core courses in any term depending on the number of students who dropped or failed the course in the previous term.

Each course is conducted by a teacher. The course teacher is responsible for maintaining the expected standard of the course and for the assessment of student's performance. Depending on the strength of registered students (i.e. the number of students) enrolled for course, the teacher concerned might have course associates and teaching assistants (TA) to help him in teaching and assessment.

For a course strength necessitating two or more parallel classes or sections, one of the course teachers or any other member of the teaching staff of the department be designated as course coordinator. He/she has the full responsibility for coordinating the work of the other members of the department involving in that course.

3.7 Departmental Monitoring Committee

Consistent with its resilient policy to keep pace with new developments in the field of science and technology, the university will update its course curriculum at frequent intervals (at least every three years). Such updating aims not only to include the expanding frontiers of knowledge in the various fields but also to accommodate the changing social, industrial and professional need of the country. This can be done through deletion and modification of some of the courses and also through the introduction of new ones.

BUGS of each department will constitute a Departmental Monitoring Committee with three teachers of the department. This committee will monitor and evaluate the performance of the Course System within the department. In addition to other teachers of the department, the committee may also propose from time to time to the Board of Undergraduate Studies any changes and modifications needed for upgrading the Undergraduate Curriculum and the Course System.

3.8 Teacher Student Contact

The proposed system encourages students to come in close contact with teachers. For promotion of teacher-student contact, each student is assigned to an Adviser and the student is free to discuss with his adviser

all academic matters, especially those related to courses taken and classes being attended by him. Students are also encouraged to meet with other teachers any time for help on academic matters.

3.9 Student Adviser

One Adviser would normally be appointed for a batch of student by the Undergraduate Board of Studies of the concerned department(s) who will advise each student on the courses to be taken by a student. Adviser will discuss with the student his academic program and then decide the number and nature of courses for which he can register. However, it is the student's responsibility to keep contacts with his adviser who will review and eventually approve the student's specific plan of study and check on subsequent progress. The adviser should be in the rank of an Assistant Professor or above from the concerned department(s).

For a student of second and subsequent terms, the number and nature of courses for which he can register will be decided on the basis of his academic performance during the previous term. The adviser will advise the students to register for the courses during the next term within the framework of the guidelines in respect of minimum/maximum credit hours limits, etc. which are elaborated at appropriate places in this report. He is also authorized to permit the student to drop one or more courses based on his academic performance and the corresponding categorization.

Special provisions exist for academically weak students with regard to make-up courses.

3.10 Registration Requirements

Any student who makes use of class room or laboratory facilities or faculty time is required to register formally. Being admitted to the university, each student is assigned to a student adviser. The student can register for courses he intends to take during a given term only on the basis of the advice and consent of his adviser.

3.10.1 Registration Procedure

Students must register for each class in which they will participate. Each student will fill up his/her Course Registration Form in consultation with

and under the guidance of his adviser. The original copy of the Course Registration Form will be submitted to the Registrar's Office, and then the requisite number of photo copies will be made by the Registrar's Office for distribution. The date, time and venue will be announced in advance by the Registrar's Office. Much counseling and advising are accomplished at registration time. It is absolutely necessary that all students present themselves at the registration desk at the specified time.

3.10.2 Limits on the Credit Hours to be taken

A student must be enrolled in at least 15 credit hours. He may be allowed to enroll in up to a maximum of 24 credit hours if recommended by his/her Adviser. A student must enroll for the prescribed sessional/laboratory courses in the respective term within the allowed credit-hour limits.

In special cases where a student cannot be allotted the minimum required 15 credit hours in a term, the relevant Board of Undergraduate Studies (BUGS) may approve a lesser number of credit hours to suit individual requirements. Such cases shall only be applicable to students needing less than 15 credits for graduation.

3.10.3 Pre-condition for Registration

A student will be allowed to register in those courses subject to the capacity constrains and satisfaction of pre-requisite courses. If a student fails in a pre-requisite course in any term, the concerned BUGS may allow him to register for a course which builds on the pre-requisite course provided his attendance and grades in continuous assessment in the said pre-requisite course is found to be satisfactory.

Registration will be done at the beginning of each term. The Registration program with dates and venue will be announced in advance. Late registration is, however, permitted during the first week on payment of a late registration fee. Students having outstanding dues to university or a hall of residence shall not be permitted to register. All students have, therefore, to clear their dues and get a clearance or no dues certificate, on the production of which, they will be given necessary Course Registration Forms and complete the course registration procedure. Registration Forms will normally available in the Register's Office.

However, for the First level students, prior department-wise enrollment/admission is mandatory. An orientation program will be conducted for them at the beginning of the first term when they will be handed over the registration package on producing enrollment slip/proof of admission.

3.10.4 Pre-registration

Pre-registration for courses to be offered by the students in a particular term will be done on a specified dates before the end of the previous term. All students in consultation with their course adviser are required to complete the pre-registration formalities, failing which a fine of Tk. xx.xx (amount may be decided by the authority) will have to be paid before registration in the next term. Further a student who does not pre-register may not get the courses desired by him subsequently.

3.10.5 Registration Deadline

Student must register for the courses to be taken before the commencement of each term and no late registration will be accepted after one week of classes. Late registration after this date will not be accepted unless the student submits a written appeal to the Registrar through the concerned Head and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be presented) from the Chief Medical Officer of the University or some other academic commitments which precluded enrolling prior to the last date of registration.

3.10.6 Penalty for Late Registration

Students who fail to register during the designated dates for registration are charged a late registration fee of Tk. **** (amount may be decided by the authority). This extra fee will not be waived whatever be the reason for late registration.

3.10.7 Course Adjustment Procedure

A student will have some limited options to add or delete courses from his/her registration list, within the first two weeks from the beginning of the term. He/She may add courses only within the first two weeks of a

regular term and only the first week of Short Term. Incase of dropping a course a student will be allowed to do so within four weeks after the commencement of a regular term and two weeks after commencement of a Short Term. Adjustment of initially registered courses in any term can be done by duly completing the Course Adjustment Form. These forms will normally be available in the Registrar's Office. For freshman students such forms can be included in the registration packet at the time of orientation.

Any student willing to add or drop courses will have to fill up a Course Adjustment Form in consultation with and under the guidance of his adviser. The original copy of the Course Adjustmen Form will be submitted to the Registrar's Office, and then the requisite number of photo copies will be made by the Registrar's Office for distribution to the concerned Adviser, Head, Dean, Controller of Examination and the student.

