# Department of Naval Architecture & Marine Engineering (NAME)

# Information Booklet

# Bangladesh University of Engineering & Technology (BUET)

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## PREFACE

The department of Naval Architecture and Marine Engineering (NAME) of Bangladesh University of Engineering & Technology, Dhaka is the first and foremost department in Bangladesh which plays a significant role in the maritime field. The department has fifty 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, detailed course outline and courses offered in different terms for the undergraduate and post-graduate students of Naval Architecture & Marine Engineering Department.

The 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 or visit the website *http://www.buet.ac.bd* regarding any update approved by the University.

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

Dr. Md. Mashiur Rahaman
Professor & 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 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 50,000 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, Mechanical Engineering and Chemical & Materials Engineering extend over four years and lead to B.Sc. Engineering degrees in Civil, Water Resources, Computer, Electrical & Electronic, Mechanical, Chemical, Material & Metallurgical, Nanomaterials & Ceramic, Naval Architecture & Marine Engineering, Industrial and Production Engineering and Biomedical Engineering.

The faculty of Architecture and Planning offers a five-year 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 Science and 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, Nanomaterials and Ceramic Engineering and Biomedical Engineering offers M.Sc. Engineering and M. Engg. Degrees and almost all departments 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 Hazrat Shahjalal International Airport, Kamalapur Railway Station, Bus terminals and Sadarghat River Port. The campus is compact with six main multistoried buildings housing eighteen departments. It also has several institutes like Institute of Appropriate Technology (IAT), Institute of Information and Communication Technology (IICT), Institute of Water and Flood Management (IWFM), Accident Research Institute (ARI), the BUET-Japan Institute of Disaster Prevention and Urban Safety (BUET-JIDPUS), Institute of Nuclear Power Engineering (INPE), Institute of Energy and Sustainable Development (IESD), Institute of Robotics and Automation (IRAB) and centers like Centre for Environmental and Resource Management (CERM), Biomedical Engineering Centre, International Training Network Centre (ITN), Bangladesh Network Office for Urban Safety

(BNUS), Center for Regional Development Studies (CRDS), Institutional Quality Assurance Cell (IQAC), Research and Innovation Centre for Science and Engineering (RISE), BUET. Students' housing and teachers' residence are at walking distance. There are nine halls of residence for students including two for female students within the campus.

## 1.3 Teaching Staff of the University

The total number of filled up teaching posts is 649 out of which 466 teachers in active service and 183 teachers are on leave for higher studies, and teaching and research in various universities/institutes around the globe (as of November 07, 2023). The following is lists of teachers in active service including those against leave vacancies.

| Sl. No. | Designation | Active | Abroad |
|---|---|---|---|
| 1 | Professor | 205 | 3 |
| 2 | Associate Processor | 48 | 3 |
| 3 | Assistant Processor | 94 | 149 |
| 4 | Lecturer | 119 | 28 |
| . | Total | 466 | 183 |

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 supernumerary 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 Resource Engineering | Both UG and PG |
| 3 | **Faculty of Electrical & Electronic Engineering** | |
| | Department of Electrical & Electronic Engineering | Both UG and PG |
| | Department of Computer Science & Engineering | Both UG and PG |
| | Department of Biomedical Engineering | Both UG and PG |
| 4 | **Faculty of Chemical and Materials Engineering** | |
| | Department of Chemical Engineering | Both UG and PG |
| | Department of Material & Metallurgical Engineering | Both UG and PG |
| | Department of Nanomaterials & Ceramics | Both UG and PG |
| | Department of Petroleum & Mineral Resource Engineering | PG only |

| | | |
|---|---|---|
| **5** | **Faculty of Science** | |
| | Department of Chemistry | PG only |
| | Department of Mathematics | PG only |
| | Department of Physics | PG only |
| **6** | **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 |
| **7** | **Institutes** | |
| | Institute of Information and Communication Technology (IICT) | PG and PG. Dip. |
| | Institute of Water and Flood Management (IWFM) | PG only |
| | Institute of Appropriate Technology (IAT) | PG only |
| | Accident Research Institute (ARI) | No Degree Offered |
| | BUET-Japan Institute of Disaster Prevention and Urban Safety (BUET-JIDPUS) | No Degree Offered |
| | Institute of Nuclear Power Engineering (INPE) | PG only |
| | Institute of Energy and Sustainable Development (IESD) | No Degree Offered |
| | Institute of Robotics and Automation (IRAB) | No Degree Offered |

