MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

Department of Environmental, Water Resources, and Coastal Engineering (EWCE)

COURSE CURRICULUM FOR UNDERGRADUATE PROGRAM

2020

CONTENTS

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EWCE Department, MIST

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CHAPTER-1

1. GENERAL INFORMATION

1.1 Introduction to MIST

The necessity of establishing a technical institute for the Bangladesh Armed Forces was felt in the late eighties. In the absence of such an institution, officers of Bangladesh Armed Forces had been graduating from Bangladesh University of Engineering and Technology (BUET), Bangladesh Institute of Technology (BIT) and other foreign institutions of science and technology. With a view to meet the increasing demand for the development and dissemination of engineering and technological knowledge, Bangladesh Armed Forces established the Military Institute of Science and Technology (MIST) promised to provide facilities for higher technical education both for the officers of Bangladesh Armed Forces as well as for civil students from home and abroad. The motto of MIST is ―Technology for Advancement. Founded on 19 April 1998, MIST started its journey on 31 January 1999 by offering a four-year bachelor's degree on Civil Engineering. Bachelor degree in Computer Science Engineering course has been started on 2001**.** Bachelor courses in Electrical, Electronic & Communication Engineering and Mechanical Engineering started its journey from 2003. Bachelor of Science program in Aeronautical Engineering (AE) and Naval Architecture and Marine Engineering (NAME) program were started in 2008-2009 and 2012-2013 respectively. Besides, four new departments started their academic session in 2014-2015 i.e. Nuclear Science & Engineering (NSE), Biomedical Engineering (BME), Architecture (Arch) and Environmental, Water Resources & Coastal Engineering (EWCE).

1.2 Vision and Mission of MIST

1.2.1 **Vision**

To be a centre of excellence for providing quality education in the field of science, engineering and technology and conduct research to meet the national and global challenges.

1.2.2 **Mission**

a. To provide comprehensive education and conduct research in diverse disciplines of science, engineering, technology and engineering management.
b. To produce technologically advanced intellectual leaders and professionals with high moral and ethical values to meet the socio- economic development of Bangladesh and global needs.
c. To conduct collaborative and research activities with national and international communities for continuous interaction with academia and industry.
d. To provide consultancy, advisory and testing services to government, industrial, educational and other organizations by rendering technical support for widening practical knowledge and to contribute in sustainable socio-economic development.

1.3 Motto and Values of MIST

1.3.1 Motto

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

1.3.2 Values

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

1.4 Eligibility of Students for Admission in MIST

The students must fulfill the following requirements:

a. **Bangladeshi Students.** Minimum qualifications/requirements to take part in the admission test are as follows:
   (1) The applicant must have passed SSC/equivalent examination in Science Group obtaining GPA 4.00 (without fourth subject) in the scale of 5.0 and in HSC/Equivalent examination from Board of Intermediate and Secondary Education/Madrasa Education Board/Technical Education Board in science group the applicant must have obtained minimum 'A+' (Plus) in any TWO (2) subjects out of FIVE (5) subjects including Mathematics, Physics, Chemistry, English, and Bengali and 'A' in rest THREE (3) subjects.
   (2) The applicant must have qualified in minimum five subjects including Mathematics, Physics, Chemistry and English Language with minimum 'B' in average in GCE 'O' Level and in 'A' level he/she must have obtained minimum 'A' in ONE subject out of three subjects including Mathematics, Physics, and Chemistry with and minimum 'B' in rest TWO subjects.
   (3) Applicants who have passed HSC or Equivalent examination in the current year or one year before the notification for admission can apply.
   (4) Sex: Male and Female.

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

(1) Educational qualifications as applicable for Bangladeshi civil students or equivalent.
(2) Must have security clearance from respective Embassy/High Commission in Bangladesh.
(3) Sex: Male and Female.

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

1.5 Number of Seats

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

Allocation of Seats

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

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

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

1.6 Admission Procedure

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

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

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

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

1.7 Students Withdrawal Policy

1.7.1 **For Poor Academic Performance.** The under graduate (B.Sc.) Engineering programs for all engineering disciplines are planned for 4 (four) regular levels, comprising of 8 (eight) regular terms. For Architecture program it is planned for 5 (five) regular levels, comprising of 10 (ten) regular terms. It is expected that all students will earn degree by clearing all the offered courses in the stipulated time. In case of failure the following policies will be adopted:

a. Students failing in any course/subject will have to clear/pass the said course/subject by appearing it in supplementary/self-study (for graduating student) examination as per examination policy.
b. Students may also retake the failed subject/course in regular term/short term as per Examination policy.
c. Maximum grading for supplementary/self-study examination etc of failed subjects will be B+ as per examination policy.

d. One student can retake/reappear in a failed subject/course only twice. However, with the Permission of Academic Council of MIST, a student may be allowed for third time as last chance.
e. In case of sickness, which leads to missing of more than 40% class or miss term final examination (supported by requisite medical documents), students may be allowed to withdraw temporarily from that term and repeat the whole level with the regular level in the next academic session, subject to the approval of Academic Council, MIST. However, he/she has to complete the whole undergraduate program within 06 (six) academic years (for Architecture 07 academic years) from the date of his/her registration.
f. Minimum credit requirement for the award of bachelor's degree in Engineering (B.Sc. Engg) and Architecture (B. Arch) will be decided by the respective Department, approved by the academic council, as per the existing rules. However the minimum CGPA requirement for obtaining a bachelor degree in engineering and Architecture is 2.20.
g. Whatever may be the cases, students have to complete the whole undergraduate Program within 06 (six) academic years (for Architecture 07 academic years) from the date of registration.
h. All other terms and condition of MIST Examination Policy remain valid.

1.7.2 **Withdrawal on Disciplinary Ground**

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

    (1) Communicating with fellow students for obtaining help in the examination hall.
    (2) Copying from another student's script/ report /paper.
    (3) Copying from desk or palm of a hand or from other incrimination documents.
    (4) Possession of any incriminating document whether used or not.

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

c. **Other Indiscipline Behaviors.** Academic Council may withdraw/expel any student on disciplinary ground if any form of indiscipline or unruly behavior is

seen in him/her which may disrupt the academic environment/program or is considered detrimental to the image of MIST.

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

1.7.3 Withdrawal on Own Accord

a. **Permanent Withdrawal.** A student who has already completed some courses and has not performed satisfactorily may apply for a withdrawal from the program.

b. **Temporary Withdrawal.** A student, if he/she applies, may be allowed to withdraw temporarily from the program, subject to approval of Academic Council of MIST, but he/she has to complete the whole program within 06 (six) academic years (for Architecture 07 academic years) from the date of his/her registration.

2. RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAM AT MIST

2.1. Introduction

MIST has introduced course system for undergraduate studies from the academic session 2017-18. The rules and regulations mentioned herein will be applicable to students for administering undergraduate curriculum through the Course System. This will be introduced with an aim of creating a continuous, even and consistent workload throughout the term for the students.

2.2. The Course System

The salient features of the Course System are as follows:

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

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

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

2.3. Number of Terms in a Year

There will be two regular terms (Spring and Fall) in an academic year. In addition to these two regular terms there may be a short term after the Fall Term of each academic session. During the short term, students can take only failed courses to cover up the credit deficiencies.
Respective departments will take the decisions about courses to be offered during each short term depending upon the number of students willing to take a particular course.

2.4. Duration of Terms

The duration of each regular term will be maximum 22 weeks with the following breakups:

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

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

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

2.5. Course Pattern and Credit Structure

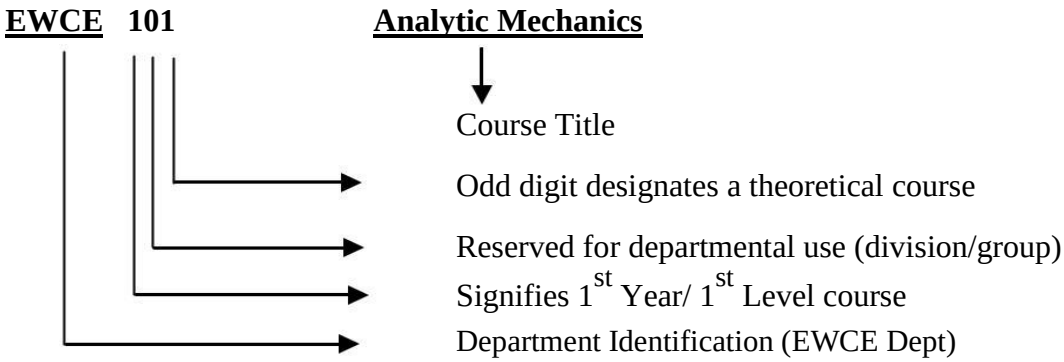
The undergraduate program is covered by a set of theoretical courses along with a set of laboratory (sessional) courses to support them.

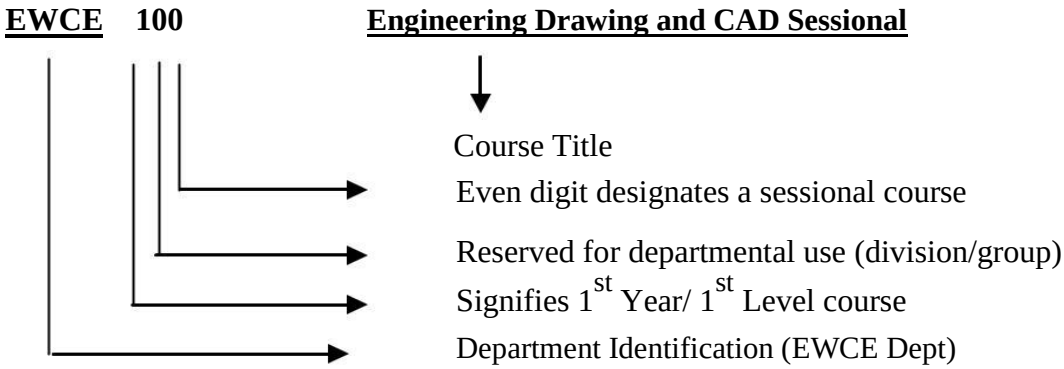
2.6. Course Designation System

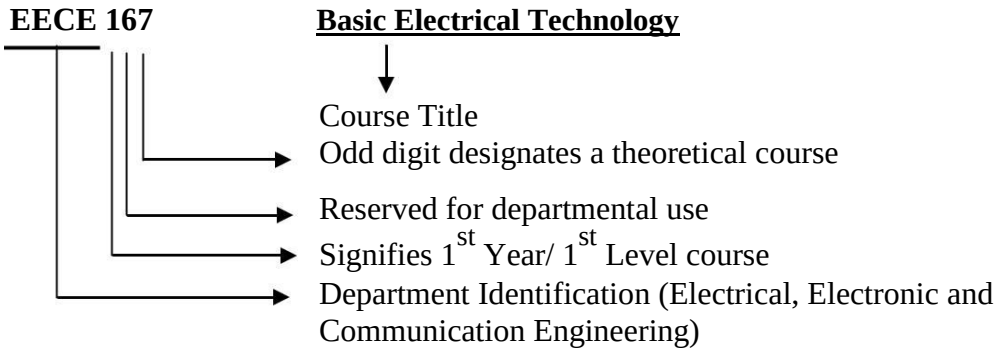
Each course is designated by a maximum of four letter code identifying the department offering the course followed by a three-digit number having the following interpretation:

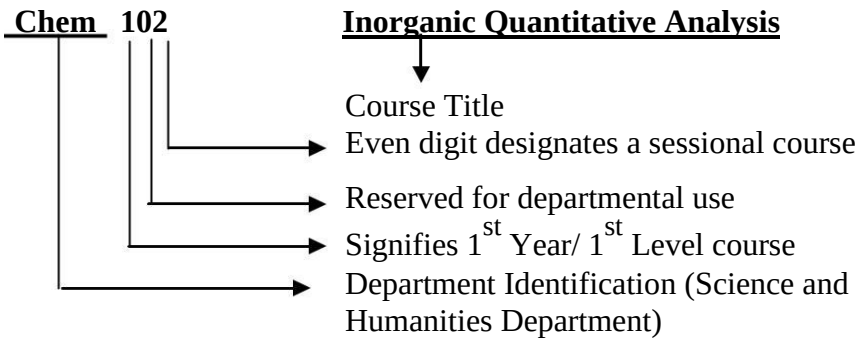
a. The left most digit corresponds to the level in which the course is normally taken by the students. The second digit is reserved for departmental use. It usually identifies a specific division/area/group of study within the department.
b. The right most digit is an odd number for theoretical courses and an even number for sessional courses.

The course designation system is illustrated as follows:









2.7. Assignment of Credits

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

a. Theoretical Courses: One lecture per week per term is equivalent to one credit.
b. Sessional Courses: Credits for sessional courses is half of the class hours per week per term.

Credits are also assigned to project and thesis work taken by the students.

2.8. Types of Courses

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

a. **Core Courses:** In each discipline, a number of courses are identified as core courses, which form the nucleus of the respective bachelor's degree program. A student has to complete the entire designated core courses of his/her discipline.
b. **Prerequisite Courses:** Some of the core courses are identified as prerequisite courses for a specific subject.
c. **Optional Courses:** Apart from the core courses, the students can choose from a set of optional courses. A required number of optional courses from a specified group have to be chosen.

2.9. Course Offering and Instruction

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

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

2.10. Teacher Student Interaction

The new course system encourages students to come in close contact with the teachers. For promotion of a high level of teacher-student interaction, each student is assigned to an adviser and the student is free to discuss all academic matters with his/her adviser. Students

are also encouraged to meet any time with other teachers for help and guidance in academic matters. However, students are not allowed to interact with teachers after the moderation of questions.

2.11. Student Adviser

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

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

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

2.12. Course Registration

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

2.12.1 Registration Procedure

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

2.12.2 Pre-conditions for Registration

a. For first year students, department-wise enrollment/admission is mandatory prior to registration. At the beginning of the first term, an orientation program will be conducted for them where they are handed over with the registration package on submission of the enrolment slip.
b. Any student, other than the new batch, with outstanding dues to the MIST or a hall of residence is not permitted to register. Each student must clear their dues and obtain a clearance certificate, upon production of which, he/she will be given necessary Course Registration Forms to perform course registration.
c. A student is allowed to register in a particular course subject to the class capacity constraints and satisfaction of pre-requisite courses. However, even if a student fails

in a pre-requisite course in any term, the concerned department (BUGS) may allow him/her to register for a course which depends upon the pre-requisite course provided that his/her attendance and performance in the continuous assessment of the mentioned pre-requisite course is found to be satisfactory.

2.12.3 Registration Deadline

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

2.12.4 Penalty for Late Registration

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

2.13. Limits on the Credit Hours to be taken

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

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

2.14. Course Add/Drop

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

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

All changes must be approved by the adviser and the Head of the concerned department.

The Course Adjustment Form has to be submitted after being signed by the concerned persons.