All changes in courses must be approved by the Adviser and the Head of the department concerned. The Course Adjustment Form will have to be submitted to the Registrar's Office after duly filled in and signed by the concerned persons. To add/drop a course respective teacher's consent will be required

3.10.8 Withdrawal from a Term

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 within a week after the end of the Term Final Examination. However, he/she may chose not to withdraw any laboratory / sessional / design course if the grade obtained in such a course is 'D' or better. The application must be supported by a medical certificate from the Chief Medical Officer of the University. The Academic Council will take the final decision about such application.

3.11 The Grading System

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/in class evaluation, class participation,

homework assignments, and a term final examination. The assessment in laboratory/sessional courses is made through observation of the student at work in class, viva-voce during laboratory hours, and quizzes. For architecture students, assessments in design sessional would be done through evaluation of a number of projects assigned throughout the term. As discussed earlier, each course has a certain number of credits, which describe its weightage. 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 is measured by the number of credits that he/she has completed satisfactorily and the weighted average of the grade points that he/she has maintained. A minimum grade point average is required to be maintained for satisfactory progress. Also a minimum number of earned credits should be acquired in order to qualify for the degree as prescribed under Article3.22.

Letter grades and corresponding grade points will be awarded in accordance with provisions shown below.

Numerical grade	Letter Grade	Grade Point
80% or above	A^+ (A plus)	4.00
75% to less than 80%	A (A regular)	3.75
70% to less than 75%	A^- (A minus)	3.50
65% to less than 70%	B^+ (B plus)	3.25
60% to less than 65%	B(B regular)	3.00
55% to less than 60%	B^- (B minus)	2.75
50% to less than 55%	C^+ (C plus)	2.50
45% to less than 50%	C (C regular)	2.25
40% to less than 45%	D	2.00
less than 40%	F	0
Continuation (for project & thesis / design courses)	X	--

3.11.1 Distribution of Marks

Thirty percent (30%) of marks shall be allotted for continuous assessment, i.e., quizzes and homework assignments, in class evaluation and class participation. The remainder of the marks will be allotted to TERM FINAL examination which will be conducted centrally by the University. There will be internal and external examiners for each course

in the Term Final Examination of 3 hour duration. The distribution of marks for a given course will be as follows:

Class Participation	10%
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:

Attendance	Marks
90% and above	10
85% to less than 90%	9
80% to less than 85%	8
75% to less than 80%	7
70% to less than 75%	6
65% to less than 70%	5
60% to less than 65%	4
less than 60%	0

The number of quizzes of a course shall be at least n+1, where n is the number of credits of the course. Evaluation of the performance in quizzes will be on the basis of the best n quizzes. The scheme of continuous assessment that a teacher proposes to follow for a course will be announced on the first day of classes.

3.12 Earned Credits

The courses in which a student has obtained 'D' or a higher grade will be counted as credits earned by him/her. Any course in which a student has obtained 'F' grade will not be counted towards his/her earned credits.

A student who obtains 'F' grade in a Core Course in any term will have to repeat the course

If a student obtains 'F' grade in an Optional Course he / she may choose to repeat the course or take a Substitute Course if available.

F' grade will not be counted for GPA calculation but will stay permanently on the Grade Sheet and Transcript. When a student will repeat a course in which he / she previously obtained 'F' grade, he/she will not be eligible to get a grade better than 'B' in such a course.

If a student obtains a grade lower than 'B' in a course, he/she will be allowed to repeat the course only once for the purpose of grade improvement by forgoing his/her earlier grade, but he/she will not be eligible to get a grade better than 'B' in such a course. A student will be permitted to repeat for grade improvement purposes a maximum of four courses in B. Sc Engg. and BURP programs and a maximum of five courses in B. Arch program.

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

3.13 Honours

Candidates for Bachelor's degree in engineering and architecture will be awarded the degree with honours if their over all GPA is 3.75 or better.

3.13.1 Dean's List

As a recognition of excellent performance, the names of students obtaining an average GPA of 3.75 or above in two regular Terms in each academic year may be published in the Dean's List in each faculty. Students who have received F grade in any course during any of the two regular terms will not be considered for Dean's List in that year.

3.14 Calculation of GPA

Grade Point Average (GPA) is the weighted average of the grade points obtained in all the courses passed/completed by a student. For example, if a student passes/completes five courses in a term having credits of C_1, C_2, C_3, C_4, and C_5 and his grade points in these courses are G_1, G_2, G_3, G_4, and G_5, respectively then

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

3.14.1 A Numerical Example

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

Course	Credits	Grade	Grade Points
NAME 117	3	A^+	4.00
NAME 219	3	B	3.00
NAME 329	3	A	3.75
MATH 205	2	B^+	3.25
HUM 203	1	A^-	3.50

Then his GPA for the term will be computed as follows:

$$GPA = \frac{3\times4.0+3\times3.0+3\times3.75+2\times3.25+1\times3.5}{3+3+3+2+1} = 3.52$$

3.15 Student Classification

For a number of reasons it is necessary to have a definite system by which to classify students as First Year/Freshman, Second Year/Sophomore, Third Year/Junior and Fourth Year/Senior. At BUET, regular students are classified according to the number of credit hours earned towards a degree. The following classification applies to the students.

Year/Level	Earned Credit Hours	
	Engineering/URP	Architecture
First Year (Freshman) Level I	0 to 36	0 to 34
Second Year (Sophomore) Level II	37 to 72	>34 to 72
Third Year (Junior) Level III	73 to 108	>72 to 110
Fourth Year (Senior) Level IV	109 and above	>110 to 147
Fifth Year Level V		>147

3.16 Registration for the Second and Subsequent Terms

A student is normally required to earn at least 15 credits in a term. At the end of each term, the students will be classified into the following three categories:

Category 1: Consisting of students who have passed all the courses prescribed for the term and have no backlog of courses. A student belonging to Category 1 will be eligible to register for all courses prescribed for the next term.

Category 2: Consisting of students who have earned at least 15 credits in the term but do not belong to category 1. A student belonging to Category 2 is advised to take at least one course less in the next term subject to the condition that he has to register for such backlog courses as may be prescribed by the adviser.

Category 3: Consisting of students who have failed to earn 15 credits in the term. A student belonging to Category 3 is advised to take at least two courses less subject to registration for a minimum of 15 credits. However he will be required to register for such backlog courses as may be prescribed by the adviser.

3.17 Performance Evaluation

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. The term grade point average is computed dividing the total grade points earned in a term by the number of term hours taken in that term. The overall or cumulative grade point average (CGPA) is computed by dividing the total grade points accumulated up to date by the total credit hours earned. Thus a student who has earned 275 grade points in attempting 100 credit hours of courses would have an overall grade point average of 2.75.

Students will be considered to be making normal progress toward a degree if their cumulative or overall GPA for all work attempted is 2.20 or more. Students who regularly maintain Term GPA of 2.20 or better

are making good progress toward their degrees and are in good standing with the university.