**Note:** UG- Undergraduate; PG- Postgraduate; PG. Dip- Postgraduate in Diploma

## 1.5 University Administration

| | |
|---|---|
| **Chancellor :** | Mohammed Shahabuddin<br>Honorable President<br>People's Republic of Bangladesh |
| **Vice-Chancellor :** | Professor Dr. Satya Prasad Majumder |
| **Pro-Vice-Chancellor :** | Professor Dr. Abdul Jabbar Khan |

# Chapter 2

# The Department of Naval Architecture & Marine Enngineering (NAME)

## 2.1 Introduction

The Naval Architecture and Marine Engineering program covers a wide range of topics, from ship hulls to the research of prospects for harnessing range of sea resources. The program not only encompasses all the elements in the field of Naval Architecture and Marine Engineering (form, strength, stability, sea keeping qualities, resistance and propulsion of ships, economic aspects of ship design and ship operation), but also incorporates several courses of mechanical engineering, electrical engineering, civil engineering, industrial & production engineering, and metallurgical engineering. Fundamentals of physical sciences and mathematics, along with humanities and social sciences, are other areas of attention. Since the design of a modern ship or several maritime systems of almost any configuration or function involves a wide range of technical disciplines, 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 courses. Is addition to the undergraduate program, post-graduate programs is/are also available, in which the students get the opportunity to specialize in certain areas at greater depth.

The department maintains close contact with the country's ship design farms, shipyards and ship operators, as well as 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. Mashiur Rahaman

| Professors | Academic Qualification and Field of Specialization |
|---|---|
| Dr. Md. Mashud Karim | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D. Engg. (Japan).<br>(Computational Ship Geometry, Hydrodynamics, Resistance & Propulsion, Propeller Optimization) |
| Dr. M. Rafiqul Islam | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D. Engg. (Japan).<br>(Dynamics of Offshore Structure, Multi-body Dynamics, Port and Harbor Engineering, Mooring Analysis) |
| Dr. Md. Shahajada Tarafder | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D. Engg. (Japan).<br>(Computational Fluid Dynamics, Ship Resistance, Propulsion and Hull Form Optimization) |
| Dr. Goutam Kumar Saha | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D. Engg. (Japan).<br>(Wave Making Resistance, Hull Form Optimization, Ship Design, Seakeeping and Maneuvering & Computational Fluid Dynamics) |
| Dr. Mir Tareque Ali | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D. Engg. (Japan).<br>(Dynamics of Offshore Structures, Dredgers and Dredging, Design of Mooring/ Towing Systems & Marine Pollution) |

| | |
|---|---|
| Dr. N. M. Golam Zakaria | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; D. Engg. (Japan).<br>(Sea Keeping Stability, Ship Design, Maritime Economics, Ship Building & Green Ship Recycling) |
| Dr. Md. Shahidul Islam | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; M.Sc. Engg. (USA); D. Engg. (Japan).<br>(Ship Structural Analysis, Mesh Generation, FEM, Ship Vibration & Fiberglass Boat) |
| Dr. Md. Mashiur Rahaman | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; M. Phil. (Japan); Ph.D. (Tokyo); Post-doc (Croatia).<br>(Computational Fluid Dynamics, Renewable Ocean Energy Utilization, Ship Recycling, Dredger and Dredging Technology, Port & Harbor Engineering) |
| Dr. Zobair Ibn Awal | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; Ph.D. (Japan).<br>(Safety Science, Marine Dynamics, Vibration and Control) |

**Assistant Professors**

| | |
|---|---|
| Dr. Kazi Naimul Hoque | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; M.Sc. Engg. (USA); Ph.D. (USA).<br>(Marine Materials, Marine Structures, Finite Element Analysis, Ocean Wave Mechanics) |
| Dr. Laboni Afroz | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; Ph.D. (Australia).<br>(Structural Integrity, Hydrodynamics, Floating Structures) |

| | |
|---|---|
| Dr. Md. Shumon Mia | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET; Ph.D. (USA).<br>(Geophysics, Seismic Cycle, Subsurface Energy Harvesting, Friction, Fracture, Structural Analysis, FEM) |