2.15. 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 before commencement of term final examination. However, application may be considered during term final examination in special case. The application must be supported by a medical certificate from the Medical Officer of MIST. The concerned student may opt for retaining the sessional courses of the term. The Academic Council will take the final decision about such applications. However, the total duration for graduation will not exceed 6 academic years.

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

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

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

2.17. Course Assessment Strategy

Theory. Forty percent (40%) of marks of a theoretical course shall be allotted for continuous assessment, i.e. quizzes, home assignments, class tests, observations/ class participation and mid-term examination. These marks must be submitted to the Office of Controller of Examinations before commencement of final exam. The rest of the marks will be allotted to the Term Final Examination. The duration of final examination will be three (03) hours. The scheme of continuous assessment that a particular teacher would follow for a course will be announced on the first day of the classes.

Distribution of marks for a given theory course is as follows:

Class Performance	5%
Class Test/ Assignment/ Homework	20%
Mid-Term Assessment	15%
Final Examination	60%
Total	**100%**

Note: Distribution of marks may be changed based on the decision of Academic Council of MIST.

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

a. Class Performance/Observation
b. Lab Test/Report Writing/Project work/Assignment
c. Quiz Test
d. Viva Voce

Total **100%**

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

a. Class Performance/Observation
b. Assignment
c. Oral Performance
d. Listening Skill
e. Group Presentation
f. Viva Voce

Total **100%**

2.18. Criteria for Collegiate, Non-collegiate and Dis-collegiate Students

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

2.19. Calculation of GPA and CGPA

Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/completed by a student. For example, if a student passes/completes *n* courses in a term having credits of C_1, C_2, … , C_n and his grade points in these courses are G_1, G_2, … , G_n respectively then

$$GPA = \frac{\sum_{i=1}^{n} CiGi}{\sum_{i=1}^{n} Ci}$$

The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the terms passed/completed by a student. For example, if a student passes/ completes n terms having total credits of TC_1, TC_2, … , TC_n and his GPA in these terms are GPA_1, GPA_2, GPA_n respectively then

$$CGPA = \frac{\sum_{i=1}^{n} TCiGPAi}{\sum_{i=1}^{n} TCi}$$

2.20. Numerical Example

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

Course	Credits, C_i	Grade	Grade G_i	Points, C_I*G_i
EWCE 100	1.50	A-	3.50	5.250
EWCE 103	3.00	A+	4.00	12.000
CHEM 101	3.00	A	3.75	11.250
MATH 107	3.00	B	3.00	9.000
HUM 205	2.00	B-	2.75	5.500
HUM 207	2.00	B	3.00	6.000
PHY 103	3.00	A+	4.00	12.000
EWCE 200	1.50	A	3.75	5.625
Total	19.00			66.625

GPA = 66.625/19.00 = 3.51

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

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

CGPA = 318.105/81.50 = 3.90

2.21. Minimum Earned Credit and GPA Requirement for Obtaining Degree

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

2.22. Impacts of Grade Earned

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

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

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

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

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

2.23. Classification of Students

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

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

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

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

b. **Category 2:** This category consists of students who have earned a minimum of 15 credits but do not belong to category 1. A student belonging to this category is advised to take at least one course less since he might have to register for one or more backlog courses as prescribed by his/her adviser.
c. **Category 3:** This category consists of students who have failed to earn the minimum required 15 credits in the previous term. A student belonging to this category is advised to take at least two courses less than a category 1 student subject to the constraint of registering at least 15 credits. However, he will also be required to register for backlog courses as prescribed by the adviser.

Definition of Graduating Student. Graduating students are those students who will have ≤ 24 credit hour remaining for completing the degree requirement.

2.24. 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 completed.

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

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

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

2.25. 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 by BUP on completion of credit and GPA requirements.

2.26. Time Limits for Completion of Bachelor's Degree

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

2.27. Attendance, Conduct and Discipline

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

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 as per MIST rules.

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

2.28. Absence during a Term

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

2.29. Recognition of Performance

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

2.30. Types of Different Examination

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

a. **Term Final Examination:** At the end of each normal term (after 17 wk or so), Term Final Examination will be held. Students will appear in the Term Final Examination for all the theory courses they have taken in the Term.

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

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

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

e. **Self-Study Course Examination:** Only graduating students (level-4) will be allowed to appear at Self Study course examination. It will be taken with Term Final Examination. No regular class will be arranged for this, but teachers will be assigned for supervising and guiding the students for study, conducting class test/quiz and regular assessment for 40% marks. Maximum two theory courses may be taken as self-study course by a student. Highest achieved grade for these courses will be B+. In that case a student will be allowed to take the maximum of 24 credit hours instead of 15 credit hours in the last Term of his/her graduation.

2.31. Rules of Different Examinations

Term Final Examination. Following rules to be followed:

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

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

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

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

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

Short Term Examination. Following rules to be followed:

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

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

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

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

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

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

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

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

i. Maximum grading will be 'B+'.

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

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

Supplementary Examination. Following rules to be followed:

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

b. Examination will be taken on 60% marks like Term Final examination. Remaining 40% marks on continuous assessment earned previously in that particular course will be counted. If a student fails in a course more than once in regular terms, then best one of all continuous assessment marks will be counted.

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

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

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

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

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

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

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

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

Improvement Examination. Following rules to be followed:

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

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

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

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

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

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

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

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

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

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

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

d. To run the self-study course, concerned Department will assign one teacher each for every self-study course offered. No regular theory class will be held, but that assigned teacher will take necessary class Tests, Quiz Test and give attendance and observation marks to give 40% marks at the end of the Term. For remaining 60% marks written examination will be taken with the Term Final Examination.

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

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

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

2.32. Irregular Graduation

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

CHAPTER 3

3. DEPARTMENT OF ENVIRONMENTAL, WATER RESOURCES, AND COASTAL ENGINEERING (EWCE)

3.1. Introduction to the Program

In line with the ongoing expansion policy of MIST, Environmental, Water Resources, and Coastal Engineering (EWCE) department is a newly introduced degree awarding department, started its journey from January 2015 session. The department has currently initiated undergraduate degree program and subsequently will go for further enlarging its arena to post graduate degree programs. Concern about environment is a global issue and environmental issues related to large scale civil engineering projects need further special attention in order to minimize the adverse impact on surrounding environment. For Bangladesh managing the vast water resources for its optimum benefit is very vital for overall livelihood of the people. The long stretched coastal zones also offer excellent opportunities to extract maximum output. More so, the unique and dynamic nature of the coastal belt needs special study and extensive research for sustaining any future project along the coastal line. Combining all mentioned above, an all-embracing study and research work on water resources, costal zones and its relevancy on the overall environment is a call for time. Realizing these importance and with a view to contributing in uplifting the socio-economic condition of the country, MIST took the bold step to produce experts on these very specialized fields. It is expected that relevant and all-encompassing studies and researches by this newly introduced department will reduce much of the existing 'knowledge and understanding gap' in those fields.

This department is enriched with highly experienced and disciplined teaching staffs having wide vision. This department highly promotes interactive learning and collective class-environment which helps the students become more engrossed in employing themselves with the subject-matter and develop their depth of knowledge in engineering education. In addition, the programs emphasizing on engineering science and design, provides students with ample opportunity to put their knowledge into practice by solving real-world problems under the guidance of our readily approachable faculty members. This department also contributes in the country's development projects. All-in-all, within a very short span of time, the EWCE department of MIST has spread its outreach throughout the nation and is playing a vital role in building an ingenious society enriched with engineering transcendence and revolution.

The proposed programs from EWCE department comprise a total of 162.50 credit hours and 205.00 contact hours & 08 weeks of field work and internship.

3.2. Major Divisions of the Department

Department of EWCE comprises of following divisions:

1. Division of Environmental Engineering.
2. Division of Water Resources Engineering.
3. Division of Coastal Engineering.

3.3. Vision and Mission of the Program

Vision:

To become a world-class fully fledged school of environmental, water resources and coastal engineering that plays a pivotal role in development sector of any country.

Mission:

a. To produce highly specialized manpower in environmental, water resources, and coastal engineering sectors through teaching, research, innovations, consultancy and partnerships.
b. To produce students with the principles of engineering and the methodology needed for environmental, water resources, and coastal engineering practice.

3.4. Laboratory Facilities of the Department

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

a. Environmental Engineering Laboratory
b. Estimating & Drawing Shop
c. Survey & Mapping Shop
d. Water Resources Engineering Laboratory
e. Costal Engineering Laboratory
f. GIS Laboratory
g. Structural Mechanics Laboratory
h. Concrete Laboratory
i. Carpentry Shop, Machine Shop and Welding Shop
j. Geotechnical Engineering Laboratory
k. Water and Environmental Model Laboratory

Students have to undertake laboratory courses (sessional) in Physics, Chemistry and English too. If necessary, undergraduate students can access the facilities of other departments and centers during their project, thesis and research works.

3.5. Awarded Degrees from EWCE Department

EWCE department will offer the following degrees in undergraduate program:

a. B.Sc. in Civil and Environmental Engineering
b. B.Sc. in Civil and Water Resources Engineering
c. B.Sc. in Civil and Coastal Engineering

Among the degrees mentioned above, the department may award the first two at present and the third one may be awarded in future, if situation demands.

3.6. Revision of Course Curriculum

The first course curriculum of EWCE department was recommended by 25th academic council of BUP and approved by 31th syndicate meeting of BUP in 2014.

Considering the present contexts, job prospects, scopes of academic research on environment/water resources/coastal engineering fields at home and abroad, and types of degree being awarded from different native and foreign universities, the course curriculum of EWCE department was thoroughly revised by the panel of experts from DU, BUET and MIST in 2017 for the second time. The panel of experts agreed to award BSc degree as Civil and Environmental Engineering, Civil and Water Resources Engineering, and accordingly they recommended including almost all core courses of Basic Engineering, Structure, Geotechnical and Transportation Engineering divisions of Civil Engineering Department of BUET and MIST. They also recommended including additional courses (mandatory and optional) on Environment and Water Resources Engineering discipline which might be undertaken in Level 4. Following their recommendations, almost all core courses of CE Department were included in the revised syllabus. The second revision was recommended by 35th academic council meeting of BUP and approved by 42th syndicate meeting of BUP in 2017.

As a part of continuous development of course curriculum, the department has revised the syllabus in 2019 incorporating more contemporary issues in the course contents to make the program more inclined to professional fields of the graduates. The revised course curriculum is presented in Chapter 4 and Chapter 5.

3.7. Program Educational Objectives (PEOs)

The **Department of Environmental, Water Resources, and Coastal Engineering (EWCE)** forms the foundation for professional and personal development of the graduates that are expected within few years after graduation. The graduates should:

a. Develop strong academic foundation for successful professional career.

b. Acquire skills to excel in the area of civil engineering both in industries and academics.
c. Possess awareness towards higher education, research & development and socio-ethical values.

3.8. Learning Outcomes

Based on the requirements of Board of Accreditation for Engineering and Technical Education (BAETE), Bangladesh, the Bachelor of Science in Civil and Environmental Engineering and Civil and Water Resources Engineering programs will have following learning outcomes:

i. **PO1 Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization (WK1, WK2, WK3, WK4) to the solution of complex Civil engineering problems.
ii. **PO2 Problem analysis**: Able to identify, formulate, research literature and analyze complex Civil engineering problems and reach substantiated conclusions using the principles of mathematics, the natural sciences and the engineering sciences (WK1, WK2, WK3, WK4).
iii. **PO3 Design/development of solutions**: Able to design solutions for complex Civil engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal and environmental concerns (WK5).
iv. **PO4 Investigation**: Able to conduct investigations of complex Civil Engineering problems using research-based knowledge (WK8) considering experimental design, data analysis and interpretation of data and information synthesis to provide valid conclusions.
v. **PO5 Modern tool usage**: Able to create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling, to complex Civil engineering problems with an understanding of their limitations (WK6).
vi. **PO6 The engineer and society**: Able to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice (WK7).
vii. **PO7 Environment and sustainability**: Able to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development (WK7).
viii. **PO8 Ethics**: Able to apply ethical principles and commit to the professional ethics, responsibilities and the norms of the engineering practice (WK7).
ix. **PO9 Individual work and teamwork**: Able to function effectively as an individual, and as a member or leader of diverse teams and in multi-disciplinary settings.

x. **PO10 Communication**: Able to communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.

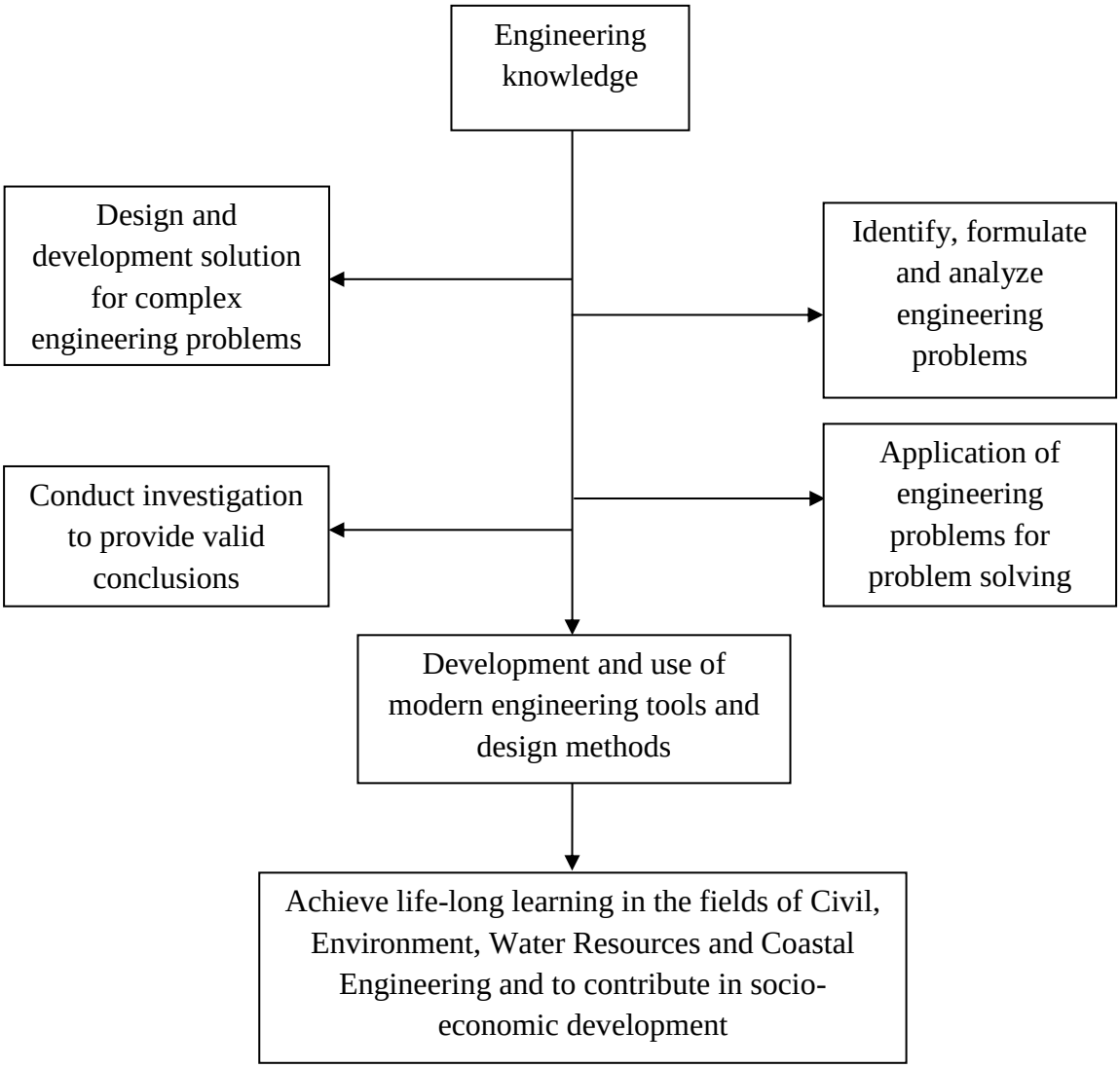
xi. **PO11 Project management and finance**: Able to demonstrate knowledge and understanding of engineering and management principles and apply these to one's work as a team member or a leader to manage projects in multidisciplinary environments.