Students who fail to maintain this minimum rate of progress will not be in good standing. This can happen when one or more of the following conditions exist:

(i) Term GPA falls below 2.20, or
(ii) Cumulative GPA falls below 2.20
(iii) Earned credits fall below 15 times the Number of Terms Attended/Studied

All such students can make up deficiencies in GPA and credit requirements by completing courses in next term(s) and backlog courses, if there be any, with better grades. When GPA and credit requirements are achieved, the student is returned to good standing.

3.18 Academic Progress, Probation and Suspension

Academic Progress: Undergraduate students will be considered to be making normal progress toward a degree if their cumulative or overall GPA for all work attempted is not less than 2.20.

Probation and Suspension: Undergraduate students who regularly maintain Term GPA of 2.20 or better are making good progress toward their degrees and are in good standing with the university. Students who fail to maintain this minimum rate of progress may be placed on academic probation.

The status of academic probation is a reminder/warning to the student that satisfactory progress towards graduation is not being made. A student may be placed on academic probation when either of the following conditions exist:

(i) The Term GPA falls below 2.20, or
(ii) The cumulative GPA falls below 2.20

Students on probation are subject to such restrictions with respect to courses and extracurricular activities as may be imposed by the respective Dean of faculty.

The minimum period of probation is one term, but the usual period is for one academic year. This allows the student an opportunity to improve the GPA through the completion of additional course work during the period that the student is on probation. The probation is extended for additional terms until the student achieves an overall GPA of 2.20 or better. When that condition is achieved, the student is returned to good standing.

Academic probation is not to be taken lightly - it is very serious matter. A student on academic probation who fails to maintain a GPA of at least 2.20 during two consecutive academic years may be suspended from this university. A student who has been suspended may petition the Dean of faculty, but this petition will not be considered until the student has been suspended at least one full Term.

Petitions for reinstatement must set forth clearly the reasons for the previous unsatisfactory academic record and it must delineate the new conditions that have been created to prevent the recurrence of such work. Each such petition is considered individually on its own merits.

After consideration of the petition, and perhaps after consultation with the student, the Dean in some cases, reinstate the student if this is the first suspension. However, a second suspension will be regarded as final and absolute.

3.19 Measures for Helping Academically Weak Students

The following provisions will be made as far as possible to help academically weak students to enable them to complete their studies within the maximum period of seven years in engineering and eight years in architecture students, respectively:

a) All such students whose cumulative grade point average (CGPA) is less than 2.20 at the end of a term may be given a load of not exceeding four courses, in the next term.

b) For other academic deficiencies, some basic and core courses may be offered during the Short Term in order to enable the student to partially make-up for the reduced load during Regular Terms.

Following criteria will be followed for determining academically weak students:

a) CGPA falling below 2.20.
b) Term grade point average (TGPA) falling below 2.20 points below that of previous term.
c) Earned credit falling below 15 times the number of terms attended.

3.20 Special Courses

a) These courses, which include self-study courses, will be from amongst the regular theory courses listed in the course catalog, a special course can be run only in exceptional cases.

b) Whether a course is to be floated, as a special course will be decided by the Head of concerned department in consultation with the teacher/course co-coordinator concerned. Decision to float a course, as a special course shall be reported to the Academic Council.

c) The special course may be offered to any student in his/her last term if it helps him/her to graduate in that term. It will be offered only if the course is not running in that term as a regular course.

d) Normally no lecture will be delivered for the special course but laboratory/design classes may be held if they form a part of the course. The course coordinator/course teacher will also assign homework's; administer quizzes and final examination for giving his or her assessments at the end of the term.

e) A student will be allowed to register for a maximum of two courses on self-study basis.

f) A Special Course shall not be utilized for grade improvement purposes.

3.21 Rules for Courses offered in a Short Term

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 constrains and satisfaction of pre-requisites.

b) Students will be allowed to register in a maximum of two courses during the Short Term.

c) A course may be given weight age up to 6 credits in any Short Term following a graduating/final term if he/she is short by a maximum of 6 earned credits only, one a self-study basis with no formal instruction. In a self-study course there will be a Final Examination, beside the continuous assessment.

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

3.22 Minimum Earned Credit and GPA Requirements for Obtaining Graduation

Minimum credit hour requirements for the award of Bachelor's Degree in engineering and architecture will be decided by the respective Undergraduate Board of Studies (BUGS). However, at least 157 credit hours for engineering and 190 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, URP or architecture is 2.20.

Completion of fulltime studentship: Students who have completed Minimum credit requirement for graduation for a Bachelors degree shall not be considered and registered as fulltime students

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 *URP and 18 such additional credits in architecture beyond respective credit-hour requirements for bachelor's degree during his/her entire period of study.

3.22.1 Application for Graduation and Award of Degree

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 on completion of credit and GPA requirements. Such provisional degrees will be confirmed by the Academic Council.

3.23 Industrial/Professional Training Requirements

Depending on each department's own requirement a student may have to complete a prescribed number of days of industrial/professional training in addition to minimum credit and other requirements, to the satisfaction of the concerned department.

3.24 Time Limits for Completion of Bachelor's Degree

A student must complete his studies within a maximum period of seven years for engineering and URP and eight years for architecture

3.25 Inclusion of Repeater from Annual System in Course System

Repeater students including private students of annual system will be included in the Course System of curricula as and when such situation will arise.

3.25.1 Equivalence of Courses and Grades

Equivalence of courses passed previously by any repeater student including private students shall be determined by the respective BUGS for the purpose of:

(a) Allowing course exemption, and
(b) conversion of numerical grades into letter grades in exempted courses

3.25.2 Exemption of Courses

Repeater students including private students may be granted exemption in theoretical course(s) in which he secured 45% or more marks and in sessional/laboratory course(s) in which he secured 41% or more marks.

3.25.3 Time Limit for Completion of Bachelor's Degree

Time allowed for a student included in Course System from Annual System to complete studies leading to a bachelor's degree will be proportional to the remaining credits to be completed by him/her.

A student in engineering, for example, having earned 40 credit hours through equivalence and exemption (of previously completed courses)

out of a total requirement of 160 credits for bachelor's degree will get (7 yrs X 120/160 = 5.25) = 5 1/2 years (rounded to next higher half-a-year) or 11 (eleven) Regular Terms to fulfill all requirements for bachelor's degree. For a student in architecture time allowed will be calculated in a similar way.

3.25.4 Relaxation of course registration for student transferred to course system from annual system

The requirement of registrations of a minimum 15 credit hours in a term shall be waived for only the terms of the level where he/she has been transferred in course system provided that he/she has been granted exemption in some of the courses offered in those terms.

3.26 Attendance, Conduct, Discipline etc.

3.26.1 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 at least 60% of all classes held in every course..