**Lecturers**

| | |
|---|---|
| Mr. Golam Sobahani | B.Sc. Engg. (NAME), BUET.<br>(Accident Analysis, Fluid Mechanics) |
| Sajid Hossain | B.Sc. Engg. (NAME), BUET.<br>(Computational Fluid Dynamics, Multiphase Flow Analysis) |
| Md. Imdadul Haque | B.Sc. Engg. (NAME), BUET.<br>(Hydrodynamics, Computational Fluid Dynamics) |
| Parama Roy Chowdhury | B.Sc. Engg. (NAME), BUET.<br>(Computational Fluid Dynamics) |
| S.M.Rasel Rahman | B.Sc. Engg. (NAME), BUET.<br>(Hydrodynamics, Computational Fluid Dynamics) |
| Nabiha Tasnim | B.Sc. Engg. (NAME), BUET.<br>(Offshore Structure, Finite Element Analysis) |

**On Leave**
**Assistant Professors**

| | |
|---|---|
| Mr. Miad Al Mursaline | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET.<br>(Underwater Acoustic Scattering, Machine Learning in Acoustics) |
| Mr. Md. Habibur Rahman | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET.<br>(Acoustics, Fluid Mechanics, CFD, Fluid-Structure Interaction, Multiphase Flows, Numerical Modeling, Turbulence, Nonlinear Dynamics) |
| Mr. Waliur Rahman | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET.<br>(Computational Fluid Dynamics, Flow analysis around ship hull and hydrofoils, Turbulence Modelling, Structural Analysis) |
| Mr. Md. Moinul Islam | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET.<br>(Computational Fluid Dynamics, Ship Motion, Ship Recycling, Maritime Economics) |
| Ms. Mohua Das | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET.<br>(Ocean Renewable Energy (Wave and Tide), Fluid Mechanics, Composite Materials) |

**On Leave**

**Lecturer**

| | |
|---|---|
| Ms. Ishrar Israil Monisha | B.Sc. Engg. (NAME), BUET; M.Sc. Engg. (NAME), BUET;<br>(Underwater Robotics) |

## 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. Ship Model Testing Center (Towing Tank)
ii. Fluid Mechanics Laboratory
iii. Marine Hydrodynamics Laboratory
iv. Ship Design Laboratory
v. Undergraduate Computer Laboratory
vi Ship Model Laboratory
vii. Marine Structure Laboratory
viii. Simulation Laboratory
ix. Marine Structure Simulation Laboratory
x. Underwater Robotics Laboratory
xi. Marine Materials Laboratory

In addition to the above-mentioned laboratory facilities the students in different level/term have to undertake sessional classes in the laboratories of physics, chemistry, mechanical, electrical and electronic, civil and metallurgical engineering departments, and in different workshops. If necessary, undergraduate and postgraduate students can access the laboratory facilities of other departments, institutes and centres 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 training. 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 one 3.0 credit hour course titled “Shipyard Practice”. The students have to undertake four weeks of shipyard training under this course.

During shipyard practice, the students actively participate in the activities involving ship design and construction. At the end of the course, the performance of the students is 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. 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 is given below. 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 become 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 so select courses according to his interest far as possible.
vi) Opportunity for students to choose fewer of more courses than the normal course load depending on his/her capabilities and needs.
vii) The flexibility to allow the student to progress at his/her 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, these courses are expected to help the student an 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, Industrial 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 course is normally taken by 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:

**Example 1:**

| | | |
|---|---|---|
| NAME | 117 | Hydrostatics and Stability |

**Explanation**

| NAME | Departmental Identification Code | |
|---|---|---|
| 117 | 1 | A digit in first position signifies Level/Term |
| | 1 | Second digit reserved for departmental use |
| | 7 | Last odd digit designates a theoretical course |
| Hydrostatics and stability | | Course Title |

**Example 2:**

| | | |
|---|---|---|
| NAME | 252 | Mechanics of Structure Sessional |

**Explanation**

| NAME | Departmental Identification Code | |
|---|---|---|
| 252 | 2 | A digit in first position signifies Level/Term |
| | 5 | Second digit reserved for departmental use |
| | 2 | Last even digit designates a sessional course |
| Mechanics of Structure Sessional | | Course Title |

### 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 few courses, which are optional in nature. The students can 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 necessitates 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 students 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 about 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 in consultation with and under the guidance of his/her respective adviser. The students will complete their course registration by logging in their BIIS account, through the registration tab. Upon verification, the supervisor, would forward the registration request to the Head of the department for necessary actions.

### 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 constraints 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, generally, 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, after which, they will be able to complete the course registration procedure through BIIS. For the First level students, prior department-wise enrollment/admission is mandatory. The First-year students will be provided with their BIIS credentials, from the Registrar office, after all their admission procedure is completed.