xii. **PO12 Life-long learning**: Able to recognize the need for, and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

3.9. Generic Skills

a. Apply the principles and theory of civil, environmental, water resources and coastal engineering knowledge to the requirements, design and development of different engineering systems with appropriate understanding.
b. Define and use appropriate research methods and modern tools to conduct a specific project.
c. Learn independently, be self- aware and self- manage their time and workload.
d. Apply critical thinking to solve complex engineering problems
e. Analyze real time problems and justify the appropriate use of technology
f. Work effectively with others and exhibit social responsibility

3.10 Curriculum/ Skill mapping



CHAPTER 4

4. COURSE CURRICULUM STRUCTURE AND SCHEDULE FOR EWCE DEPARTMENT

Considering the program outcome mentioned in Chapter 3, the course schedule for the undergraduate students of the Department of Environmental, Water Resources, and Coastal Engineering (EWCE) is designed and described in this chapter. This curriculum will be effective from Spring 2020 session.

4.1. Summary of Course Curriculum (Credit Hours)

Level/ Term	Humanities	Math	Basic Science	Dept Engg courses	Optional courses	Total
1-I	3.50	3.00	3.00+1.50	7.00+1.50	-	19.50
1-II	-	3.00	6.00+3.00	6.00+1.50	-	19.50
2-I	2.00	3.00	-	11.00+4.50	-	20.50
2-II	2.00	3.00	-	9.00+4.50	-	18.50
3-I	-	-	-	17.00+4.50	-	21.50
3-II	-	-	-	16.00+6.00	-	22.00
4-I	-	-	-	14.00+8.00	-	22.00
4-II	-	-	-	3.00+3.00	10.00+3.00	19.00
Total Credit Hrs	7.50	12.00	13.50	116.50	13.00	162.50
% Of Total Course	4.62%	7.38%	8.31%	71.69%	8.00%	-

4.2. Summary of Term wise Theory and Laboratory Courses

Sl	Level	Term	No. Theory Courses	Theory (Cr. Hrs)	No. Lab Courses	Lab (Cr. Hrs)	Thesis (Cr. Hrs)	Industrial Attachment (Cr. Hrs.)	Integrated Design Project (Cr. Hrs)	Credit
1	1st	I	5	15	3	4.5	-	-	-	19.50
2		II	5	15	3	4.5	-	-	-	19.50
3	2nd	I	6	16	3	4.5	-	-	-	20.50
4		II	5	14	4	4.5	-	-	-	18.50
5	3rd	I	5	17	3	4.5	-	-	-	21.50
6		II	5	16	2	3.0	-	1.0	2.0	22.00
7	4th	I	5	14	3	4.5	1.5	-	2.0	22.00
8		II	5	13	2	3	3	-	-	19.00
									Total =	**162.50**

4.3. Contact Hours and Credit Hours' Distribution in Eight Terms

Level/Term	Theory Contact Hours	Sessional Contact Hours	Theory Credit Hours	Sessional Credit Hours	Total Contact Hours	Total Credit Hours
1/I	15.00	9.00	15.00	4.50	24.00	19.50
1/II	15.00	9.00	15.00	4.50	24.00	19.50
2/I	16.00	9.00	16.00	4.50	25.00	20.50
2/II	14.00	9.00	14.00	4.50	23.00	18.50
3/I	17.00	9.00	17.00	4.50	26.00	21.50
3/II	16.00	12.00	16.00	6.00	28.00	22.00
4/I	14.00	16.00	14.00	8.00	30.00	22.00
4/II	13.00	12.00	13.00	6.0	25.00	19.00
Total	**120.00**	**85.00**	**120.00**	**42.50**	**205.00**	**162.50**

4.4. Thesis

Thesis will have to be undertaken by students under a supervisor in partial fulfillment of the requirement of his/her degree in the final year/ Level 4. Credit hours allotted to the thesis will be 4.5 corresponding to 9 contact hours.

4.5. Integrated Design Project

Integrated design project is a sessional course that builds on earlier design courses and other engineering knowledge. Students are exposed to real world design aspects of engineering projects with the guidance of faculty mentor. Students of different disciplines are encouraged to work in teams, but are individually assessed. This course brings together and further enhances a range of generic skills such as teamwork, problem solving and communication.

4.6. Teaching Strategy

Theory courses will be conducted by participatory lectures, presentation slides, demonstration videos, white board etc.

Sessional courses will be conducted by lab demonstration, test, field sampling, field visit etc based on the course contents

4.7. Term wise Distribution of Courses

LEVEL-1, TERM-I

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
CHEM 101	Chemistry	Theory	3.0	3.0
MATH 107	Differential and Integral Calculus, Matrices		3.0	3.0
HUM 107	English		2.0	2.0
EWCE 101	Analytical Mechanics		4.0	4.0
EWCE 131	Ecology and Environmental Pollution		3.0	3.0
	Subtotal (Theory)		**15.00**	**15.00**
CHEM 102	Inorganic Quantitative Analysis	Sessional	1.5	3.0
HUM 106	Communitive English		1.5	3.0
EWCE 100	Engineering Drawing and CAD Sessional		1.5	3.0
	Subtotal (Sessional)		**4.5**	**9.0**
	Total = Credits: 19.50; Contact hours: 24.00			

LEVEL-1, TERM- II

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
PHY 103	Physics	Theory	3.0	3.0
MATH 109	Differential Equations and Statistics		3.0	3.0
EECE 167	Basic Electrical Technology		3.0	3.0
EWCE 103	Surveying		3.0	3.0
EWCE 105	Environmental Chemistry		3.0	3.0
	Subtotal (Theory)		**15.00**	**15.00**
PHY 104	Physics Lab	Sessional	1.5	3.0
Shop 142	Workshop Sessional		1.5	3.0
EWCE 104	Practical Surveying	Field Work	1.5	3.0*
	Subtotal (Sessional & Field Work)		**4.5**	**9.0**
	Total = Credits: 19.50; Contact hours: 24.00			

* Equivalent Contact Hours [Duration - 4 Weeks; after Term Final Examination].

LEVEL-2, TERM-I

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
HUM 205/ 207/209	Accounting/ Economics / Sociology	Theory	2.0	2.0
MATH 201	Laplace Transformation, Vector Analysis and Coordinate Geometry		3.0	3.0
EWCE 201	Construction Materials		3.0	3.0
EWCE 203	Geology and Geomorphology		3.0	3.0
EWCE 205	Numerical Method		2.0	2.0
EWCE 211	Mechanics of Solids I		3.0	3.0
	Subtotal (Theory)		**16.00**	**16.00**
EWCE 204	Computer Programming Sessional	Sessional	1.5	3.0
EWCE 206	GIS in Environmental and Water Resources Engineering		1.5	3.0
EWCE 212	Structural Mechanics and Materials Sessional		1.5	3.0
	Subtotal (Sessional)		**4.5**	**9.0**
	Total = Credits: 20.50; Contact hours: 25.00			

LEVEL-2, TERM-II

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
HUM 205/ 207/209	Accounting/ Economics / Sociology	Theory	2.0	2.0
MATH 203	Applied Math for Engineering		3.0	3.0
EWCE 213	Mechanics of Solids II		3.0	3.0
EWCE 261	Fluid Mechanics		3.0	3.0
EWCE 263	Hydrology		3.0	3.0
	Subtotal (Theory)		**14.00**	**14.00**
EWCE 200	Details of Construction & Quantity Surveying	Sessional	1.5	3.0
EWCE 208	Engineering Computations Sessional		1.5	3.0
EWCE 262	Fluid Mechanics Sessional		1.5	3.0
	Subtotal (Sessional)		**4.5**	**9.0**
	Total = Credits: 18.50; Contact hours: 23.00			

LEVEL-3, TERM-I

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
EWCE 311	Structure Analysis and Design I	Theory	4.0	4.0
EWCE 315	Design of Concrete Structures I		3.0	3.0
EWCE 331	Water Supply Engineering		3.0	3.0
EWCE 341	Principal of Soil Mechanics		3.0	3.0
EWCE 351	Transportation Engineering		4.0	4.0
	Subtotal (Theory)		**17.00**	**17.00**
EWCE 332	Environment Engineering Sessional	Sessional	1.5	3.0
EWCE 342	Soil Mechanics Sessional		1.5	3.0
EWCE 352	Transport Engineering Sessional		1.5	3.0
	Subtotal (Sessional)		**4.5**	**9.0**
	Total = Credits: 21.50; Contact hours: 26.00			

LEVEL-3, TERM-II

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
EWCE 301	Project Planning and Construction Management	Theory	3.0	3.0
EWCE 317	Design of Concrete Structure II		3.0	3.0
EWCE 333	Waste Water Engineering and Sanitation		4.0	4.0
EWCE 343	Geotechnical and Found Engineering		3.0	3.0
EWCE 361	Open Channel Hydraulics		3.0	3.0
	Subtotal (Theory)		**16.00**	**16.00**
EWCE 300	Students' Internship Program (SIP)	Internship	1.0	2.0[+]
EWCE 316	Concrete Structure Design Sessional I	Sessional	1.5	3.0
EWCE 362	Open Channel Hydraulic Sessional		1.5	3.0
EWCE 450	Integrated Design Project	Project	2.0	4.0
	Subtotal (Internship, Sessional & Project)		**6.0**	**12.0**
	Total = Credits: 22.0; Contact hours: 28.00			

[+] Equivalent Contact Hours [Duration - 4 Weeks; after Term Final Examination].

LEVEL-4, TERM-I

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
EWCE 401	Professional Practice & Communication	Theory	2.0	2.0
EWCE 411	Structural Analysis and Design II		3.0	3.0
EWCE 431	Environment and Social Impact Assessment		3.0	3.0
EWCE 461	River Engineering and Flood Management		3.0	3.0
EWCE 471	Coastal Engineering		3.0	3.0
	Subtotal (Theory)		**14.00**	**14.00**
EWCE 432	Environmental Engineering Design Sessional	Sessional	1.5	3.0
EWCE 462	Computer Applications in Water and Environmental Engineering		1.5	3.0
EWCE 464	Advanced GIS and RS in Environment and Water Resources Engineering		1.5	3.0
EWCE 400	Thesis	Thesis	1.5	3.0
EWCE 450	Integrated Design Project (IDP)	Project	2.0	4.0
	Subtotal (Sessional, Thesis, & Project)		**8.0**	**16.0**
	Total = Credits: 22.00; Contact hours: 30.00			

LEVEL-4, TERM-II (Major: Environmental Engineering)

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
EWCE 467	Integrated Water Resource Management (IWRM)	Compulsory Theory	3.0	3.0
EWCE 433	Solid and Hazardous Waste Management	Major Theory	3.0	3.0
EWCE 435	Air Pollution and Control		2.0	2.0
EWCE 437	Industrial Waste and Waste Water Treatment		3.0	3.0
EWCE 469/ 473/ 475/ 477	Mathematical Modelling in Water Resources Engineering/ Waterway Engineering/ Urban Hydrology/ Climatology	Minor Theory	2.0	2.0
	Subtotal (Theory)		**13.00**	**13.00**
EWCE 400	Thesis	Thesis	3.0	6.0
EWCE 434	Environmental Modelling Sessional	Sessional	1.5	3.0
EWCE 436/ 438	Treatment plant design sessional/ Building Service Sessional		1.5	3.0
	Subtotal (Thesis & Sessional)		**6.0**	**12.00**
	Total = Credits: 19.00; Contact hours: 25.00			

LEVEL-4, TERM-II (Major: Water Resources Engineering)

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
EWCE 467	Integrated Water Resource Management (IWRM)	Compulsory Theory	3.0	3.0
EWCE 463	Irrigation and Drainage Engineering	Major Theory	3.0	3.0
EWCE 465	Design of Hydraulic Structures		3.0	3.0
EWCE 477	Climatology		2.0	2.0
EWCE 435/ 439/481/ 483/485	Air Pollution and Control / Natural Resources & Renewable Energy/ Climate Change & Disaster Management/ Building Services/ Environmental Management System	Minor Theory	2.0	2.0
	Subtotal (Theory)		**13.00**	**13.00**
EWCE 400	Thesis	Thesis	3.0	6.0
EWCE 466	Hydraulic Structure Design Sessional	Sessional	1.5	3.0
EWCE 468	Water Modelling Sessional		1.5	3.0
	Subtotal (Thesis, Sessional & Project)		**6.0**	**12.0**
	Total = Credits: 19.00; Contact hours: 25.00			

CHAPTER 5

5. DETAILED CURRICULUM OF UNDERGRADUATE COURSE

5.1 Courses Offered by EWCE Department

EWCE	Engineering Drawing & CAD Sessional
100	1.50 Credits. 3 Hrs/Wk

Rationale:

It will be useful for designing and drawing schematics for simple blocks, orthographic and isometric representations, dimensioning, etc. Designing and drawing of basic civil engineering components using AutoCAD will be helpful during project work in later semesters, as well as professionally.

Course Objectives:

1. To impart knowledge of different terms, projections and views in field of engineering
2. To make the students efficient in drawing and understanding civil drawings.
3. To gain knowledge about the basic functions of AutoCAD efficiently
4. To take data and transform it into graphic drawings

Course Outcomes:

Students will be able –

1. To learn basic concepts like how to project a point, line, solid objects in a plane and different types of projection etc.
2. To analyze a drawing provided by a professional engineer.
3. To familiarize themselves with two dimensional CAD drawings.
4. To draw and interpret detail architectural and structural drawing of residential building.