3.26.2 Conduct and Discipline

A student shall conform to a high standard of discipline, and shall conduct himself, within and outside the precincts of the university in a manner befitting the students of a university of national importance. He shall show due courtesy and consideration to the employees of the university and Halls of Residence, good neighborliness to his fellow students and the teachers of the university and pay due attention and courtesy to visitors.

To safeguard its ideals of scholarship, character and personal behavior, the university reserves the right to require the withdrawal of any student at any time for any reason deemed sufficient.

3.27 Absence during 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 Term Final Examination will result in 'F' grades.

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 a make-up quizzes or assignments immediately on returning to the classes. Such request should be supported by medical certificate from a university Medical officer. The medical certificate issued by registered medical practitioners (with the Registration Number shown explicitly on the certificates) will also be acceptable only in those cases where the student has valid reasons for his absence from the university.

DEPARTMENTAL CODE

01	Architecture
02	Chemical Engineering
03	Civil Engineering
04	Chemistry
05	Computer Science and Engineering
06	Electrical & Electronic Engineering
07	Humanities
08	Industrial & Production Engineering
09	Mathematics
10	Mechanical Engineering
11	Metallurgical Engineering
12	**Naval Architecture & Marine Engineering**
13	Petroleum & Mineral Resources Engineering
14	Physics
15	Urban & Regional Planning
16	Water Resources 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	29	20
Theory (Credit Hours/Contact Hours)	117/117	69/ 69
Sessional (Credit Hours/Contact Hours)	43.5/87	31.5/63
Total Credit hours	160.50	
Total contact hours	204.00	

Contact hours and credit hours in eight terms in NAME department

Level-Term	Contact hours for Theory courses	Contact hours for Sessional courses	Cumulative contact hours	Cumulative credit hours
1-I	14.0	10.5	24.5	19.25
1-II	15.0	9.0	48.5	38.75
2-I	14.0	10.5+3.0*	76.0	59.50
2-II	14.0	12.0	102	79.50
3-I	14.0	12.0+3.0*	131	101.00
3-II	16.0	9.0	156	121.50
4-I	15.0	9.0	180	141.00
4-II	15.0	9.0	204	160.50
Total	**117.0**	**87**	**204**	**160.50**

***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
1-II	-	3+0	3+1.5	3+1.5	6+1.5	-	15+4.5
2-I	2+1.5	3+0	-	6+3+1.5*	3+.75	-	14+5.25+1.5*
2-II	2+0	3+0	-	6+4.5	3+1.5	-	14+6
3-I	2+0	-	-	9+6+1.5*	-	3+0	14+6+1.5*
3-II	-	4+0	-	9+4.5	-	3+0	16+4.5
4-I	-	-	-	6+4.5	3+0	6+0	15+4.5
4-II	-	-	-	9+4.5	-	6+0	15+4.5
Total	**8+1.5**	**16+0**	**9+3**	**51+(28.5+3)**	**15+7.5**	**18+0**	**117+43.5**

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

Level- 1 Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Chem 109	Chemistry –1	3	3
Hum 111	English	2	2
Math 181	Differential Calculus and Integral Calculus	3	3
NAME 117	Hydrostatics and Stability	3	3
Phy 105	Structure of Matter, Electricity, Magnetism and Modern Physics	3	3
Sessional Courses			
ME 160	Mechanical Engineering Drawing-1	3	1.5
Chem 114	Chemistry Sessional –1	3	1.5
Shop 188	Foundry and Welding Shop Sessional	3	1.5
Shop 186	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		
EEE 161	Electrical Engineering Principles	3	3
Phy 107	Waves and Oscillations, Geometrical Optics and Wave Mechanics	3	3
Math 183	Coordinate Geometry and Ordinary Differential Equation	3	3
ME 169	Basic Thermal Engineering	3	3
NAME 123	Fluid Mechanics	3	3
	Sessional Courses		
NAME 124	Fluid Mechanics Sessional	3	1.5
ME 170	Basic Thermal Engineering. Sessional.	3	1.5
Phy 102	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			
HUM 113	Economics	2	2
Math 281	Vector Analysis and Differential Equation (Special Types)	3	3
MME 293	Shipbuilding Materials	3	3
NAME 219	Marine Engines and Fuels	3	3
NAME 251	Mechanics of Structure	3	3
Sessional Courses			
Hum 102	English Sessional	3	1.5
MME 294	Shipbuilding Materials Sessional	1.5	0.75
NAME 218	Ship Design Laboratory – I	3	1.5
NAME 252	Mechanics of Structure Sessional	3	1.5
	Total (5T + 4S)	**24.50**	**19.25**
Training course during vacation			
NAME 200	Shipyard Practice-1 (3 weeks consolidated)	3	1.5

Level -2 Term –2

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Hum 211	Sociology	2	2
EEE 261	Electrical and Electronic Technology for Marine Engineers	3	3
Math 283	Statistics, Partial Differential Equation and Matrices	3	3
NAME 223	Marine Hydrodynamics	3	3
NAME 225	Shipbuilding Technology –I	3	3
Sessional Courses			
EEE 262	Electrical and Electronic Technology for Marine Engineers Sessional	3	1.5
NAME 224	Marine Hydrodynamics Sessional	3	1.5
NAME 228	Ship Design Laboratory -II	3	1.5
NAME 246	Computer Aided Design (CAD)	3	1.5
	Total (5T + 4S)	**26.00**	**20.00**

Level-3, Term-I

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Hum 313	Principles of Accounting	2	2
NAME 317	Design of Marine Vehicles	3	3
NAME 319	Theory of Machines	3	3
NAME 351	Ship Structure	3	3
Optional courses (any one **)			
NAME 315	Country Boats	3	3
NAME 335	Port and Harbor Engineering	3	3
NAME 353	Sea Waves and Spectral Analysis	3	3
NAME 357	Marine Pollution	3	3
NAME 371	Finite Element Method for Ship Structure	3	3
Sessional Courses			
NAME 318	Ship Design Laboratory – III	3	1.5
NAME 336	Computer Programming in Ship Design-I	3	1.5
NAME 338	Ship Design Project and Presentation		
NAME 352	Ship Structure Sessional	3	1.5
	Total (5T+4S)	**26.00**	**20.00**
Training course during vacation			
NAME 300	Shipyard Practice-II (3 weeks consolidated)	3	1.5

Level-3, Term-II

Course No.	Course Title	Contact hours	Credit hours
Theoretical Courses			
Math 381	Fourier Analysis, Harmonic Function, Complex Variable and Laplace Transforms	4	4
NAME 323	Resistance and Propulsion of Ships		
NAME 325	Shipbuilding Technology-II	3	3
NAME 329	Heat Transfer	3	3
Optional courses (any one **)			
NAME 327	Economic and Social Aspects of Marine Transportation System	3	3
NAME 343	Marine Acoustics	3	3
NAME 347	Design of Special Ships	3	3
NAME 363	Computational Fluid Dynamics (CFD)	3	3
Sessional Courses			
NAME 324	Resistance and Propulsion of Ships Sessional	3	1.5
NAME 328	Ship Design Laboratory IV	3	1.5
NAME 338	Ship Design Project and Presentation	3	1.5
	Total (5T+3S)	**25.00**	**20.50**

Level-4, Term-I

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

Level -4, Term-II

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

GROUP A: Hydrodynamics and Structural Division (TABLE A)

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

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

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

** Optional courses are divided into two major divisions:

1) Hydrodynamics and Structural division and
2) Design and Production division.