### 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 date before the end of the previous term. All students in consultation with their course advisers 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 is generally 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. 500.00 (Five hundred) only. 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, generally 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.

In case of dropping a course, a student will be allowed to do so, generally, 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 though the BIIS.

Any student willing to add or drop courses will have to complete the procedure through BIIS, in consultation with and under the guidance of his adviser.

All changes in courses must be approved by the Adviser and the Head of the department concerned. 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 choose 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 overall 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

$$\mathbf{GPA}=\frac{\sum \mathbf{CiGi}}{\sum \mathbf{Ci}};$$

### 3.14.1 A Numerical Example

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

| Course | Cred-its | 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:

$$\text{GPA}=\frac{3\text{x}4.0+3\text{x}3.0+3\text{x}3.75+2\text{x}3.25+1\text{x}3.5}{3+3+3+2+1}=3.52$$

## 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/Level 1 | 0 to 36 | 0 to 34 |
| Second Year/Level 2 | > 36 to 72 | > 34 to 72 |
| Third Year/Level 3 | > 72 to 108 | > 72 to 110 |
| Fourth Year/Level 4 | > 108 | > 110 to 147 |
| Fifth Year/Level 5 | | > 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 weightage 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.

### 3.22.1 Completion of fulltime studentship

Students who have completed Minimum credit requirement for graduation for a Bachelor's 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.

### 3.22.2 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.

Letter grade S may be used for Satisfactory.

Letter grade U may be used for Unsatisfactory.

In case of Unsatisfactory Performance, he/she has to repeat the Industrial/Professional Training until he/she has earned S grade.

## 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 ÔF' 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 make-up quizzes or assignments immediately on returning to the classes. Such requests 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 on the certificates) will also be acceptable only in those cases where the student has valid reasons for his absence from the university.

## 3.28 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
17 Nanomaterials and Ceramic Engineering
18 Bio Medical Engineering

# Chapter 4

# Undergraduate Courses

## 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 | Department |
|---|---|---|
| Theory Subjects | 40 | 23 |
| Sessional Subjects | 28 | 19 |
| Theory (Credit Hours/Contact Hours) | 117/117 | 69/69 |
| Sessional (Credit Hours/Contact Hours) | 43.5/87 | 31.5/63 |
| Total Credit hours | 160.5 | 100.5 |
| Total Contact hours | 204.0 | 132.0 |

**Contact hours and credit hours in eight terms in NAME department**

| Level-Term | Contact hours for Theory courses | Contact hours for Sessional courses | Cumula-tive contact hours | Cumulative credit hours |
|---|---|---|---|---|
| 1-I | 14.0 | 10.5 | 24.5 | 19.25 |
| 1-II | 15.0 | 12.0 | 51.5 | 40.25 |
| 2-I | 14.0 | 10.5 | 76.0 | 59.50 |
| 2-II | 14.0 | 12.0 | 102.0 | 79.50 |
| 3-I | 14.0 | 12.0+6.0* | 134.0 | 102.5 |
| 3-II | 16.0 | 6.0 | 156.0 | 121.5 |
| 4-I | 15.0 | 9.0 | 180.0 | 141.0 |
| 4-II | 15.0 | 9.0 | 204.0 | 160.5 |
| **Total** | **117.0** | **87.0** | **204.0** | **160.5** |
| ***Training course** (4 week @ 21 hr/week ≈ 14 week @ 6 hr/week) | | | | |

**Distribution of credit hours for different categories of courses in NAME department**

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

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

**Level-1 Term-I**

| Course No. | Course Title | Contact hours | Credit hours |
|---|---|---|---|
| **Theoretical Courses** | | | |
| Chem 117 | 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 113 | Structure of Matter, Electricity, Magnetism and Modern Physics | 3 | 3 |
| **Sessional Courses** | | | |
| Chem 114 | Inorganic Quantitative Analysis Sessional | 3 | 1.5 |
| ME 160 | Mechanical Engineering Drawing-1 | 3 | 1.5 |
| Shop 186 | Machine Shop Sessional | 1.5 | 0.75 |
| Shop 188 | Foundry and Welding Shop Sessional | 3 | 1.5 |
| **Total (5T+4S)** | | **24.50** | **19.25** |