Course Contents:

Lines and lettering; plane geometry: drawing of linear and curved geometric figures, e.g. pentagon, hexagon, octagon, ellipse, solid geometry: concept of isometric view and oblique view, theory of projections; drawing of isometric view of 3d objects such as cube, prism, pyramid, cone and cylinder; projections of cube, prism, cone, cylinder; developments of cube, pyramid, cone, cylinder; plan, elevations and sections of one storied buildings.

Introduction to computer usage; introduction to CAD packages and computer aided drafting: drawing editing and dimensioning of simple objects; plan, elevations and sections of one-storied buildings; reinforcement details of beams, slabs, stairs etc; plans, elevations and sections of culverts, bridges and other hydraulic structures; drawings of building services.

Text and Ref Books:

1. Civil Engineering Drawing - Gurcharan Singh & Subash Chandra
2. Prathomic Engineering Drawing - Hamonto Kumar Bhottacharjo
3. Engineering Drawing Basant Agrawal and C M Agrawal
4. AutoCAD manual.

EWCE	Analytical Mechanics
101	**4.00 Credits. 4 Hrs/Wk**

Rationale:

Purpose of this course is to provide the students with the basic knowledge in mechanics of rigid body which will be helpful while studying strength of materials.

Course Objectives:

1. Understand different force systems and their basic mathematics in order to solve statically determinate stationary rigid bodies, external / internal forces in a statically determinate beam, trusses and frames composed of pin connected members and forces developed in the cables and supports.
2. Apprehend the problems involving friction and their real application (in a limited scale)
3. Determine geometric properties like centorids of line, area and volume, Theorems of Pappus and Guldinus, Centre of pressure along with internal properties of object such as Rectangular and Polar Moment of Inertia and Radius of gyration of single and composite areas, Transfer formula, Product of Inertia, Moment of Inertia at inclined axis, maximum and minimum moment of inertia, Moment of Inertia of Masses.
4. Perceive components of all types of plane motions and solution techniques with a view to getting a clear conception of Impulse and Momentum, coefficient of restitution;

Course Outcomes:

Students will be able –

1. To apply equations of equilibrium to analyze statically determinate rigid bodies (with and without friction).
2. To apply equations to determine the forces in different types of Frames and Trusses.
3. To apprehend the Friction forces that are developed between rough/non-smooth bodies.
4. To analyze and design cables and determine the forces in supports.

Course Contents:

Coplanar and non-coplanar force systems; moments; analyses of two-dimensional frames and trusses; friction; flexible chords; introduction to space frames;
Centroids; moments of inertia of areas and masses; plane motion; Work, Power, Energy; Impulse and momentum, Hydraulic forces for Reservoir, Dam etc.

Text and Ref Books:

1. Analytic Mechanics – Faires & Chambers (3rd Edition)
2. Engineering Mechanics – Singer
3. Engineering Mechanics: Statics, 13th Ed., Hibbeler
4. Engineering Mechanics: Dynamics, 13th Ed., Hibbeler
5. Fundamentals of Physics, 9th Ed., Halliday, Resnick and Walker

EWCE	Surveying
103	**3.00 Credits. 3 Hrs/Wk**

Rationale:

The purpose of this course is to introduce various surveying technology and provide basic knowledge of various surveying and mapping projects which will be helpful during project work in later semesters, as well as professionally.

Course Objectives:

1. To become technically adept on surveying technology as well as supporting math and science disciplines,
2. To enable the graduates assisting professional land surveyors in various surveying and mapping projects.
3. Technical skills and knowledge acquired from this course will facilitate the graduates to perform their work duties with a commitment to quality, timeliness, and continuous improvement.

Course Outcomes:

1. Apply the knowledge, techniques, skills, and modern tools of surveying technology to narrowly defined surveying technology activities.
2. Apply the knowledge of mathematics, science, engineering, and technology to surveying technology problems that require limited application of principles but extensive practical knowledge.
3. Identify, analyze, and solve narrowly defined surveying technology problems.

Course Contents:

Fundamentals of surveying, linear measurement, chain surveying, plane table survey, traverse surveying, leveling, calculation of area and volume, topographic survey, trigonometrical survey, tacheometric surveying, curves and curve setting, project survey.

Special and modern survey equipment (Total station, EDM, RTK-GPS, ADCP, Echo-sounder, OBS etc.)

Hydrographic survey (measurement of velocity and discharge, sounding, tide gages), photogrammetry, astronomical surveying, GIS and remote sensing.

Text and Ref Books:

1. Surveying - Volume I, II, III - Dr. B.C. Punmia (SI Units)
2. A Text book of Surveying - M.A. Aziz & Shahjahan
3. Schaum's Outline of Introductory Surveying - Roy Wirshing and James Wirshing
4. Construction Surveying and Layout: A Step-By-Step Field Engineering Methods - Wesley G. Crawford
5. Basic Surveying - Raymond Paul and Walter Whyte, 4th Ed.

EWCE	Practical Surveying
104	1.50 Credits. 3 Wk

Rationale:
The purpose of this course is to introduce various instruments of surveying and applying those in the field. This training will be useful for the students in professional field.

Course Objectives:
1. To orient the students with the use of various instruments of surveying and applying those in the field of survey
2. To utilize the students‘ theoretical knowledge on surveying (EWCE-103) into practical fields
3. To train the students to plan and execute survey work for any engineering project

Course Outcomes:
Students will be able –
1. To perform survey with instruments including chain, plane table, level, theodolite, total station aided by RTK GPS
2. To present the survey data in a standard way
3. To plot the digital data into geo-referenced map and analyses them for various purposes

Course Contents:
Linear and angular measurement techniques; traverse surveying; leveling and contouring; curve setting; tacheometry; project surveying; modern surveying equipment and their applications, Hydrographic surveying

Text and Ref Books:
1. Surveying- Volume I, II, III - Dr. B.C. Punmia (SI Units)
2. A Text book of Surveying - M.A. Aziz & Shahjahan
3. Practical Surveyor - Samuel Wyld and David Manthey

EWCE	Environmental Chemistry
105	3.00 Credits. 3 Hrs/Wk

Rationale:
The purpose of this course is to introduce various chemical phenomena occurring in major environmental regime like atmosphere, water, soil and biosphere. Learning about chemical behavior of environmental systems will be helpful in understanding of pollution monitoring, design of pollution control systems in later semesters as well as in professional fields.

Course Objectives:
1. To understand the importance of 3R (Reuse, Reduce and Recycle) principle
2. To understand the details of pollutant chemistry in atmosphere, water, soil and food as well as their adverse effects on environment and human health
3. To describe the process chemistry involved in water and waste water treatment plants
4. To understand the chemical mobilization from anthropogenic sources, like industrialization, agriculture, drug and food additives.

Course Outcomes:
Students will be able –
1. To relate the concept of 3R principle with their day-to-day work environment
2. To have comprehensive idea about pollutant sources as well as chemical fate in various regimes of environment
3. To acquire knowledge about chemical processes in water and waste water treatment plants
4. To have basic idea about chemical assimilation as well as accumulation from drug and food additives

Course Contents:
Fundamental of environmental chemistry; Green synthetic chemistry, concept of 3R (reuse, reduce and recycle).

Atmospheric chemistry: Atmospheric cycles; air pollution and pollutants - criteria and critical pollutants; ozone hole and stratospheric ozone depletion; chemical and photochemical reactions in atmosphere; hydrocarbons and photochemical smog.

Aquatic chemistry: Water properties; solubility of gases and solids; colloidal suspension; Complexation reactions, solution approaches for aqueous equilibrium; Aqueous carbonate system; general concept on – alkalinity, pH, capacity diagram, pE, electron activity; Redox equilibria; organic and inorganic pollutants; heavy metal contamination; adsorption isotherms; Chemical fate of pollutants.

Soil Chemistry: Soil Composition; acid-base and ion exchange equilibria in soil, pollution mobilization from farming.

Chemistry of pesticides, insecticides, anti-biotic and food preservatives.

Text and Ref Books:
1. Chemistry for Environmental Engineering – Clair N. Sawyer, Perry L. McCarty and Gene F. Parkin, 4th ed., McGraw Hill Inc.
2. Environmental Chemistry – Stanley E. Manahan., 8th ed., CRC Press
3. Aquatic Chemistry: Chemical Equilibria and Rates in Natural Waters – Werner Stumm and James J Morgan, 3rd ed., Hoboken : Wiley, 2012
4. Introduction to Environmental Engineering – Gilbert M. Masters and Wendell P. Ela, 3rd ed., Prentice-Hall Inc.

EWCE	Ecology and Environmental Pollution
131	3.0 Credits. 3 Hrs/Wk

Rationale:

The purpose of this course is to introduce ecological levels of organization, biogeochemical cycles, biodiversity loss, environmental and anthropogenic pollutants, their sources and impacts on environment and human health. Understanding about ecological processes and loss will help to identify the areas of intervention for conservation in practical field. Basic understanding about environmental pollutants and existing standards will be helpful in understanding the importance of pollution abatement in later semesters as well as in professional fields.

Course Objectives:

1. To understand the basic concept of material transport and energy dissipation in various trophic levels, human induced alteration of biogeochemical cycles, biodiversity loss and its impacts on environment.
2. To understand the basics of pollutant from atmosphere, water and soil as well as their adverse effects on environment and human health
3. To give basic idea about environmental rules and standards
4. To apprehend preliminary concept of environmental pollution management

Course Outcomes:

Students will be able –

1. To understand the influence of human activities in alteration of biogeochemical cycles and importance of ecological conservation
2. To be acquainted with environmental pollutants, sources, mobilization through ecological cycles and impacts on environment
3. To acquire general idea about environmental laws, regulations and pollution management

Course Contents:

Ecology, ecosystem and bio-diversity; food chain and food web; biogeochemical cycles; human influence on biogeochemical cycles.

Environmental Pollution; Environmental parameter monitoring; General concepts of pollutants: (nuclear, fossil fuel, air, domestic, agricultural and industrial); adverse effects of pollution; sampling and monitoring of pollutants; Environmental standards; Environmental Pollution Management.

Text and Ref Books:

1. Environmental Science – Earth as Living Planet - Daniel B. Botkin, Edward A. Keller, 8th ed., John Wiley and Sons, Inc.
2. Environmental Science – A Global Concern - William P. Cunningham, Mary Ann Cunningham, 12th ed., McGraw Hill Companies
3. Fundamentals of Ecology - Eugene P. Odum, Gray W. Barrett, 5th ed., Thomson Learning Inc.
4. Environmental Engineering – Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, McGraw Hill International Edition
5. Introduction to Environmental Engineering – Gilbert M. Masters and Wendell P. Ela, 3rd ed., Prentice-Hall Inc.

EWCE	Details of Construction and Quantity Survey
200	1.50 Credits. 3 Hrs/Wk

Rationale:

In this course students will be introduced with components of different civil engineering. This hand on training will be useful for the students in later projects.

Course Objectives:

1. To impart knowledge on the basics of different types of components of a building, design loads, framed structure and load bearing wall structure.
2. To make the students efficient in practical field through site visits and technical sessions.

Course Outcomes:

Students will be able –

1. To acquire knowledge on components of a building, design loads, framed structure and load bearing wall structure.
2. To understand practical difficulties faced in fields.
3. To apprehend the basics of building construction.

Course Contents:

Types of building, components of a building, design loads, framed structure and load bearing wall structure,

foundations: shallow and deep foundation, site exploration, bearing capacity of soil;

brick masonry: types of brick, bonds in brickwork, supervision of brickwork, defects and strength on brick masonry, typical structures in brickwork, load bearing and non-load bearing walls, cavity walls, partition walls; lintels and arches: different types of lintels and arches, loading on lintels, construction of arches;

stairs: different types of stairs, floors: ground floors and upper floors; roofs and roof coverings; shoring; underpinning; scaffolding and formwork; plastering, cement concrete construction; house plumbing: water supply and wastewater drainage;

Estimating and Cost Analysis of a building, bridge, shore structures etc.

Text and Ref Books:

1. Concrete and Formwork - T W Love
2. Building Construction – W.B. McKay (Vol. 1)
3. BDA Guide to Successful Brickwork - the Brick Development Association.
4. Concrete Construction - Ken Nolan
5. Building Construction – Sushil Kumar
6. Formwork for Concrete - M.K. Hurd, , Fifth Edition,
7. "New Scaffolding Guidance TG20:08 – Guide to Good Practice for Scaffolding with Tube and Fittings" NASC (National Access and Scaffolding Confederation), UK
8. Plumbing a House: For Pros by Pros - Peter Hemp
9. Building Construction – Dr. B.C. Punmia
10. Building Construction Engineering – Gurcharan Singh
11. Construction Drawings and Details for Interiors: Basic Skills, 2nd Edition - Rosemary Kilmer and W. Otie Kilmer
12. Sound Insulation- Carl Hopkins
13. Popular Mechanics Complete Home How-to - Albert Jackson, David Day
14. PWD manual on house construction and plumbing

EWCE	Construction Materials
201	3.00 Credits. 3 Hrs/Wk

Rationale:
This course is very useful for civil engineering students. In this course students will be given knowledge on various engineering materials including but not limited to brick, cement, sand, coarse aggregate, mortar, concrete, wood, steel, aluminum, geo-textiles, composites, FRP, etc. Students will be also familiarizing with behavior and characteristics of these materials. Studying of these materials will be useful for the students in later projects.

Course Objectives:
1. To gain knowledge on the basics of engineering materials.
2. To become confident at the use of engineering materials in the construction of civil engineering structures.

Course Outcomes:
Students will be able –
1. To analyze the suitability of engineering materials for different types of construction works.
2. To select appropriate construction materials for different types of structures.

Course Contents:
Properties and uses of aggregates, brick, cement; sand, lime, mortars; concrete; marine concrete; concrete mix design; wood structures and properties; shrinkage and seasoning; treatment and durability; mechanical properties; creep behavior; advanced fiber reinforced polymer (FRP) composites, glass fiber, nano tubes; reinforcement types; corrosion prevention in RC structures; geotextiles and geo-synthetics; elastic, elastoplastic and elasto-visco-plastic materials; Ferro-cement.

Text and Ref Books:
1. Building Materials – Gurcharan Singh
2. Engineering Materials - M.A. Aziz
3. A Text book of Engineering Materials – G.J. Kulkarni (6th Edition)
4. Engineering Materials Technology: Structures, Processing, Properties, and Selection - James A. Jacobs and Thomas Kilduff, 5th Ed.

EWCE	Geology and Geo-morphology
203	3.00 Credits. 3Hrs/Wk

Rationale:
In this course students will be given basic knowledge on typical formations and mineralogical compositions of rock and minerals. Students will be also familiarizing with geomorphological formations.

Course Objectives:
1. To gain knowledge on the composition of several types of soils, rocks and the seismicity

map of Bangladesh
2. To attain insight on the common geomorphological formations emphasizing on the perspective of Bangladesh.

Course Outcomes:
Students will be able –
1. To understand the typical formations and mineralogical compositions of soils and rocks.
2. To learn the seismicity measurement scales and map of Bangladesh.
3. To learn the general trends in geomorphological formations and its importance in riverine areas of Bangladesh.