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

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

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

4.3.1 Compulsory Courses

NAME 117: Hydrostatics and Stability
3.00 Credit, 3 hrs. /wk

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

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

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

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

Experiments based on NAME 123

NAME 200: Shipyard Practice-I
1.50 Credit, 3 hrs. /wk.

Practical works concentrated in 3 weeks.

Ship construction: mould loft, gas cutting, welding, fabrication, subassembly, assembly, field assembly, erection, launching, outfitting, delivery trial. Diesel engine workshop practice.

NAME 218 Ship Design Laboratory I
1.50 Credit, 3 hrs. /wk.

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

NAME 219: Marine Engines and Fuels
3.00 Credit, 3 hrs. /wk.
Prereq. ME 169

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

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

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

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

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

flows, vorticity, velocity potential functions, stream functions, Euler's equation of motion, Bernoulli's equation, velocity and pressure distribution.

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

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

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

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

Experiments based on NAME 223

NAME 225: Shipbuilding Technology I
3.00 Credit, 3 hrs. /wk.

Development of ship welding. Different types of welding and their equipment. Welding principle, types of power sources and their characteristics. Welding methods: MMAW, GMAW, SAW, Electroslag welding, TIG. Types of welding joints. Welding symbols. Welding sequence in shipbuilding, Common defects in ship welding: welding distortion monitoring and control, inspection and testing of welded specimen. Non destructive testing. Methods and principles of cutting, cutting equipment. Steel surface preparation – shot blasting, acid pickling, etc. Introduction to the rules of Classification Societies.

NAME 228 Ship Design Laboratory II
1.50 Credit, 3 hrs. /wk.
Prereq.: NAME 117, NAME 218

Hydrostatic calculation, stability and cross curves, trim calculations.

NAME 246: Computer Aided Design (CAD)
1.50 Credit, 3 hrs. /wk.

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

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

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

NAME 251: Mechanics of Structure
3.00 Credit, 3 hrs. /wk.

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

NAME 252: Mechanics of Structure Sessional
1.50 Credit, 3 hrs. /wk.

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

NAME 300: Shipyard Practice -II
1.50 Credit, 3 hrs. /wk.

Practical works concentrated in 3 weeks.

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

NAME 317: Design of Marine Vehicles
3.00 Credit 3 hrs. /wk.
Prereq.: NAME 117

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

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

NAME 318: Ship Design Laboratory III
1.50 Credit, 3 hrs. /wk.
Prerequisite: NAME 218

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

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

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

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

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

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

Sessional based on NAME 323

NAME 325: Shipbuilding Technology II
3.00 Credit, 3 hrs. /wk.
Prereq.: NAME 225,

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

NAME 328: Ship Design Laboratory IV
1.50 Credit, 3 hrs. /wk.
Prerequisite: NAME 218, NAME 318

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

NAME 329: Heat Transfer
3.00 Credit, 3 hrs. /wk.

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

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

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

NAME 338: Ship Design Project and Presentation
3.00 Credit, 6hrs. /wk.
Prereq. NAME 218, NAME 318, NAME 246

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

Design of a particular ship: principal particulars, lines plan, displacement, general arrangement (GA), freeboard, volume, scantling, power, machinery, endurance, outfit, approximate trim and stability, light weight and deadweight, design update and final design with lines, GA, midship, profile, deck and bottom construction based on Rule Book, shell expansion, hydrostatic curves, trim and cross curves of stability, power, engine selection and propeller design.

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

Prereq.: NAME 251

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

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

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

NAME 400: Project and Thesis
4.50 Credit, 9 hrs/wk.

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

NAME 415: Marine Maintenance and Repair
3.00 Credit. 3 hrs/wk.
Prereq.: NAME 225 , NAME 325

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

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

Interpolation methods. Solution of numerical, algebraic and transcendental equations. Numerical differentiation and integration. Solving equations by finite difference technique. Regression analysis, the

method of least squares, curve fitting. Application to Naval Architecture problems.

NAME 419: Motion and Control
3.00 Credit, 3 hrs/wk.

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

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

NAME 427: Maritime System and Management
3.00 Credit. 3 hrs/wk.
Prereq.: NAME 317

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

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

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

Marine auxiliary machineries: windlasses, winches, cargo access equipment for dry, unitized, liquid and cryogenic cargoes, steering gear:

types and characteristics. Drive design criteria, testing, commissioning. Pipe materials, piping systems and valves, steam traps, anchors, anchor hawse, chains, etc. Emergency systems. Propeller, shaft and stern gear arrangement.

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

Sessional based on NAME 219 and NAME 429

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

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

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

NAME 449: Navigation and Maritime Regulations
3.00 Credit. 3 hrs/wk.

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

4.3.2 Optional Courses

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

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

NAME 327: Economic and Social Aspects of Marine Transportation System
3.00 Credit. 3 hrs/wk.

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

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

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

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

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

NAME 347: Design of Special Ships
3.00 Credit. 3 hrs/wk.
Prereq. NAME 317

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

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

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

NAME 357: Marine Pollution
3.00 Credit. 3 hrs/wk.

General concepts of marine pollution. Types of marine pollution: oil pollution, heavy metal pollution, synthetic organic chemical pollution, eutrophication. Biological consequences of marine pollutants – substances harmful to living organisms. Sources of marine pollution: natural, transportation, accidents, and routine discharge. Monitoring of

pollution and environmental impact assessment. Life cycle assessment of marine transport. Past, current, and proposed approaches for the improvement of marine pollution problems related to marine transports.

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

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

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

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

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

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

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

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

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

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

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

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

NAME 425: Shipyard Management
3.00 Credit. 3 hrs/wk.

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

NAME 439: Ship Vibration
3.00 Credit. 3 hrs/wk.

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

ship. Consequences of vibration in different types of vessels. Reduction of vibration by propeller and machinery selection, suppression, isolation and insulation.