**Level-1 Term-II**

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

**Level-2 Term-I**

| Course No. | Course Title | Contact hours | Credit hours |
|---|---|---|---|
| **Theoretical Courses** | | | |
| HUM 113 | Economics | 2 | 2 |
| Math 281 | Vector Analysis and Differential Equation (Special Types) | 3 | 3 |
| MME 293 | Shipbuilding Materials | 3 | 3 |
| NAME 219 | Marine Engines and Fuels | 3 | 3 |
| NAME 251 | Mechanics of Structure | 3 | 3 |
| **Sessional Courses** | | | |
| Hum 102 | English Sessional | 3 | 1.5 |
| MME 294 | Shipbuilding Materials Sessional | 1.5 | 0.75 |
| NAME 238 | Ship Design and Drawing II | 3 | 1.5 |
| NAME 252 | Mechanics of Structure Sessional | 3 | 1.5 |
| **Total (5T+4S)** | | **24.50** | **19. 25** |

**Level-2 Term-II**

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

**Level-3 Term-I**

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

**Level-3 Term-II**

| Course No. | Course Title | Contact hours | Credit hours |
|---|---|---|---|
| **Theoretical Courses** | | | |
| Math 381 | Fourier Analysis, Harmonic Function, Complex Variable and Laplace Transforms | 4 | 4 |
| NAME 319 | Theory of Machines | 3 | 3 |
| NAME 355 | Ship Construction | 3 | 3 |
| NAME 329 | Heat Transfer | 3 | 3 |
| **Optional courses (any one **)** | | | |
| NAME 327 | Economic and Social Aspects of Marine Transportation System | 3 | 3 |
| NAME 343 | Marine Acoustics | 3 | 3 |
| NAME 347 | Design of Special Ships | 3 | 3 |
| NAME 363 | Computational Fluid Dynamics (CFD) | 3 | 3 |
| **Sessional Courses** | | | |
| NAME 336 | Computer Programming in Ship Design I | 3 | 1.5 |
| NAME 338 | Ship Design Project and Presentation | 3 | 1.5 |
| **Total (5T+2S)** | | **22.00** | **19. 00** |

**Level-4 Term-I**

| Course No. | Course Title | Contact hours | Credit hours |
|---|---|---|---|
| **Theoretical Courses** | | | |
| IPE 479 | Engineering Management | 3 | 3 |
| NAME 415 | Marine Maintenance and Repair | 3 | 3 |
| NAME 419 | Motion and Control | 3 | 3 |
| **Optional courses (any two **)** | | | |
| NAME 413 | Theory of Hydrofoils | 3 | 3 |
| NAME 437 | Ship Recycling | 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 437 | Ship Recycling | 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 | Credit 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/Production Division **(Table B)**

| Course No. | Name of the Course | Credit 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 437 | Ship Recycling | 3 | Design/ 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/Production Division

A student belonging to a particular division must take six optional courses (two in Level 3 and four in Level 4) altogether from that division in Level 3 and Level 4. Moreover, a student belonging to Hydrodynamics and Structural Division must take at least two optional courses from hydrodynamics courses and at least two optional courses from Structural courses shown in TABLE A. Similarly, a student belonging to Design and Production division must take at least two optional courses from Design courses and at least two optional courses from Production courses shown TABLE B.

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

### 4.3.1 Compulsory Courses

**NAME 117: Hydrostatics and Stability**
3.00 Credit, 3 hrs. /wk.
Hull form definition of ships and ocean structures, Lightweight, deadweight, capacity and tonnage measurement, Hydrostatic calculations, Initial stability, free surface effects, stability at large angles, intact stability computations, damaged stability, and its calculations by lost buoyancy and added weight method, Inclining experiment. International Maritime Organization (IMO) stability criteria, wind heel criteria, Subdivision and floodable length calculations, Subdivision indices, Launching calculations.

**NAME 118 Ship Design and Drawing I**
1.50 Credit, 3 hrs. /wk.
Reproduction of general arrangement (GA) plan, lines plan, offset table, and Bonjean curves.

**NAME 123: Fluid Mechanics**
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, the impact of jets, dimensional analysis, principles of similitude and model testing, Aerofoil and its application. Hydraulic machines: reciprocating and centrifugal pumps, Cavitation.