Course Contents:
Rocks and minerals: identification of rocks and minerals, common rock forming minerals; physical properties of minerals; mineraloids rocks; types of rocks, cycle of rock change; earthquake and seismic map of Bangladesh; geology of Bangladesh.
Structural geology: faults; types of faults; fold and fold type; domes; basins; erosional process; quantitative analysis of erosional land forms.
Fluvial processes in Geomorphology: channel development; channel widening; valley shape; stream terraces; alluvial flood plains; deltas and alluvial fans; fluvial deposits; coastal deposits; glacial deposits; lacustrine deposits, aeolian deposit, river basin; channel morphology; channel patterns and the river basin; geology and geomorphology of rivers of Bangladesh.

Text and Ref Books:
1. Geology for Civil Engineers - A.C. McLean & C.D. Gribble
2. Foundations of Engineering Geology - Tony Waltham

EWCE	**Computer Programming Sessional**
204	**1.50 Credits. 3 Hrs/Wk**

Rationale:
This is a hand on training course for computer programming. In this course students will be given basic knowledge on algorithm, problem solving technique and how to apply this in a computer language program.

Course Objectives:
1. To introduce students the basic concepts of C++ language and enable them to write simple correct programs

Course Outcomes:
On successful completion of this course students will be able –
1. To write clear, elementary C++ programs
2. To understand algorithmic thinking, problem-solving techniques and apply it to programming
3. To write code with C++ arithmetic, increment, decrement, assignment, relational, equality and logical operators

4. To code C++ control structures (if, if/else, switch, while, do/while, for) and use built-in data types

Course Contents:
Programming concepts and algorithms; internal representation of data; elements of structured programming language: data types, operators, expressions, control structures, functions, pointers and arrays, input and output; concept of Object Oriented Programming (OOP): encapsulation, inheritance, polymorphism and abstraction, development of programs related to Civil, Environmental and Water Resources Engineering.

Text and Ref Books:
1. Teach Yourself C– Herbert Schildt
2. Programming With C– Schaum's Outline Series

EWCE	**Numerical Methods**
205	**2.00 Credits. 2Hrs/Wk**

Rationale:
In this course students will be given basic knowledge on various numerical solution techniques and computations. This will be useful for the students in a later stage of their study, as well as professional life.

Course Objectives:
1. To gain knowledge on the basic computations on numerical problems.
2. To become skilled in using numerical solution techniques. 3. To learn the schemes of reducing the numerical errors in basic computations.

Course Outcomes:
Students will be able –
1. To analyze the numerical problems using the different solution techniques.
2. To get insight on the fundamental concepts in developing the algorithm for various computer codes.
3. To solve complex boundary value problems using the solution methods.

Course Contents:
Basics of Numerical Methods; Numerical solution of non-linear algebraic and transcendental equations; Systems of linear algebraic equations; interpolation and curve fitting; roots of equations; numerical differentiation; numerical integration; initial value problems; two-point boundary value problems; finite differences.

Text and Ref Books:
1. Numerical Mathematical Analysis – James b. Scarborough
2. Introductory Methods of Numerical Analysis– S.S. Sastry
3. Numerical Methods For Scientific And Engineering Computation - Jain, Iyengar, Jain
4. Numerical Methods using Matlab (-John H Mathews and Kurtis K Fink, 4th Ed.
5. Fundamentals of Engineering Numerical Analysis - Parviz Moin (2010)

EWCE	GIS in Environmental and Water Resources Engineering
206	1.50Credits. 3 Hrs/Wk

Rationale:
This is a hand on training course for GIS. In this course students will be introduced to basic functions and analysis of GIS. Students will be also practice using GPS and related software.

Course Objectives:
1. To understand basic functions of GIS
2. To understand common formats of GIS data like shapefiles, raster, and geodatabases.
3. To produce maps for basic GIS analysis
4. To utilize GIS software for conducting spatial analysis
5. To use GPS and related softwares

Course Outcomes:
Students will be able –
1. To know the fundamental concepts of Geographic Information Systems.
2. To produce maps from geographic data.
3. To effectively prepare GIS layout
4. To use GIS tools for spatial analysis.

Course Contents:
Introduction, use and applications of GIS software, Hands-on exercises using various methods, GPS and related software.

Text and Ref Books:
1. Concepts and Techniques of Geographic Information System – C.P. Lo Albert and K.W. Yeung
2. Principles of Geographical Information System – Peter A. Burrough and Rachel A. McDonnel
3. Geographical Information System and Computer Cartography - Christopher Jones
4. ArcGIS 9.3.1 Tutorial – Wilpen L. Gorr, Kristen S. Kurland

EWCE	Engineering Computations Sessional
208	1.50 Credits. 3 Hrs/Wk

Rationale:
This is a hand on training course for computer programming for civil engineers. In this course students will be given knowledge to solve real life engineering problem using various numerical methods which will be helpful later on in various projects.

Course Objectives:
1. To gain knowledge on the basics of computational programming tools.
2. To become skilled at the application of various numerical analysis.

Course Outcomes:
Students will be able –

1. To perform numerical analysis of engineering problems.
2. To solve linear and non-linear equations, problems related to mechanics and equation of motion.

Course Contents:
Introduction to hi-level computational programming tools; application to numerical analysis: basic matrix computation, solving systems of linear equations, non-linear equations, differential equations, interpolation and curve fitting, numerical differentiation, numerical integration; application to engineering problems: solving problems related to mechanics, numerical solution of equation of motion etc.

Text and Ref Books:
1. Mastering Matlab 7 – Duane Hanselman and Bruce Littlefield, Pearson Education
2. Lab Manual

EWCE	**Mechanics of Solids I**
211	**3.00 Credits. 3 Hrs/Wk**

Rationale:
This is a basic mechanics course. In this course students will be introduced to basic solid mechanics including stress, strain, deformation, different loads, behavior of structures under loading.

Course Objectives:
1. Grasp the internal force systems in frame members and compute the internal forces at various location.
2. Understand concepts of stress and strain and their relationships for structural materials (constitutive relations)
3. Understand various stresses e.g. bending, shear, tear etc.

Course Outcomes:
Students will be able –
1. To understand Shearing Stress, Tearing Stress and Axial Stress beams and frames.
2. To analyze and design of simple and composite beams.
3. To analyze stress distribution straight and bent beams.

Course Contents:
Concepts of stress and strain, constitutive relationships; deformations due to tension, compression and temperature change; beam statics: reactions, axial force, shear force and bending moments; axial force, shear force and bending moment diagrams using method of section and summation approach; elastic analysis of circular shafts, solid non-circular and thin walled tubular members subjected to torsion; flexural and shear stresses in beams; shear center; thin walled pressure vessels.

Text and Ref Books:
1. Engineering Mechanics of Solids - Popov

	2. Theory and Problems of Strength of Materials -William A Nash 3. Strength of Materials – Andrew Pytel, Ferdinand L. Singer (4th Edition)

EWCE	**Structural Mechanics and Materials Sessional**
212	**1.50 Credits. 3 Hrs/Wk**

Rationale:
This is a hand on training course for engineering materials and mechanics. In this course students will be introduce to basic testing procedure for brick, cement, sand, stone, concrete, and steel. Students will be also learning testing of different structures.

Course Objectives:
1. To gain knowledge on the basics of different experimental results
2. To become familiar with professional and contemporary issues in the design
3. To devise the theories for different behavior of materials

Course Outcomes:
Students will be able –
1. To perform analysis and design of reinforced concrete members and connections.
2. To identify and interpret the appropriate relevant industry design codes.

Course Contents:
Tension, direct shear and impact tests of mild steel specimen; slender column test; static bending test; hardness test of metals; helical spring test;
General discussion on preparation and properties of concrete; FM of aggregates; normal consistency, initial setting time, soundness and fineness test of cement, compressive strengths of cement mortar; design and testing of a concrete mix and testing of bricks for compressive strength.

Text and Ref Books:
1. Engineering Mechanics of Solids– Popov
2. Theory and Problems of Strength of Materials -William A Nash
3. Laboratory Manual

EWCE	**Mechanics of Solids II**
213	**3.00 Credits. 3 Hrs/Wk**

Rationale:
This is a continuation of EWCE 211 Mechanics of Solids I. In this course students will be introduced to stress, strain, deformation, behavior of beams and columns subjected to various loading.

Course Objectives:
1. To gain knowledge about the effect (state of stress) on beam due to combined loading.
2. To understand the transformation stresses and construction Mohr's circles of stress.

3. To gain knowledge about failure criteria by different theories of failure and understand their modes of failure.
4. Understand Euler's buckling theory and its application in compressive members.
5. To design different bolted, riveted and welded joints.
6. To learn to compute the deflection of beam by various methods.
7. To understand the concept of strain energy for axial stress, flexural stress and shear stress.
8. To understand the behavior of cable under uniformly distributed load and concentrated load.

Course Outcomes:
On successful completion of this course students will be able to –
1. To investigate the state of stress due to combined loading at beam and column and find neutral axis.
2. To construct Mohr's circle of stress and transform normal and shear stresses.
3. To analyze different modes of failure based on their criteria.
4. To find critical load and stress using Euler Buckling Formula.
5. To analyze and design bolted riveted and welded joints.
6. To calculate the deflection and rotation at any point of beam under transverse loading using direct integration method and moment area method.
7. To solve different problems of strain energy for axial loading, bending and torsion. 8. Understand the behavior of cable under uniformly distributed load and concentrated load.

Course Contents:
Symmetric and unsymmetric bending of beams; stress transformation, failure criteria; beam deflection by direct integration and moment area method; buckling of columns; elastic strain energy and external work; cable and cable supported structures; bolted, riveted and welded joints.

Text and Ref Books:
1. Engineering Mechanics of Solids– Popov
2. Advanced Strength and Applied Elasticity- A C Ugural and S K Fenster, 5th ed.
3. Theory and Problems of Strength of Materials -William A Nash
4. Strength of Materials– Andrew Pytel, Ferdinand L. Singer, 4th Ed.
5. Mechanics of Materials – Laurson & Cox
6. Strength of Materials – R.S. Khurmi

EWCE	**Fluid Mechanics**
261	**3.00 Credits. 3 Hrs/Wk**

Rationale:
This is a basic fluid mechanics course. In this course students will be introduced to basic principles and analysis of fluid systems which will be helpful for the students on later stage of their study.

Course Objectives:
1. To understand the basic principles and analysis of both static and dynamic fluid systems
2. To perform design calculations on engineering fluid systems

Course Outcomes:
Students will be able to –
1. Demonstrate their understanding of the basic principles of static and fluid systems
2. Devise simple solutions to a range of problems in basic fluid flows
3. Use appropriate modeling tools to design pipelines and equipment
4. Undertake basic design calculations of fluid engineering systems

Course Contents:
Fluid properties; fluid statics; kinematics of fluid flows; fluid flow concepts and basic equations- continuity equation, Bernoulli's equation, energy equation, momentum equation and forces in fluid flow; steady incompressible flow in pressure conduits, laminar and turbulent flow, general equation for fluid friction; empirical equations for pipe flow; minor losses in pipe flow; pipe flow problems-pipes in series and parallel, pipe networks.

Text and Ref Books:
1. Fluid Mechanics with Engineering Application – Franzini
2. Fluid Mechanics– Streeter & Wylie
3. Fluid Mechanics – Frank M.White

EWCE	**Fluid Mechanics Sessional**
262	**1.50 Credits. 3 Hrs/Wk**

Rationale:
This is a hand on training course for fluid systems. In this course students will be introduce to the basic principles and analysis of both static and dynamic fluid systems.

Course Objectives:
1. To understand the basic principles of various fluid systems
2. To be able to perform analysis on both static and dynamic fluid systems

Course Outcomes:
On successful completion of this course students will be able to –
1. Devise simple solutions to a range of problems in basic fluid flows
2. Undertake basic design calculations of fluid engineering systems

Course Contents:
Centre of pressure; proof of Bernoulli's theorem; flow through venturimeter; flow through orifice; coefficient of velocity by coordinate method; flow through mouthpiece; flow over v-notch; flow over sharp-crested weir; fluid friction in pipe.

Text and Ref Books:
1. Fluid Mechanics with Engineering Application – Franzini

	2. Fluid Mechanics – Streeter & Wylie 3. Laboratory Manual

EWCE	**Hydrology**
263	**3.00 Credits. 3 Hrs/Wk**

Rationale:
Basic understanding regarding hydrologic cycle, hydrological parameters and their inter relationships acquired from this course will be helpful for later semesters as well as in professional fields.

Course Objectives:
1. To understand the basic principles of hydrology
2. To gain knowledge about hydrologic data and statistical analysis methods
3. To get basic idea about groundwater flow

Course Outcomes:
On successful completion of this course students will be able to –
1. Undertake basic calculation on flood routing and other hydrologic data
2. Understand the relationships between rainfall and runoff; infiltration and soil moisture
3. Explain the physical characteristics and movement of groundwater

Course Contents:
Hydrologic cycle; physics of air flow; cyclone; precipitation; Stream flow; infiltration and soil moisture; evaporation and evapo-transpiration; hydrologic data acquisition; rainfall-runoff relationships; Hydrographs; Flood routing and statistical methods in hydrology; groundwater: physical properties and movement.

Text and Ref Books:
1. Engineering Hydrology – K Subramanya
2. Groundwater Hydrology - David Keith Todd, Larry W. Mays, 3rd ed. Wiley

EWCE	**Students' Internship Program**
300	**1.00 Credits.**

Rational:
In this course the students will learn to communicate with industrial/ professional organizations/ personnel as well as to be introduced with organizational/ project activities, where they will find the application of their theoretical knowledge. Real life exposure of the students through this course will be very helpful in their professional life.

Course Objectives:
1. To apply class room knowledge in solving real life engineering problems.
2. To experience corporate culture and its contribution for the society.

	Course Outcomes: Students will be able– 1. To apply theoretical knowledge in solving engineering problems. 2. To illustrate the current practices in construction project management. 3. To explain corporate culture and its contribution for the society. 4. To produce project report with proper appearance, format, grammar, introduction, objective and procedure. **Course Contents:** Professional attachment in civil/ environmental/ water resources engineering related job/work at projects/organization/firms prescribed by the department. Performance will be evaluated based on a presentation and a report submitted by the intern and evaluation of the reporting officer at the organization/firm.

EWCE	**Project Planning and Construction Management**
301	**3.00 Credits. 3 Hrs/Wk**
	Rationale: This is a professional field oriented course where students will be given knowledge on project planning, construction site management, financial evaluation of projects etc. This course will be useful for the students in future to skills on project development. **Course Objectives:** 1. Development of knowledge on principles of management, construction site management, project organization, 2. Development of basic understanding on economic/financial evaluation of a project, project planning, scheduling by using PERT, CPM, allocation of resources by linear programming 3. Learning the knowledge on conflict management, human resource management **Course Outcomes:** Students will be able to – 1. Lead an engineering project. 2. Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety 3. Function on multidisciplinary teams. **Course Contents:** Project planning and evaluation; feasibility reports; cash flows, Project Life Cycle; payback period; cost-benefit analysis, socio-economic impacts; Planning and scheduling, PERT, CPM; resource scheduling; linear programming and application. Principles of construction management: project organization, methods and practices, technology, management of materials and equipment's, site management, contracts and

specifications, inspection and quality control, safety, economy. Conflict management; psychology in administration: human resource management. Demand forecasting; inventory control; stores management; procurement; legal issues in construction; environmental regulations. Project Control & Monitoring.