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

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

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

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

NAME 455: Computer Aided Ship Production
3.00 Credit. 3 hrs/wk.
Prereq. NAME 246, NAME 325

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

NAME 457: Fishing Vessel Technology
3.00 Credit. 3 hrs/wk.
Prereq. NAME 317

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

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

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

NAME 465: Marine Production and Planning
3.00 Credit. 3 hrs/wk.

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

NAME 467: Control Engineering
3.00 Credit. 3 hrs/wk.

Introduction to theory of control system, mechanical, hydraulic, pneumatic, thermal and electro-mechanical control systems. Representation of control systems- block diagrams. Study of frequency,

step function and system responses. Transfer functions and characteristics functions. Routh's criterion for stability. System analysis – Nyquist and Bode diagrams. Root locus plots.

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

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

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

NAME 471: Computer Aided Ocean Structure Analysis
3.00 Credit. 3 hrs/wk.
Prereq. NAME 251, NAME 351

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

NAME 475: Dredger and Dredging Technology
3.00 Credit. 3 hrs/wk.

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

Cutter suction dredger: design features, types of cutter, design of ladder, performance parameters, positioning system. Dredging calculation: estimating discharge-head, effect of dredge material characteristics,

pump performance characteristics, estimation of output of various types of dredging. Special features of dredge pump. Types of floaters. Pipeline fittings. Brief review of dredging operation, dredging need in Bangladesh.

NAME 477: Optimization Methods in Ship design

3.00 Credit, 3 hrs/wk.

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

NAME 481: Optimum Structural Design

3.00 Credit, 3 hrs/wk.

Prereq.: NAME 251, NAME 351

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

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

4.4 Detail Syllabus of Undergraduate Courses offered by other departments

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

Modern concept of Atomic Structure, Advanced concepts of bonds and molecular structure, Crystal structures, Modern periodic table, Chemistry of Transition metals, Properties and uses of noble gases, Acids and Bases, Chemistry of solutions, Properties of dilute solutions, Chemical equilibrium, Thermo chemistry, Electrochemical cells, Ionization of water and p^H, Chemical kinetics, Phase rule and phase diagrams, Selected topics on organic chemistry, Introduction to organic polymer, Basic concepts of dyes color and constitution.

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

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

EEE 161: Electrical Engineering Principles
3.00 Credit, 3 hrs/wk.

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

EEE 261: Electrical and Electronic Technology for Marine Engineers
3.00 Credit, 3 hrs/wk.

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

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

Laboratory experiments based on EEE 261.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Math 181: Differential Calculus and Integral Calculus
3.00 Credit, 3 hrs/wk.

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

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

Math 183: Co-ordinate Geometry and Ordinary Differential Equation
3.00 Credit, 3 hrs/wk

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

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

Math 281: Vector Analysis and Differential Equation (Special Types)
3.00 Credit, 3 hrs/wk

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

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

Math 283: Statistics, Partial Differential Equation and Matrices
3.00 Credit, 3 hrs/wk

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

Partial Differential Equation: Introduction, Equations of the linear and non-linear first order, Standard forms, Linear equations of higher order, Equations of the second order with variable co-efficients.

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

Math 381: Fourier Analysis, Harmonic Function, Complex Variable and Laplace Transforms
4.00 Credit, 4 hrs/wk

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

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

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

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

ME 160: Mechanical Engineering Drawing-I
1.50 Credit, 3 hrs. /wk.

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

ME 169: Basic Thermal Engineering
3.00 Credits, 3 hrs. /wk.

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

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

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

Sessional based on ME 169

MME 293: Shipbuilding Materials
3.00 Credit, 3 hrs. /wk.

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

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

Experiments based on MME 293

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

Laboratory Experiments Based on Phy 107

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

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

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

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

Phy 107: Waves & Oscillations, Geometrical Optics and Wave Mechanics

3.00 Credit 3 hrs. /wk.

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

Geometrical Optics: Combination of lenses: Equivalent lens and equivalent focus length, Cardinal points of a lens, Power of a lens; Defects of images: Spherical aberration, Astigmatism, Coma, Distortion, Curvature, Chromatic aberration; Optical Instruments: Compound microscope, Polarizing microscope, Resolving power of a microscope, Camera and photographic techniques.

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

Shop 186: Machine Shop Sessional
0.75 Credit, 1.5 hrs. /wk.

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

Shop 188: Foundry and Welding Shop Sessional
1.50 Credit, 3 hrs. /wk.

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

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

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

5.1 For Master's and M. Phil. Degrees

For all post graduate degrees in Engineering, Architecture, Urban and Regional Planning and Physics, Chemistry and Mathematics, in addition to test, assignments and /or examinations during the semester may be given by the teacher(s) concerned, there shall be a written examination and /or other test for each of the subjects offered in a semester at the end of that semester. The dates of which shall be announced by the Dean of the respective faculties at least two weeks before the commencement of the examination. The final grade in a subject shall be based on the performance in all tests, assignments and /or examinations.

5.1.1 Grading System:

Final grades for courses shall be recorded as follows:

Grade	Merit Description	Grade Points	Numerical Markings
A (Plus)	Excellent	4.0	90% and above
A	Very good	3.5	80% to below 90%
B (Plus)	Good	3.0	70% to below 80%
B	Average	2.5	60% to below 70%
C	Pass	2.0	50% to below 60%
F	Failure	0	Below 50%
I	Incomplete	-	
S	Satisfactory	-	
U	Unsatisfactory	-	
W	Withdrawn	-	

Note:

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

- Given only a student is unable to complete the course because of circumstances beyond his control, it must be made up by the close next two semesters or the incomplete grade becomes a failure. He may, however, be allowed to register without further payment of tuition fees for that course.

5.1.2 Qualifying Requirements

The qualifying requirement for graduation is that a student must earn a minimum grade point of 2.65 based on the weighted average in his course work.

A student obtaining F grade in a course may be allowed to repeat the course with the prior approval of the BPGS. Performance in all the courses including all the F grades shall, however, be reflected in the transcript.

If the cumulative number of F grades obtained by the student is three or more in the same or different subjects taken together, he shall not be allowed to continue in the program.

If at the end of the second or any subsequent semester, the cumulative GPA falls below 2.5 he shall be allowed to continue in the program.

5.1.3 Thesis/Project

In addition to successful completion of course works every student shall submit a thesis on his research work or a report on his project work, fulfilling the requirements as detailed below.

Every candidate submitting a thesis/project in partial fulfillment of the requirements of a degree, shall be required to appear at an oral examination on date or dates fixed by the Head of the Department and must satisfy the examiners that he is cap[able of intelligently applying the results of this research to the solution of problems of undertaking independent work, and also afford evidence of satisfactory knowledge related to the theory and technique used in his research work.

5.2 For Doctoral (Ph.d.) Degree

5.2.1 Conduct of Examination

As in Art. 5.1.2 above for Masters and M. Phil. Degrees.