**NAME 124: Fluid Mechanics Sessional**
1.5 Credit, 3 hrs. /wk.
Experiments based on NAME 123

**NAME 217: Theoretical Ship Design**
3.00 Credit, 3 hrs. /wk.
**Prerequisite. NAME 117**
Engineering design philosophy, Various design stages: concept design, basic designs, preliminary designs, contract designs, detailed designs. Design spiral: cargo routes, estimation of dimensions and hull form and displacement, preliminary G. A. plan, calculation of freeboard, depth and volume, calculation of longitudinal strength and powering, selection of machinery and outfit, checking for trim and stability, estimation of lightweight and cargo deadweight, economic criteria, and evaluation. Case studies of typical merchant ships.

**NAME 219: Marine Engines and Fuels**
3.00 Credit, 3 hrs. /wk.
**Prerequisite. 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.
**Prerequisite. 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 aero foil.

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.
**Prerequisite. NAME 123, NAME 124**
Experiments based on NAME 223

**NAME 238 Ship Design and Drawing II**
1.50 Credit, 3 hrs. /wk.

**Prerequisite. NAME 117, NAME 118**

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

**NAME 246: Computer-Aided Design (CAD)**

1.50 Credit, 3 hrs. /wk.

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

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

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

**NAME 248: Ship Design and Drawing III**

1.50 Credit, 3 hrs. /wk.

**Prerequisite. NAME 238**

Scantling of structural members, Mid-ship section, longitudinal construction, and shell expansion drawings. Capacity plan.

**NAME 251: Mechanics of Structure**

3.00 Credit, 3 hrs. /wk.

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

**NAME 252: Mechanics of Structure Sessional**

1.50 Credit, 3 hrs. /wk.

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

**NAME 310: Shipyard Practice**

3.0 Credit, consolidated 4 weeks @ 21hrs./wk.

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

**NAME 319: Theory of Machines**

3.00 Credit, 3 hrs./wk.

Introduction, Kinematics and Kinetics of motion. Simple harmonic motion, Simple mechanism. Velocity in mechanisms (instantaneous centre methods and relative velocity method). Accelerations in mechanism. 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.

**Prerequisite. NAME 223**

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

Screw propeller geometry. Momentum and blade element theories. Propellers in open water, propeller coefficients and design charts.

Hull propeller interaction- wake, thrust deduction and relative rotative efficiency. Propeller cavitations. Propeller blade strength. Screw design according to circulation theory for uniform and non-uniform wake. Speed trials and service performance analysis.

**NAME 324: Resistance and Propulsion of Ships Sessional**

1.50 Credit. 3 hrs./wk.

Sessional based on NAME 323

**NAME 329: Heat Transfer**

3.00 Credit, 3 hrs. /wk.

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

**NAME 336: Computer Programming in Ship Design-I**

1.50 Credit, 3 hrs. /wk.

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

**NAME 338: Ship Design Project and Presentation**

3.00 Credit, 6hrs. /wk.

**Prerequisite. NAME 118, NAME 238, NAME 246, NAME 248**

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

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

**NAME 345: Welding Technology**

3.00 Credit, 3 hrs. /wk.

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

**NAME 348: Ship Design and Drawing IV**

1.50 Credit, 3 hrs. /wk.

**Prerequisite. NAME 118, NAME 238, NAME 248**

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

**NAME 351: Ship Structure**

3.00 Credit, 3 hrs./wk.

**Prerequisite. NAME 251**

Forces on the ship. Ship strength calculation, longitudinal and transverse strength of the 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.

**Prerequisite. NAME 252**

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

**NAME 355: Ship Construction**

3.00 Credit, 3 hrs. /wk.

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

**NAME 400: Project and Thesis**

4.50 Credit, 9 hrs./wk.

The 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.

**Prerequisite. NAME 345, NAME 355**

Maintenance requirements – corrosion, fatigue, marine fouling. Failure causes – fatigue failure of structural members, deformation failures, failure due to corrosion. Repairs to failures. Measures for failure of structural members due to deformation, corrosion, fatigue, etc. Prevention of marine growth and removal of marine growth both in dry and wet condition, Design considerations with regard to maintenance. Maintenance scheduling. Welding repair decision model. Classification requirements of hull survey, identification of defects,

plates, and welds. In situ plate cutting and welding, tolerance requirements, distortion removal. Underwater welding- dry and wet. Welding Inspection. Impact of preventive maintenance and repair techniques on operation.