Text and Ref Books:

1. Project Planning and Control -Lester
2. The Process of Management – William H. Newman
3. Introduction to Operational Research – Hiller & Liberman
4. Project Management Techniques – A.O. Awani
5. Construction Planning, Equipment and Methods – Peurifoy
6. Material Management & Inventory Control – A.K. Datta
7. Project Management – S. Chowdhury

EWCE	Structural Analysis and Design I
311	4.00 Credits. 4 Hrs/Wk

Rationale:

In this course students will learn how to analysis various structural components subjected to both static and moving loads. Analysis technique learnt here will be useful in later courses where students will learn how to design different structural components.

Course Objectives:

To analyze the statically determinate linear structural systems such as simple beams, cantilever beams, three hinged arches or frames, or compound structural systems and trusses subjected to dead and lateral load /or moving loads, to draw internal force diagrams and to calculate the displacements.

Course Outcomes:

Students will be able to –

1. Learn how to analyze statically determinate and indeterminate structures
2. Learn how to determine lateral load on structure at different area in Bangladesh
3. Get knowledge on various types of structures and their behavior
4. Axial load on a column from different stories.

Course Contents:

The concept of stability and determinacy of structures; Analysis of statically determinate trusses and arches; Approximate analysis of statically indeterminate structures: Portal Frames. Bridge Portal, Mil bent; Braced trusses; Analysis of multi-storied building frames under gravity (vertical) load; Analysis of multi-storied building frames under lateral (wind and seismic) load: Portal method and Cantilever method; Deflection of beams, trusses and frames by energy method (strain energy, principles of virtual work, Castigliano's theorem); Influence lines; Moving loads on beams; Analysis of suspension bridge; Wind and earthquake loads.

	Text and Ref Books: 1. Theory of Simple Structures– T.C. Shedd and J.Vawter (2nd Edition) 2. Elementary Structural Analysis – Utku, Norris & Wilber (4th Edition) 3. Advanced Strength and Applied Elasticity, 5th Edition, by A C Ugural and S K Fenster 4. Structural Analysis by Aslam Kassimali (3rd Edition)

EWCE	**Design of Concrete Structures I**
315	**3.00 Credits. 3 Hrs/Wk**
	Rationale: It is the design course for reinforced concrete structures, especially designing of various components, such as beam and slab, of a reinforced concrete building. In this course students will learn how to design a reinforced concrete beam and slab due to flexural and shear force. **Course Objectives:** 1. To gain knowledge on the basics of reinforced concrete structure. 2. To become skilled at the design of beam, slab and web reinforcement for beam. 3. To become aware of the proper safety and serviceability of reinforced concrete structures. **Course Outcomes:** Students will be able to – 1. Understand basic performance of concrete and steel as structural material in reinforced concrete structure. 2. Design component of building structures safely, economically and efficiently. 3. Understand practical design consideration using different safety provisions. **Course Contents:** Fundamental behavior of reinforced concrete; introduction to strength design and alternate design methods; flexural design of beams (singly reinforced, doubly reinforced, T-beam) using strength design method; shear, diagonal tension and torsion of beams; bond and anchorage; design of one way slabs; design of two-way edge supported slabs: using strip and alternate methods. **Text and Ref Books:** 1. Reinforced Concrete: Mechanics and Design – James Wight and James MacGregor, 6th Ed. 2. Design of Concrete Structures – Nilson (12th Edition) 3. Design of Concrete Structures – Nilson, David & Dolan, 14th Ed.

EWCE	Concrete Structures Design Sessional I
316	1.50 Credits. 3 Hrs/Wk

Rationale:
This is the class room design sessional where students will be guided to design and detail of different components of a low rise masonry structure, slab bridge and balanced cantilever bridge.

Course Objectives:
1. To help the students to communicate with the design processes and outcome in a manner acceptable to the engineering profession, through calculation and drawings.
2. To help the students to understand about the use and apply of design code and design loads for strength and serviceability and their importance in limit state design.
3. To make the students be able to identify, formulate and solve real time RCC Structures.

Course Outcomes:
Students will be able to –
1. Design a reinforced concrete low rise building
2. Design slab bridge and balanced cantilever bridge in real time project.
3. Analyze the behavior of RCC beam

Course Contents:
Analysis the behavior of reinforced concrete beams through experiment; design of slab bridge, balanced cantilever bridge (AASHTO LRFD 2012) and low-rise building using ACI code.

Text and Ref Books:
1. Design of Concrete Structures - Nilson (10th, 12th and 15th Edition)
2. Bangladesh National Building Code (BNBC) - 2012
3. AASHTO LRFD Bridge: Design Specifications 2012

EWCE	Design of Concrete Structures II
317	3.0 Credits. 3 Hrs/Wk

Rationale:
It is the second design course for reinforced concrete structures after EWCE 315. In this course students will continue to learn how to design various components of reinforced concrete building, such as short column, slender column, footing, pile caps, retaining wall, shear wall, etc which will be necessary at later semester for projects, as well as professionally.

Course Objectives:
1. To gain knowledge on the basics of reinforced concrete structure. 2. To become skilled at the design of beam, slab and web reinforcement for beam. 3. To become aware of the proper safety and serviceability of reinforced concrete structures.

Course Outcomes:
Students will be able to –
1. Understand basic performance of concrete and steel as structural material in reinforced

concrete structure.
2. Design component of building structures safely, economically and efficiently.
3. Understand practical design consideration using different safety provisions.

Course Contents:
Introduction to floor systems and design of column supported slabs (flat plates, detailing of flat plate, direct design method); design of columns under uniaxial and biaxial loading, introduction to slender column; ; seismic detailing; structural design of footings, pile caps; design of RCC shear wall.
Prestressed Concrete: concepts of prestressing; materials; anchorage systems; analysis of sections for flexure and shear; design of prestressed concrete beam.
Behavioral principles and design of structural steel; design of tension members, bolted and welded connections; flexural members; design of beam-columns; connection design, moment connections, column bases; detailing of steel structures, introduction to steel-concrete composite structures, advantages of composite construction.

Text and Ref Books:
1. Design of Concrete Structures – Nilson, 12th Ed.
2. Design of Concrete Structures – Nilson, David & Dolan, 15th Ed.
3. Reinforced Concrete: Mechanics and Design - James Wight and James MacGregor, 6th Ed.
4. Fundamentals of Reinforced Concrete – Ferguson & Philip
5. Bangladesh National Building Code (BNBC) 2012
6. Design of Prestressed Concrete Structure – T.Y. Lin, Ned H. Burns, 3rd Ed.
7. Prestressed Concrete Structures - Michael P Collins

EWCE	**Water Supply Engineering**
331	**3.00 Credits. 3 Hrs/Wk**

Rationale:
In this course students will be presented with basic knowledge on water supply system, surface water collection, treatment and distribution, and water quality requirement. Knowledge gained from this course will be used in later semesters and also in professional life.

Course Objectives:
1. To gain knowledge on the basics of water supply technology.
2. To become skilled at the design and construction of surface water treatment plant, ground water well and water distribution networks.
3. To get acquainted with low cost water supply options for rural communities and draught vulnerable areas
4. To devise the theories for well hydraulics.

Course Outcomes:
Students will be –
1. Skilled enough to predict the fresh water demand and provide required water supply in

urban as well as rural areas.
2. Able to design and construct advanced surface/ground water treatment plant, groundwater well and water supply pump.
3. Able to design and construct water distribution networks.
4. Capable enough to compute the water loss and solve the unaccounted water issue

Course Contents:
Introduction to Water Supply Engineering; Water requirement in urban and rural communities; Sources of water supply
Ground water exploration, types of wells and pumps; design, drilling, construction and maintenance of wells.
Rain water harvesting system and alternative water supplies for water stressed areas;
Surface water collection, transportation, treatment and distribution systems; analysis and design of distribution network; Fire hydrants; Water meters; Water loss control.
Water quality requirements; Bangladesh and international standards; Water treatment methods, climate resilient water safety plan (CRWSP).

Text and Ref Books:
1. A Text Book of Water Supply Engineering - M. A. Aziz, 1st ed., Hafiz Book Center
2. Water Supply and Sanitation - M. Feroz Ahmed, Md. Mujibur Rahman, 1st ed., ITN-BUET
3. Water and Environmental Engineering - M. Habibur Rahman, Abdullah Al-Muyeed , 1st ed., ITN-BUET
4. Environmental Engineering - Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, International Edition, McGraw Hill Companies
5. Water Safety Plan (WSP) – A Risk Based Approach for Water Safety, 1st ed., ITN-BUET

EWCE	**Environmental Engineering Sessional**
332	**1.50 Credits. 3 Hrs/Wk**

Rationale:
This is the practical course on environmental engineering where students will be trained and practiced on various water and wastewater sampling and testing methods. Experience gained from this course will be used in later semesters and also in professional life.

Course Objectives:
1. To impart knowledge to determine and analyze different parameters and substances in water.
2. To make the students efficient in performing different environmental experiments to satisfy specific needs and interpret the findings.
3. To introduce the students with standard procedure, how the test of water samples are conducted according to the standard code.

Course Outcomes:
1. Students will be able to understand the impact of engineering solution in a global economic environmental context. 2. Students will have the ability to develop environmental

engineering systems that includes consideration such as risk, sustainability, pollution etc.

Course Contents:
Water and wastewater sampling techniques, sample preservation, physical, chemical and biological tests of water and wastewater; breakpoint chlorinating, alum coagulation; Sampling and laboratory analysis of air; Sampling and laboratory analysis of solid waste.

Text and Ref Books:
1. Chemistry for Environmental Engineering – Clair N. Sawyer, Perry L. McCarty and Gene F. Parkin, 4th ed., McGraw Hill Inc.
2. Water Supply and Sanitation - M. Feroz Ahmed, Md. Mujibur Rahman, 1st ed., ITN-BUET

EWCE	Waste Water Engineering and Sanitation
333	4.00 Credits. 4 Hrs/Wk

Rationale:
In this course students will be introduced with basic knowledge on waste water technology and sanitation, design and construction of treatment plant and sanitation system. Knowledge gained from this course will be used in later semester and also in professional life.

Course Objectives:
1. To gain knowledge on the basics of waste water technology and sanitation options.
2. To become skilled at the design and construction of sanitary sewer, storm sewer, waste water treatment plant.
3. To learn about the details of sewage treatment methods and design of treatment units.
4. To understand the importance of sludge management and learn about the sludge treatment facilities.
5. To be acquainted with the sanitation technologies, especially practiced in low-income and developing countries around the world and learn to design those facilities knowing the appropriateness of technologies suitable to specific site condition.

Course Outcomes:
Students will be –
1. Skilled enough to predict the waste water discharge, storm water flow and sanitation requirement in urban as well as rural areas.
2. Able to design and construct sanitary sewer, storm sewer, septic tanks.
3. Able to design and construct waste water treatment plants and sewage treatment as well as disposal options.

Course Contents:
Introduction to Wastewater Engineering, Estimation of wastewater; Wastewater collection systems; Hydraulics of sewer; Design, construction and maintenance of sanitary sewer and storm drainage system; Sewer appurtenances; Plumbing system for building.
Microbiology of sewage and waste water; Wastewater characteristics; Preparatory, primary and secondary treatment methods and disposal; Treatment and disposal of industrial effluents; Sludge treatment and disposal.

Water supply, sanitation and health; Sanitation for low income communities, Design and construction of septic tanks, soak wells and subsurface drain fields; Sustainability of water and sanitation services; participatory development approach in water and sanitation sector; community management of water and sanitation services.

Text and Ref Books:

1. Water Supply and Sanitation- Feroz Ahmed and Mujibur Rahman
2. Environmental Engineering – Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, McGraw Hill International Edition
3. Environmental Sanitation, Wastewater Treatment and Disposal – Tanveer Ferdous Saeed, Abdullah Al-Muyeed, Tanvir Ahmed
4. Introduction to Environmental Engineering – Gilbert M. Masters and Wendell P. Ela, 3rd ed., Prentice-Hall Inc.Wastewater Engineering- Metcalf and Eddy
5. Water Supply and Sewerage- Terence J. McGhee
6. Wastewater Engineering- Metcalf and Eddy
7. Plumbing Practices – Syed Azizul Haq, Peng
8. Plumbing Installation and Design – L. V. Ripka, 4th ed.

EWCE	Principles of Soil Mechanics
341	3.00 Credits. 3 Hrs/Wk

Rationale:

This is the introductory course on geotechnical engineering where students will be presented with basic knowledge on types and identification of soil, soil properties and theories on soil mechanics. Student will be further exposed to soil mechanics software which will be useful in later semesters and also in professional life.

Course Objectives:

1. To gain insight on the basics of soil types and its different ground formations.
2. To understand the basic theories of soil mechanics and its practical applicability.

Course Outcomes:

Students will be able to –

1. Analyze the results of laboratory tests for soil classification and will be able to determine the shear strength parameters, the coefficient of permeability, the consolidation and the compaction characteristics according to the ASTM standards.
2. Apply the consolidation and stress distribution theory to predict the consolidation behavior in presence of clay layer beneath the foundations.
3. Compute the lateral forces acting on the retaining structures. 4. Students will be able to estimate the flow rates and uplift forces due to the seepage within the soil.

Course Contents:

Scope of Geotechnical Engineering: Soil Mechanics and foundation engineering; formation, type and identification of soils; soil composition; soil structure and fabric; index properties of soils; engineering classification of soils; soil compaction; principles of total and effective stresses; stress distribution within the soil mass due to external loadings; permeability and

	seepage; stress-strain-strength characteristics of soils; compressibility and settlement behavior of soils. **Text and Ref Books:** 1. Foundation Engineering -R.B. Peck, W.E. Hanson and T.H. Thornbur 2. Introduction to Geotechnical Engineering - B.M. Das

EWCE	**Soil Mechanics Sessional**
342	**1.50 Credits. 3 Hrs/Wk**
	Rationale: In this sessional course students will be given the basic knowledge on different types of soil investigation equipment and techniques for both laboratory and field tests of soil samples. This knowledge will be will be useful in later semesters in performing thesis and project work, and also in professional life. **Course Objectives:** 1. To gain knowledge on the basics of soil investigation techniques. 2. To become skilled at the design and construction of footings, rafts and piles in sand and clay type soil. 3. To devise the theories for stability of slopes. **Course Outcomes:** Students will be able to – 1. Analyze the soil for different types of foundation and will also be able to perform the bearing capacity and settlement calculation of soil. 2. Design and construct footings, rafts and piles in clay. 3. Design and construct footings, rafts and piles in sand. **Course Contents:** Field identification tests of soils; grain size analysis by sieve and hydrometer; specific gravity test; Atterberg limits test; permeability tests; unconfined compression test; compaction test; relative density test; direct shear tests; consolidation tests; test of geotextiles. **Text and Ref Books:** 1. Geotechnical Engineering Laboratory Handout: MIST 2. Soil Mechanics Laboratory Manual – B.M. Das 3. ASTM Standards for Geotechnical Engineering

EWCE	Geotechnical and Foundation Engineering
343	3.00 Credits. 3 Hrs/Wk

Rationale:
This course will help the students to get in-depth knowledge about sub-soil conditions and design, construction of different types of foundations which will be very helpful in their professional life.