5.2.2 Qualifying Requirements

5.2.2.1 Course Work

To qualify for the degree a student must earn a minimum grade point of 2.75 based on the weighted average in his course work.

5.2.2.2 Comprehensive Examination

The date and time of the comprehensive examination shall be fixed by the doctoral committee on the request of the supervisor. Comprehensive examination shall ordinarily be held after the completion of the course work by the student.

The comprehensive examination shall comprise a written examination and/ or an oral examination to test the knowledge of the student in his field of study. The doctoral committee shall conduct the comprehensive examination. If a student fails to qualify in a comprehensive examination he shall be given one more chance to appear in the examination as scheduled by the doctoral committee.

If the cumulative number of F grades obtained by the student is three or more in the same or different subjects taken together, he shall not be allowed to continue the program.

Research work for a thesis shall be carried out in this university or at a place (s) approved by the doctoral committee in consultation of the supervisor.

5.2.3 Thesis

At the end of the student's research work the student shall submit a thesis, which must be an original contribution to engineering/sciences and worthy of publication. At least five type written copies of the thesis

in the final form must be submitted to the Head of the Department through the supervisor in the approved format.

In case a student fails to satisfy the Board of Examiners in thesis and/ or oral examination, the student shall be given one more chance to resubmit the thesis and/ or appear in oral examination as recommended by the Board.

A student who has been transferred to the Ph.d. program from the M.Sc. Engg./ M. Phil. Program may be awarded an M.Sc. Engg./ M. Phil. Degree on recommendation of the supervisor, if the student fails to qualify for the award of the Ph.D. degree.

6.1 Summary of Postgraduate Courses

Course No	Subject Title	Credit Hours
Math 6903	Applied Mathematics	3
NAME 6000	Thesis	18
NAME 6002	Project	6
NAME 6101	Ship Structures-I	3
NAME 6102	Ship Structures-II	3
NAME 6103	Finite Element Methods	3
NAME 6201	Ship Propulsion	3
NAME 6202	Theory of Wave Making Resistance	3
NAME 6203	Sea keeping Performance	3
NAME 6204	Weather Routing of Ships	3
NAME 6205	Boundary Layer Theory	3
NAME 6301	Analysis and Design of Welded Structures	3
NAME 6302	Ship Production Technology	3
NAME 6303	Computer Aided Hull Design	3
NAME 6401	Marine Transportation System	3
NAME 6402	Design of Cargo Access Equipment	3
NAME 6403	Computer Simulation	3
NAME 6501	Advanced Marine Engineering	3
NAME 6502	Marine Transmission Systems	3
NAME 6503	Control Theory in Marine System Design	3
NAME 6601	Mechanics of Water Waves	3
NAME 6602	Harbor Engineering	3
NAME 6603	Analysis of Offshore Structures	3
NAME 6604	Hydrodynamic Loading of Floating Bodies	3
NAME 6700	Seminar	0

One Non-Departmental Course other than Math 6903 may be registered.

6.2 Detailed Syllabus of Postgraduate Courses

Math 6903: Advanced Mathematics

Statistics: The Normal distribution. Correlation and Regression. Coefficient of Correlation. Correlation of time series. Characteristic Movements of time series. Moving averages. Measurement of seasonal variation, Forecasting. Chain Base Method and Cost of living index.

Numerical Analysis: Numerical solution of ordinary differential equation, Taylor series Method, Euler's method, Runge-Kutta method. Accuracy of one step method, multistep method. System of differential equation.

Boundary value and Engineering problems (linear and non linear). Shooting method (linear and non linear), finite difference method. Solution of applied problems. Solution of partial differential equation- Elliptic, Parabolic, Hyperbolic partial differential equation with special consideration to Heat Equation.

Fourier Analysis: Fourier series expansion for a single variable, Real and complex form, Convergent Fourier series, Calculus of Fourier series, Fourier integral formula and Fourier transforms. Fourier transform and its properties. Convergence of Fourier series, Fourier transforms for single and multivariable. The discrete Fourier transform and properties. Application in solving boundary value problems.

Advanced Vector Analysis: Kinematics and Differential Geometry, Elementary theory of surfaces, Metric.

NAME 6101: Ship Structure-I

Elastic Analysis-stiffness and flexibility, the equilibrium matrix, rigid and semi-rigid joint connections. Theory of plates and shells, the rectangular plates, large deflection theory of plates, membrane theory of shells. Introduction to finite element methods to simple ship structural problems.

NAME 6102: Ship Structure-II

Analysis of structural failure, plasticity, beam and frame analysis, yield line theory. Analysis of strength of welded ship grillage, optimum design. Mechanics of fracture-brittle and fatigue fractures, design application fracture mechanics. Materials for marine vehicles-the selection of construction steels, fiber reinforced plastics, concrete as a shipbuilding material. Simple economics for rivalries between materials. Design for production.

NAME 6103: Finite Element Methods

Introduction: influence co-efficient and stiffness matrices. Formulation and calculation of the finite element matrices using the principles of virtual displacements. Preparing computer programs. Introduction to the isoperimetric family of elements.

Familiarization with and use of existing finite element programs developed for marine structural analysis and design. Pre- and post-processors for data processing.

NAME 6201: Ship Propulsion

Introduction: Propeller Theory: Blade element theory, vortex theory-lifting line, lifting surface, lifting body; Propulsive Devices: Fixed pitch propeller, Ducted propeller, Contra Rotating propeller, Controllable pitch propeller; Propulsion Machinery: Selection of main machinery and auxiliaries.

NAME 6202: Theory of Wave Making Resistance

Ship wave making resistance; Ship wave systems; Wave making resistance of surface ship; Theoretical calculation of wave making resistance; Interference effects; Effects of viscosity; Scale effects; Comparison between calculated and observed wave making resistance; Design of bulbous bow; Recent developments in wave making resistance of ships.

NAME 6203: Sea-keeping Performance

Introduction: Seakeeping theories, Added resistance due to ship motion in regular and irregular waves, added resistance due to wave reflection, Methods of predicting added resistance in wave. Added resistance due to wind. Methods of predicting added resistance due to wind, Resistance increase due to steering on a straight course, Sea spectra, Response spectra, Involuntary speed loss and power increase at constant power and constant speed approach, Voluntary speed reduction in seaways, Weather routing of ships.

NAME 6204: Weather Routing of Ships

Introduction: Climatology, Seasonal Climatology of different ships, Trading routes, Coastal and landlocked areas, Storm pattern, Total marine environment, Wave theory and wave height, Wind speed relationship. Wave spectral families. Behavior of ships at sea, Routing methods, Climate routing, Strategic Routing, Tactical routing, Case studies, Selected papers on weather routings.