**NAME 416: Numerical Computations Sessional**

1.5 Credit, 3 hrs. /wk.

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

**NAME 419: Motion and Control**

3.00 Credit, 3 hrs./wk.

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

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

**NAME 427: Maritime System and Management**

3.00 Credit. 3 hrs. /wk.

**Prerequisite. NAME 217**

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

**NAME 429: Marine Engineering**

3.00 Credit. 3 hrs./wk.

**Prerequisite. 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.
**Prerequisite. 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. Lifesaving appliances and firefighting 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 the 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 underwater 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 bandwidth. Propeller noise. Singing. Cavitation noise. Structure – fluid interaction - structural resonance, acoustic control measures, hull array. Devices for underwater sound production and reception. Commercial applications of underwater acoustics.

**NAME 347: Design of Special Ships**

3.00 Credit. 3 hrs./wk.

**Prerequisite. NAME 217**

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. The 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.

**Prerequisite. NAME 123, NAME 223**

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

**Prerequisite. 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. Isoperimetric elements in two and three dimensions. Formulation of stiffness matrix for beam and shell elements, linear static analysis. Problems involving non-linear material behavior. Introduction to Finite Element software and analysis of frame structures.

**NAME 413: Theory of Hydrofoils**

3.00 Credit. 3 hrs./wk.

**Prerequisite. 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.
**Prerequisite. 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 propulsions.

**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 437: Ship Recycling**
3.00 Credit, 3 hrs./wk.

**Ship Recycling:** overview, definitions, history, current locations, processes and methods, stakeholders, economic contribution. The international and national regulations and standards of ship recycling. Material and waste from ship recycling: hazardous and valuable materials, life cycle assessment (LCA) and cost benefit analysis, inventory of hazardous materials (IHM), waste management. Design for ship recycling: rules, end of life treatment options, effect on the supply chain, role of ship designer in remanufacturing, material selection and practices.

**Safety principles & risk assessment in ship recycling:** Introduction to health safety and environment (HSE), safety assurance, safety in design and operations, accident theories and models, risk assessment methods, hazard and operability study (HAZOP), safety management.

**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.

**Prerequisite. 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.

**Prerequisite. NAME 345, NAME 355**

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

**NAME 457: Fishing Vessel Technology**

3.00 Credit. 3 hrs./wk.

**Prerequisite. NAME 217**

Types of sea fish for human consumption. Fishing methods and gear types: active and passive gears, advantages, and disadvantages. Fish finding and communication equipment. General arrangement and space requirement of fishing craft. Stability, propulsion systems and seakeeping 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.

**Prerequisite. 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 vessels, large hinged vessels, the array of elastically connected cylinders, risers, pipelines, etc.

**NAME 465: Marine Production and Planning**

3.00 Credit. 3 hrs./wk.

Overview of the 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.

**Prerequisite. 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 cutters, 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.

**Prerequisite. 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 Detailed Syllabus of Undergraduate Courses offered by other departments

**Chem 117: 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 pH, 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 complaint, 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 writers.

**Hum 113: Economics**

2.00 Credit, 2 hrs. /wk.

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

**Hum 211: Sociology**

2.00 Credit, 2 hrs. /wk.

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

**Hum 313: Principles of Accounting**

2.00 Credit, 2 hrs. /wk.

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

**IPE 479: Engineering Management**

3 Credit, 3 hrs. /wk.

**Management:** Evolution of management thought, classical quantitative and behavioral schools, interactions between organizations and their environment. Management principles, Management functions. The management team, management by objectives.

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

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

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

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

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

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

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

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

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

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

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

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

**Math 381: Fourier Analysis, Harmonic Function, Complex Variable and Laplace Transforms**

4.00 Credit, 4 hrs./wk.

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

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

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

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

**ME 160: Mechanical Engineering Drawing-1**

1.50 Credit, 3 hrs. /wk.

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

**ME 169: Basic Thermal Engineering**

3.00 Credits, 3 hrs. /wk.

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

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

**ME 170: Basic Thermal Engineering Sessional**

1.50 Credit, 3 hrs. /wk.

Sessional based on ME 169

**MME 293: Shipbuilding Materials**

3.00 Credit, 3 hrs. /wk.

Metals as materials of construction; Industrially significant properties of metallic materials; Production, properties and uses of Pig Iron, Cast Iron and Carbon Steels; Nonferrous alloys; Protective Coatings; Ferrous alloys: Plain carbon, alloy, tool, stainless, heat-resisting and creep- resisting steels etc.; The Fe-Fe3C 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 113: 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 inter-planer spacing and Miller indices, Bragg's Law, Methods of determination of inter-planer 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 161: 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 Equipment, Patterns: Definition and function, Types and pattern making, Molding: Definition, Molding materials, Sand Preparation, Types of mold 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.