Course Objectives:
1. To become skilled in exploring subsoil condition and in determining the properties of underlying soil of a site.
2. To gain knowledge on the analysis, design and construction of footing, raft and pile foundations in various types of soil conditions.
3. To acquire knowledge on the analysis and design of natural and man-made soil slopes.

Course Outcomes:
Students will be able to –
1. Explore the subsoil condition of a site and to determine the properties of foundation soil in order to design and construct proper types of foundation of any civil engineering structures.
2. Evaluate the bearing capacity and settlement for the purpose of designing footing and raft foundations for a structure on various subsoil and loading conditions.
3. Evaluate the bearing capacity and settlement for the purpose of designing single and group pile foundation for a structure in various types of subsoil and loading conditions.
4. Analyze the performance of existing foundation and construct new footing, raft and pile foundation in various subsoil conditions.
5. Analyze the stability of any soil slopes in order to determining proper and stable slopes on various subsoil and groundwater conditions.

Course Contents:
Types of foundations; bearing capacity of shallow and deep foundations; subsoil investigation techniques; settlement and distortion of foundations; design and construction of footings, rafts and piles; lateral earth pressure; slope stability analyses.

Text and Ref Books:
1. Foundation Engineering - R.B. Peck, W.E. Hanson and T.H. Thornburn
2. Principles of Foundation Engineering: SI Edition - B.M. Das

EWCE	Transportation Engineering
351	4.00 Credits. 4 Hrs/Wk

Rationale:
In this course students will be introduced with basic knowledge on transportation modes and system, geometric design of high ways and traffic engineering. Student will be further exposed to intelligent transportation system and traffic impact assessment which will be useful in later semesters and also in professional life.

Course Objectives:

1. To acquire knowledge on geometric design of highways.
2. To orient with road traffic systems including fundamentals of traffic engineering.
3. To understand basics of transport planning.
4. To get acquainted with Intelligent Transportation System (ITS) and Traffic Impact Assessment (TIA).

Course Outcomes:

Students will be able to –

1. Explore the problems related to different geometric features of the highways including finding solutions to common challenges encountered.
2. Forecast travel demands using contemporary methods for effective transportation planning.
3. Analyze traffic characteristics and flow parameters. They will also be able to plan and design two phase traffic signal, road sign, marking and street lighting.
4. Investigate road traffic accident.
5. Have clear idea about different tools and functioning of ITS. They will also know the procedures for conducting TIA.

Course Contents:

Transport planning, concepts, scope and hierarchy, process, goals and objectives.
Socio-economic activities, land use-transport interaction, travel demand forecasting; Transportation system of Bangladesh.
Geometrical design of highways, cross-section elements, curves and sight distances; Pavement types, materials, functions and design;
Traffic engineering: fundamentals of traffic engineering, vehicle and traffic characteristics, traffic control devices and systems; Intelligent transportation system.

Text and Ref Books:

1. Highway Engineering – Paul H. Wright, 6th Ed.
2. Transportation Engineering and Transport Planning – L.R. Kadiyali
3. Transportation Planning and Traffic Engineering – O'Flaherty

EWCE	**Transportation Engineering Sessional**
352	**1.50 Credits. 3 Hrs/Wk**

Rationale:

In this course the students will learn to perform mix design for highway materials and capacity analysis for road traffics, which they can apply professionaly.

Course Objectives:

1. To learn testing of highway materials and mix design
2. To perform analysis on road traffic capacity

Course Outcomes:

Students will be able to –

1. Design mixture of highway materials

2. Understand the parameters for quality control of highway materials
3. Use computer models for traffic analysis

Course Contents:
Testing and quality control of highway materials; bituminous mix design; roadway traffic and capacity analysis; computer models and application packages.

Text and Ref Books:
1. Highway Engineering – Paul H. Wright, 6th Ed.
2. Transportation Engineering and Transport Planning – L.R. Kadiyali
3. Laboratory Manual

EWCE	**Open Channel Hydraulics**
361	**3.00 Credits. 3 Hrs/Wk**

Rationale:
This is the fundamental course on open channel flow where students will be introduced with basic knowledge on open channel system, energy and momentum theories for open channel flow and designing of open channel.

Course Objectives:
1. To gain knowledge on the basics of open channel flow focusing critical, uniform and gradually varied flow and how those are different from pipe flows
2. To devise the energy and momentum theories for flow through open channels
3. To become skilled at the design of channels and computation of flow profiles

Course Outcomes:
Students will be able to –
1. Analyze open channel flows and its measurement techniques
2. Estimate energy dissipation due to hydraulic jump
3. Design channels and compute numerically the flow profiles

Course Contents:
Open channel flow and its classification; velocity and pressure distributions; energy equation, specific energy and transition problems; critical flow and control; principles of flow measurement and devices; concept of uniform flow, Chezy and Manning equations, estimation of resistance coefficients and computation of uniform flow; momentum equation and specific momentum; hydraulic jump theory and analysis of gradually varied flow; computation of flow profiles; design of channels.

Text and Ref Books:
1. Open Channel Hydraulics – Chow
2. Open Channel Hydraulics – French
3. Flow Through Open channels – Rang Raju
4. Flow in Open channel - Subramanya

EWCE	Open Channel Hydraulics Sessional
362	1.50 Credits. 3 Hrs/Wk

Rationale:
In this course the students will learn to apply their theoretical knowledge on hydraulic properties of open channel in practical fields for designing open channel systems.

Course Objectives:
1. To gain knowledge on the basics of open channel flow focusing critical, uniform and gradually varied flow
2. To devise the energy and momentum theories for flow through open channels

Course Outcomes:
Students will be able to –
1. Analyze open channel flows and its measurement techniques
2. Estimate energy dissipation due to hydraulic jump

Course Contents:
Broad-crested weir. Sluice gate. Venturi flume. Parshall flume. Cut-throat flume. Hydraulic jump. Velocity distribution profile. Manning's roughness coefficient. Specific force and specific energy.

Text and Ref Books:
1. Open Channel Hydraulics – Chow
2. Laboratory Manual

EWCE	Thesis
400	4.50 Credits. 9 Hrs/Wk

Rationale:
This course will enable the students identifying real life problems, performing background studies, brainstorming, assessing the problems, drawing interpretations and recommending solutions, which will be beneficial for their professional life.

Course Objectives:
1. To gain knowledge about the research process with the help of relevant literature review.
2. To solve a problem individually or as a team with a guidance from the supervisor(s).

Course Outcomes:
Students will be able to –
1. Understand the research process with the help of relevant literature review.
2. Work independently to solve a problem with a little help from supervisor.
3. Become a critical thinkers with analytical skills.
4. Become ethical and socially responsible.
5. Become more competent in oral, written and communication/presentation.
6. Create a proper engineering project work as per engineering dissertation/ thesis format.

Course Contents:
Experimental and theoretical investigation of various topics in Environmental Engineering and Water resources engineering. Individual or group study of one or more topics from any of the above fields. The students will be required to submit a thesis/project report at the end of the work and present his/her work in front of a board consists of faculty member(s).

EWCE	Professional Practices and Communication
401	2.00 Credits. 2 Hrs/Wk

Rationale:
This is a professional course where students will be given knowledge on projects, ethics in engineering professions, public procurements rules and regulations, and communication skills including oral presentation, conducting meetings and facing interview. They will be taught how to write CV and how to prepare contract documents and development project proposal.

Course Objectives:
1. To have a clear idea about different phases of a project.
2. To comprehend basic communication skill
3. To understand code of Ethics in engineering profession.
4. To gain knowledge on types of contracts, public procurements rules & regulations
5. Development of basic skills on report writing, oral presentation, conducting meeting and writing minutes, CV writing, facing interview
6. Development of basic skills on preparation of development project proposal (DPP)
7. Development of skills on preparation of tender documents

Course Outcomes:
Students will be able to –
1. Ascertain the essential elements required at different phases of a project.
2. Write engineering and business reports.
3. Learn code of ethics for engineers and will be able to take an ethical decision after critical analysis of the situation.
4. Make procurement of goods, works and services according to PPR 2008
5. Communicate effectively
6. Students will be able to formulate DPP

Course Contents:
Introduction to mode of communications in professional practices; Types of Project Proposals; Research proposal: development of technical and financial proposal, implementation and reporting; Development projects: development and proposal writing, contractual provisions, techniques of specification writing, evaluation of bids, project evaluation, project implementation, report writing; Professional ethics in Civil/Water

Resources Engineering/Management.

Text and Ref Books:

1. Project Management - Planning and Control – Albert Lester.
2. The Process of Management – William H. Newman.
3. Project Management - S Choudhury
4. Business correspondence and Report Writing- A practical approach to business and technical communication - R C Sharma and Krisna Mohan
5. PPR 2008
6. DPP preparation guide book published by planning commission

EWCE 411	**Structural Analysis & Design II** **3.00 Credits. 3 Hrs/Wk**

Rationale:

This is the second course on structural analysis. In this course students will learn how to analysis various structural components of indeterminate subjected to both static and moving loads. Analysis technique learnt here will be useful in later courses where students will learn how to design different structural components.

Course Objectives:

1. To gain knowledge on analyzing the statically indeterminate beams and frames by moment distribution, consistent deformation/ flexibility and stiffness methods.
2. To attain a workable knowledge on generating algorithms by using direct stiffness method using computer.
3. To gain knowledge on developing influence lines of statically indeterminate beams and frames.

Course Outcomes:

Students will be able to –

1. Analyze and design statically indeterminate beams and frames by aforementioned methods.
2. Generate algorithms by using direct stiffness method.
3. Develop influence lines of statically indeterminate beams and frames.

Course Contents:

Analysis of statically indeterminate beams and frames by moment distribution, consistent deformation/flexibility and stiffness methods; algorithms for implementing direct stiffness method using computer; influence lines of statically indeterminate beams and frames.

Text and Ref Books:

1. Structural Analysis - R. C. Hibbeler, Prentice Hall, 8th Ed.
2. Indeterminate Structural Analysis - C K Wang, McGraw-Hill International Editions
3. Matrix Analysis of Framed Structures - W. Weaver Jr., James M. Gere, McGraw Hill, 2nd Ed.
4. Elementary Structural Analysis - Charles Head Norris, John Benson Wilbur and Senol Utku, McGraw Hill, 4th Ed.
5. Structural Analysis - Aslam Kassimali, CENGAGE Learning, 3rd Ed.

EWCE	Environment and Social Impact Assessment
431	3.00 Credits. 3 Hrs/Wk

Rationale:
In this course the students will learn to perform EIA as well as ESIA for various development projects which will be very helpful in their professional life.

Course Objectives:
1. To learn the methodologies of EIA and ESIA for various development schemes/ projects.
2. To achieve workable knowledge on evaluating EIA and ESIA of national and international development projects.
2. To apprehend the importance of stakeholder participation and other social perspectives of development projects.

Course Outcomes:
Students will be able to –
1. Formulate EIA and ESIA framework for development projects.
2. Evaluate EIA index for assessing the sustainability of projects
2. Understand the importance of social inclusion in development projects.

Coarse Contents:
Introduction to ESIA, methodology of EIA; EIA of development schemes; economical evaluation of EIA; EIA in water resources and industrial projects; application of EIA; EIA for protection measures; EIA of : draughts in dry season, rainy season, impact of flood, solid waste management etc. Different EIA index calculation. Environmental laws and regulations

Economic and social structure; development and economic growth; socio-economic indicators; population, prosperity and poverty; employment of workforce; population displacement; rehabilitation strategy; productivity, landloss, landuse and land ownership patterns; fisheries and aquaculture; deforestation and afforestation; communication, commerce, industries and other economic benefits; water supply, sanitation, health and nutrition; inequalities in distribution of benefits and losses; socio-economic survey; case studies. Gender issues, Legal aspects of EIA.

Text and Ref Books:
1. Environmental Impact Assessment - Larry W. Canter, 2nd Ed. McGraw-Hill
2. Environmental Impact Assessment: A Guide to Best Professional Practices - Charles H. Eccleston, CRC Press
3. Evaluating Environmental and Social Impact Assessment in Developing Countries - Salim Momtaz, S. M. Zobaidul Kabir Waltham, Mass, Elsevier, 2013.
4. Methods of Environmental Impact assessment - Therivel, Riki, 1st Ed. UCL press

EWCE	Environmental Engineering Design Sessional
432	1.50 Credits. 3 Hrs/Wk

Rationale:

In this course the students learn to design water supply, sewerage network, sanitary facilities, drainage network, treatment facilities, building plumbing system, which they will be able to apply in their professions.

Course Objectives:

1. To impart knowledge to conceptual design and analyze different components of an industrial area.
2. To develop the students efficient in performing plumbing design, sewer system design, water distribution design for any building, residential/ industrial area.

Course Outcomes:

Students will be –

1. Skilled enough to predict the fresh water supply requirement, water waste water discharge, storm water flow and sanitation requirement in urban as well as rural areas.
2. Able to design and construct water wells, sanitary sewer, storm sewer, septic tanks.
3. Able to design and construct waste water treatment plants and sewage treatment options.
4. Able to design house plumbing facilities efficiently

Course Contents:

Design of water supply and sewerage system: estimation of industrial, domestic and fire demands, designing deep tube well and water distribution network; estimation of industrial, domestic and commercial wastewater generation, sewer network design; household plumbing system design; design of water and wastewater treatment plants.

Text and Ref Books:

1. A Text Book of Water Supply Engineering - M. A. Aziz, 1st ed., Hafiz Book Center
2. Water Supply and Sanitation - M. Feroz Ahmed, Md. Mujibur Rahman, 1st ed., ITN-BUET
3. Water and Environmental Engineering - M. Habibur Rahman, Abdullah Al-Muyeed , 1st ed., ITN-BUET
4. Environmental Engineering - Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, International Edition, McGraw Hill Companies
3. Environmental Sanitation, Wastewater Treatment and Disposal – Tanveer Ferdous Saeed, Abdullah Al-Muyeed, Tanvir Ahmed
4. Introduction to Environmental Engineering – Gilbert M. Masters and Wendell P. Ela, 3rd ed., Prentice-Hall Inc.
5. Wastewater Engineering- Metcalf and Eddy
6. Water Supply and Sewerage- Terence J. McGhee
7. Plumbing Practices – Syed Azizul Haq, Peng
8. Plumbing Installation and Design – L. V. Ripka, 4th ed.