NAME 6205: Boundary Layer Theory

Outline of boundary layer theory, Derivation of Navier-Stokes equations, Exact solutions of the Navier-Strokes equations. Very slow motions, Boundary layer equations for two dimensional flow, Boundary layer on a flat plate, Boundary layer development on actual ships. Boundary layer formation over large hull projections and appendage. Detailed effects of hull roughness on the ship boundary layer. Friction formulations taking account of curvature and roughness. Separation of boundary layers around ship components. Separation control.

NAME 6301: Analysis and Design of Welded Structures

Residual stresses in welded joints; Distortion in weldments; Fracture toughness; Brittle and fatigue fracture of welded structure; Effects of distortion and residual stress on buckling strength of welded structures; Welded cracking and joint restraint. Effects of weld defects on service behaviors; Nondestructive testing of welded joints.

Strength of welded structures; Design of welded connections; miscellaneous structural design; Joint design and production for static and dynamic welded structures.

NAME 6302: Ship Production Technology

The ideal layout of shipyard: Material handling facilities; Production Process; Advanced fabrication processes (N/C flame cutting, double curvature bending by Universal Press and Line Heating etc.); Component assembly; Sub-assembly, assembly and grand assembly; Block assembly; Advanced outfitting; Zone outfitting: Block erection. Machinery installation, Launching; Pier outfitting, trial and delivery.

Production planning, Scheduling and line charts; production piling charts; Man-hour control, Subcontracting: Quality control; Application of the critical path analysis.

NAME 6303: Computer Aided Hull Design

Analytic representation of a curve, Advanced interpolation and control polygon techniques, Bezier and B-spline approximations, B-spline curve fitting.

Form parameter of curves, Development of lines plan, Parametric surface representation, Blend generation, Partial differential equation (PDE) method for surface generation, Free form surface generation, Bezier surfaces, B-spline surfaces, Non-uniform rational B-spline (NURBS) surfaces, Surface design with volume constraints, Gaussian curvature and surface fairness. Generation and optimization of ship hull and propeller blade geometry.

NAME 6401: Marine Transportation System

Trade and markets, International trade, operation research technique used in marine transportation problem, through transportation system, Marine transportation system design, Operation and economics of marine transportation system.

NAME 6402: Design of Cargo Access Equipment

Influence of cargo access equipment of ships performance, Hatch-covers, Cargoes and ships, General requirement for access equipment; Access equipment for vertical and horizontal loading ships, Ship design and selection of access equipment, Specific design requirements of access equipment, Access equipment in service, Recent developments and prospects, Economic aspects.

NAME 6403: Computer Simulation

Simulation as an operation research techniques, General procedure for simulation, Simulation types, Probability concepts in simulation, Random number generation with arbitrary distribution, Random sequence tests, Simulation languages, Use of *FORTRAN* in simulation, Extended control simulation language, Computer simulation model in marine transportation system.

NAME 6501: Advanced Marine Engineering

Analysis of power plant including mathematical representation of steam turbine, Gas turbine and diesel plant. Auxiliary system " Evaluation including clutch and gear box control-Total system" performance when subjected to full ahead to crash strop maneuver, Control systems philosophy, design and application to machinery set combinations.

Design of marine transmission devices-spur, helical, bevel, worm gears and wheel systems. Lubrication and cooling, Wear characteristics, Clutch design and operation.

NAME 6502: Marine Transmission Systems

Detailed assessment of spur, Helical, Cross-Axial Helical, Bevel, Worm and Wheel systems, Principles of engagement, Generation analytical geometry, Measurement and detailed specification. Manufacturing methods and acceptable tolerances, Lubrication, Cooling power dissipation, Efficiency and wear characteristics. Clutch design and

operation-Friction self synchronizing and shaft types, Performance characteristics, Hydraulic coupling types performance analysis, Heat transfer principles, Controllable pitch propeller operation and control of pneumatic and hydraulic types actuation systems.

NAME 6503: Control Theory in Marine System Design

Revision of the fundamentals of control, Transient and Frequency Response, Stability analysis, Root locus, Rough Hurwitz-Nichol Chart representation, Comprehensive methods, Application of stability criteria to system design, Application to hydraulic, pneumatic and electronic systems, principles of Analogue computing the operational amplifier and its application to inversion, integration, multiplication and function generation, problem definition, Simulation of marine systems. Introduction to digital simulation methods interfacing requirements, Simulation as a design process, Optimization of control schemes and Marine plant performance, Demonstration of Hybrid techniques in the analysis of fast ship performance.

NAME 6601: Mechanics of Water Waves

Review of Hydrodynamics: Hydrostatics, Equation of Continuity, Rotational and Irrotational Flows, The Dynamical Equations of Motion, Viscous Flows. Surface Waves: Small Amplitude Wave Theory, Finite Amplitude Waves, Waves creation by winds. Fixed Structure in Waves: Hydrostatic pressure beneath a surface waves, Waves at a vertical Flat Barrier, Consequences of Viscosity, Wave induced forces on a pile, Wave induced vibrations of fixed structures, Wave making drag, Flooding structures in waves, Coupled Heaving and Pitching, Moored and Towed bodies.

NAME 6602: Harbor Engineering

Tides and harmonic analysis: Equilibrium theory of the tides, harmonic analysis of tides, harmonic Analysis and Continuous spectra. Harbor Resonance: Free Oscillation in closed basins, Forced oscillations in basins of sample platform, Modeling of resonance phenomenon in the laboratory. Wave spectra: Statistical properties of individual waves,

wave spectrum and wave transformation. Harbor Planning: Ship Characteristics, Elements of Harbor layouts, Hydraulic aspects of harbor layout, Layout of Docks and Breakwaters. Break Water Design: Information on Mound Breakwater, wave pressure formula for composite breakwater, principles of the design of composite breakwaters, wave force calculation for composite breakwater, design of Breakwater Caissons.

NAME 6603: Analysis of Offshore Structures

Classification of different types of offshore structures and their conceptual design. Features of Drilling and produc' on rigs, fixed structures, floating structures, complaint structures, Linked multi-body systems. Comparison of different designs of offshore production platforms. Analysis of Fundamentals of hydromechanics, Wave theories; Hydrostatic Analysis, Hydrostatic forces and stability of offshore structures, Hydrodynamic Analysis, Wave forces on hydro dynamically transparent structures, Motion of hydro dynamically transparent structures in a seaway, Forces and motions of hydro dynamically compact structures in a seaway.

NAME 6604: Hydrodynamic Loading of Floating Bodies

Overview of fluid mechanics, Linear wave theory, Morrison equation and diffraction theory, Numerical solution of Green function and fluid forces on floating bodies, Governing equation of second order wave drift forces, Wind and current forces and their effects on floating bodies, Response of floating bodies to regular and irregular waves.