## 4.5 List of Equivalent Courses

| **Course in Old Syllabus** | | | **Equivalent Course in New Syllabus** | | |
|---|---|---|---|---|---|
| Course No. | Course Title | Credits | Course No. | Course Title | Credits |
| NAME 200<br>NAME 300 | Shipyard Practice I<br>Shipyard Practice II | 1.5<br>1.5 | NAME 310 | Shipyard Practice | 3.0 |
| NAME 218 | Ship Design Laboratory-I | 1.5 | NAME 118 | Ship Design and Drawing I | 1.5 |
| NAME 225 | Ship Building Technology-I | 3.0 | NAME 345 | Welding Technology | 3.0 |
| NAME 228 | Ship Design Laboratory-II | 1.5 | NAME 238 | Ship Design and Drawing II | 1.5 |
| NAME 317 | Design of Marine Vehicles | 3.0 | NAME 217 | Theoretical Ship Design | 3.0 |
| NAME 318 | Ship Design Laboratory-III | 1.5 | NAME 248 | Ship Design and Drawing III | 1.5 |
| NAME 325 | Ship Building Technology-II | 3.0 | NAME 355 | Ship Construction | 3.0 |
| NAME 328 | Ship Design Laboratory-IV | 1.5 | NAME 348 | Ship Design and Drawing IV | 1.5 |

# Chapter 5

## Rules and Regulation for Postgraduate Program

### 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:**

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

- Grade I is given only a student is unable to sit for the examination of a course at the end of the semester because of circumstances beyond his/her control. He/she must apply to the Head of the Department within one week after the examination to get an I grade in that course. It must be completed within the next two semesters, otherwise, the I grade becomes an F grade. He/she may, however, be allowed to register without further payment of tuition fees for that course.
- Satisfactory or Unsatisfactory- used only as final grades for thesis/project and non-credit courses. Grade for thesis/project "In Progress" shall be so recorded. If, however, thesis/project is discontinued an I grade shall be recorded.

### 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 Head of the Department on the recommendation of the Supervisor/Advisor. Such approval shall be reported to the BPGS.

A student shall not be allowed to continue the program if he/she obtains a total of three or more F grades in one or more than one subjects taken together, during the course of his/her studies.

If at the end of the second or any subsequent semester, the cumulative GPA falls below 2.5, he/she shall not 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/her research work or a report on his/her project work, fulfilling the requirements as detailed below.

Every student submitting a thesis/project in partial fulfillment of the requirements of a degree, shall be required to appear at an oral examination, on a date or dates fixed by the Supervisor concerned in consultation with the Head of the Department and must satisfy the examiners that he/she is capable 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/her research work.

## 5.2 For Doctoral (Ph. D.) Degree

### 5.2.1 Grading System:

As in Art. 5.1.1 above for Master's 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 average (GPA) of 2.75 based on the weighted average of grade points (GP) in his/her course work.

A student obtaining F grade in a course may be allowed to repeat the course with the prior approval of Head of the Department on the recommendation of the supervisor. Such approval shall be reported to the BPGS.

A student shall not be allowed to continue the program if he/she obtains a total of three or more F grades in one or more than one subjects taken together, during the course of his/her studies.

#### 5.2.2.2 Comprehensive Examination

The date(s) and time of the comprehensive examination shall be fixed by the Doctoral Committee on the request of the supervisor. Comprehensive examination shall 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/her field of study and research. The Doctoral Committee shall conduct the comprehensive examination. If a student fails to qualify in a comprehensive examination, he/she shall be given one more chance to appear at the examination as scheduled by the Doctoral Committee.

In addition to successful completion of course works and comprehensive examination every student shall submit a thesis on his/her research work fulfilling the requirements.

### 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 six type written copies of the thesis in the final form must be submitted to the Head of the Department.

The student shall certify that the research work was done by him/her and that this work has not been submitted elsewhere for any other purpose (except for publication).

On completion of the research work and submission of the thesis an oral examination shall be arranged on a date or dates fixed by the supervisor in consultation with the Head of the Department in which the student shall defend his/her thesis.The student must satisfy the examiners that he/she is capable of intelligently applying the results of his/her research to the solution of problems, of undertaking independent research and afford evidence of satisfactory knowledge related to the theory and technique used in his/her research work.