EWCE 433	**Solid and Hazardous Waste Management** **3.00 Credits. 3 Hrs/Wk**

Rationale:

The students will learn about the sources and complete management of solid, hazardous and medical wastes, which will help them to design efficient management system of all kinds of solid and hazardous wastes starting from collection to final disposal, keeping the environment free of nuisance and safe guar ding human health.

Course Objectives:

1. To understand the characteristics of solid and hazardous waste.
2. To address the collection, storage, transfer, treatment and disposal options of different wastes.
3. To assess the potential of resource recovery
4. To design efficient waste management system for the community.

Course Outcomes:

Students will be able to –

1. Explore the characterization of different kinds of solid and hazardous wastes and their treatment.
2. Analyze health and environmental issues related to solid waste management.
3. Solve various steps in solid waste management-waste reduction at source, collection techniques, materials and resource recovery/recycling, optimization of solid waste transport, treatment and disposal techniques.
4. Ensure waste management for health safety.

Course Contents:

Solid Waste Management: sources and characterization of solid wastes; solid waste generation; onsite handling, storage, processing, collection, transfer and transport of SW; resources and energy recovery and recycling; treatment and disposal options of SW.

Hazardous Waste Management: sources and characterization of hazardous wastes; types and generation of hazardous waste, hazardous waste management plant; methods of treatment and disposal for hazardous wastes.

Healthcare waste management: categories and treatment methods of healthcare wastes.

Integrated waste management; legal and financial aspects of waste management.

Text and Ref Books:

1. Solid and Hazardous Waste Management - M. Habibur Rahman and Abdullah Al-Muyeed ITN- BUET
2. Environmental Engineering - Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, International Edition, McGraw Hill Companies
3. Integrated solid waste management: engineering principles and management issues - Tchobanoglous, George; Theisen, Hilary; Uigil, Samuel. 1st Ed. McGraw Hill Book Company
4. Hazardous Waste Management in Bangladesh – A Country Inventory - Department of Environment (DoE), Bangladesh

EWCE	Environmental Modelling Sessional
434	1.50 Credits. 3 Hrs/Wk

Rationale:
In this course the student will learn to use models and advanced software to solve practical problems found in surrounding environment, like water, air, soil, noise level etc which will help them to apply their knowledge in professional life.

Course Objectives:
1. To identify solve environmental problems with mathematical models.

Course Outcomes:
Students will be able to –
1. To formulate environmental pollution problems in mathematical models.
2. To predict and verify solutions to environmental problems through models.

Course Contents:
Water and air quality and noise level modelling using relevant engineering software

Text and Ref Books:
1. Surface Water Quality Modeling – Steven C. Chapra

EWCE	Air Pollution & Control
435	2.0 Credits. 3 Hrs/Wk

Rationale:
Students will learn about the causes of air pollution and measures for air pollution control, which will help them design air pollution abatement system in their professional life.

Course Objectives:
1. To identify the causes of air pollution.
2. To design air quality monitoring systems.
3. To formulate air pollution control and management system.

Course Outcomes:
Students will be able to –
1. Analyze the root cause of air pollution and also to control such pollution.
2. Design air quality monitoring and abatement systems.
3. Design a smart, green and air pollution free urban community.
4. Apply their understanding for air pollution management to ensure health safety.

Course Contents:
Sources, classification and effects of air pollutants; air pollution regulations: air quality standards, emission standards, pollution indices; pollutants from combustion process; air pollution and meteorology: atmospheric properties, lapse rates and stability, atmospheric

	diffusion theories, Gaussian plume models; Indoor air quality; Air quality monitoring; Introduction to air quality models; Air pollution management and control measures: atmospheric removal and engineered systems. **Text and Ref Books:** 1. Air Pollution Control - C. David Cooper and F. C. Alley, 3rd Ed. 2. Environmental Pollution and Control - J. Jeffrey Peirce, Ruth F. Weiner and P. Aarne Vesilind, 4th Ed. 3. Fundamentals of Air Pollution - Daniel Vallero

EWCE	**Treatment Plant Design Sessional**
436	**3.0 Credits. 3 Hrs/Wk**
	Rationale: Students will learn about the processes in treatment of surface water, ground water and wastewater. They will learn designing the treatment plants, which will be helpful in their professional life. **Course Objectives:** 1. To learn about the treatment processes for surface and ground water to make it suitable for drinking water supply. 2. To learn about the waste water treatment processes. 3. To learn the design basic and treatment schemes of the treatment plants. **Course Outcomes:** Students will be able to - 1. Formulate the treatment processes specific to surface water, ground water and wastewater 2. Design the materials and chemical dosing for treatment required in the treatment plants. **Course Contents:** Detail design of an environmental treatment plant (ETP) to mitigate the adverse effects of untreated waste such as garment, leather and other industrial activities. **Text and Ref Books:** 1. An Applied Guide to Water and Effluent Treatment Plant Design – Sean Moran, 1st Edition, 2018, Elsevier 2. Water Treatment Plant Design – American Waste Water Association, 4th Ed. 2004, McGraw Hill Publications 3. Integrated design and Operation of water Treatment Facilities – Susumu Kawamura, 2nd Ed. 2000, John Wiley and Sons

EWCE	Industrial Waste and Waste Water Treatment
437	**3.0 Credits. 3 Hrs/Wk**

Rationale:
Students will learn about various treatment processes for different types of industrial waste and waste water, which will be helpful in their professional life.

Course Objectives:
1. To learn about the characteristics of various industrial wastes and waste waters.
2. To learn about the problems associated with poor management of industrial waste and wastewater.
3. To learn about the laws and regulations for industrial waste and wastewater treatment and disposal

Course Outcomes:
Students will be able to -
1. Characterize various industrial waste and waste water
2. Identify the problems associated with industrial waste and wastewater and realize the importance of proper waste management.
3. Understand the treatment processes and disposal options for different types of industrial waste and waste water.

Course Contents:
Waste water estimation, collection and transportation of sewage; characteristics of sewage; quality, characteristics, treatment and problems associated with industrial water; overview of waste reduction techniques in industries, waste problems of major industries and their methods of treatment and disposal- such as petroleum industries (gasoline kerosene treatment), textile industries, tannery; cement, fertilizer, paper and pulp, jute processing, dairy, drug and pharmaceutical, sugar, food and allied industry; Treatment and disposal of industrial waste sludge; Laws and regulations for industrial wastewater and waste treatment.

Text and Ref Books:
1. Industrial waste water treatment – A D Patwardhan, New Delhi: PHI Learning Private Ltd.
2. Handbook of Advanced Industrial and Hazardous Wastes Treatment - Lawrence K. Wang, Yung-Tse Hung, Nazih K. Shammas, CRC Press.
3. Industrial Wastewater Treatment, Recycling and Reuse - Vivek Ranade and Vinay Bhandari, Butterworth Heinemann
4. Industrial Wastewater Treatment - Wun Jern Ng, Imperial College Press

EWCE	Building Service Sessional
438	**1.5 Credits. 3 Hrs/Wk**

Rationale:
Students will learn to design of different services to be provided in a building, like water supply system, waste water and storm drainage system, water storage system, rainwater harvesting system, which will be helpful in their professional life.

Course Objectives:
1. To learn about the major facilities/ services required for better living in buildings, especially in high rise buildings.
2. To design the necessary building services - water supply system, waste water and storm drainage system and water storage system.
3. To design alternative water supply system – rain water harvesting.

Course Outcomes:
Students will be able to -
1. Design the water supply, waste water and storm water drainage system
2. Design underground and overhead water storage tanks
2. Design rain water harvesting system

Course Contents:
Plumbing design - water supply (hot water and cold water) and sewerage design of multi-storied buildings, Rainwater Harvesting- planning and design of rainwater and ground water storage structures, design of rainwater harvesting filters, maintenance and monitoring of rainwater harvesting system.

Text and Ref Books:
1. Building Services Engineering – David V. Chadderton, 6th Ed.
2. Building Services Handbook – Roger Greeno, 7th Ed, Fred Hall

EWCE	Natural Resources and Renewable Energy
439	**2.0 Credits. 3 Hrs/Wk**

Rationale:
Students will learn about natural resources, renewable energy , energy efficiency which will be helpful in their professional life in designing energy efficient engineering solutions.

Course Objectives:
1. To understand the importance of natural resources conservation and management.
2. To learn about the use of energy in various emerging technologies
3. To learn about the importance of using renewable energy

Course Outcomes:
Students will be able to -
1. Get acquainted with various use of energy.

	2. Learn about emerging energy efficient technologies 3. Realize the significance of renewable energy in day-to-day life. **Course Contents:** Classification and sources, extraction, depletion, protection and management of natural resources. Overview, history, mainstream technologies, wind power, hydropower, solar energy, biomass, bio fuel, geothermal energy, gallery, commercialization, growth of renewable, economic trends, hydroelectricity, wind power development, solar thermal, photovoltaic development, photovoltaic power stations, bio fuel development, geothermal development, and emerging technologies of renewable energy **Text and Ref Books:** 1. Managing Our Natural Resources - William G. Camp, Thomas B. Daugherty, 4th Ed, Thomson Learning 2. Introduction to Renewable Energy - Vaughn C. Nelson, CRC Press 3. Renewable Energy - Bent Sorensen, 3rd Ed, Elsevier Inc. 4. Renewable Energy Systems: Advanced Conversion Technologies and Applications - Fang Lin Luo, Ye Hong, CRC Press 5. Sustainable Energy Solutions for Climate Change - Mark Diesendorf, Routledge, New York

EWCE	**River Engineering and Flood Management**
461	**3 Credits. 3 Hrs/Wk**
	Course Outcomes: Students will be able to 1. Demonstrate the understanding of the basic of river engineering and the morphological processes related to river. 2. Distinguish different types of bank erosion and choose the necessary river training works to control those. 3. Categorize the basics of scouring process and its effects on the hydraulic structures. 4. Explain basic dredging processes and the navigation process. **Course Contents:** Behavior of alluvial rivers; river channel pattern and fluvial processes; aggradations and degradation, local scours, river training and bank protection works; navigation and dredging of sediment movement in river channels, bed form and flow regimes. Case studies Flood and its causes; flood processes in rural and urban areas, methods of flood management: structural and non-structural measures such as reservoirs, levees and flood walls, channel improvement, interior drainage, floodways, land management, flood proofing, flood zoning, flood hazard mapping, flood forecasting and warning flood risk and damage.

	Text and Ref Books: 1. Principles of River Engineering – Chang 2. Principles of River Engineering – Garg 3. River Engineering – Peterson 4. Sediment Transport Technology (Water & Sediment Dynamics) – Daryl B. Simons & Fuat Sentirk

EWCE	**Computer Applications in Water and Environmental Engineering**
462	**1.50 Credits. 3 Hrs/Wk**
	Rationale: The course will provide students with the knowledge to effectively use computer program to analyze difficult hydraulic conditions in natural and constructed channels, utilizing one-dimensional and two-dimensional modeling techniques. This course will also cover the fundamentals of building and calibrating water distribution system models, which can be used for master planning, operational analysis of existing systems and design. **Course Objectives:** 1. To update and improve student's proficiency in flood analysis. 2. To learn how to evaluate and use different modeling program options. 3. To learn how to use program solutions for mixed flow, multiple culverts, bridge modeling, lateral structures and water distribution systems. 4. To calculate flows and head losses using field data, factors, controls and other parameters to design distribution systems **Course Outcomes:** Students will be able to 1. Solve numerical approximation equations of open channel flow 2. Understand basic principles of modeling 1D and 1D/2D river flow 3. Build a river model and to interpret results of a river flow model 4. To set up and extend water distribution model for different practical applications. **Course Contents:** Introduction to hydrodynamic modeling, definition and examples, review of mass balance, momentum and energy equations, different hydrodynamic models and their applications and limitations; hands on training on hydrodynamic models. Introduction to modeling of water distribution systems, understanding the movement of drinking water constituents within distribution systems, optimizing operations of tanks and pumps. **Text and Ref Books:** 1. Hydraulic Modelling: An Introduction: Principles, Methods and Applications, Pavel Novak, Vincent Guinot, Alan Jeffrey, Dominic E. Reeve. 2. Computer Modeling of Water Distribution Systems, James P. Cooper 3. User manual and application guide of the related software

EWCE	Irrigation and Drainage Engineering
463	3.0 Credits. 3 Hrs/Wk

Course Objectives:

By the end of this course students should be able

1. To understand the fundamental information on irrigation and flood management
2. To perform design calculations of irrigation projects

Course Outcomes:

Students will be able to

1. Design an irrigation project which include water requirements, canal design and hydraulic structures required for irrigation projects etc.
2. Plan proper water management for flood protection

Course Contents:

Importance of irrigation; soil water physics; crop/irrigation water requirements and scheduling of irrigation methods and design; sources and quality of irrigation water; soil and water salinity, irrigation and drainage structures; irrigation pumps, drainage criteria; steady state drainage system, surface/subsurface drainage systems design; irrigation water management, Irrigation projects in Bangladesh.

Text and Ref Books:

1. Irrigation Engineering and Hydraulic Structures – Garg
2. Irrigation Principles and Practices –Vaughn, E. Hansen, Orson W. Israelsen
3. Introductory Irrigation Engineering – B.C. Punmia
4. Irrigation Engineering – S.Leliavsky

EWCE	Advanced GIS and RS in Environment and Water Resources Engineering
464	1.50 Credits. 3 Hrs/Wk

Rationale:

The content of this course will impart cutting edge knowledge and practical based skills among the students through rigorous theory, practical work and hands on training focused on key and applied aspects of GIS and remote sensing.

Course Objectives:

1. To introduce students with newer approaches on data sciences, analytics, big geo-spatial data.
2. To include advanced application of GIS, its management and implementation.
3. To understand the basic remote sensing technology and satellite derived data (image, climatic variables etc.)
4. To impart knowledge and hands on training on latest GIS and RS softwares

Course Outcomes:

Students will be able to

1. Explain the multidisciplinary applications of GIS and remote sensing.

2. Select and acquire both primary and secondary spatial data for use in GIS.
3. Manage and analyse digital data in raster and vector formats
4. Interpret, classify, analyze and use aerial photos/satellite images.
5. Undertake planning, designing, operations and maintenance of urban and rural infrastructure by applying his/her knowledge in all stages of RS & GIS and inter-disciplinary projects.

Course Contents:

Introduction to raster data, introduction to surface data: TIN, DEM; spatial analyst, Model builder, 3D Analyst, Geo statistical Analyst

Introduction to Remote Sensing data/satellite images, Browsing Satellite data from USGS website, Study of Satellite Image Annotation (information) LANDSAT and Sentinel-2, Image enhancement, Image classification (supervised, unsupervised), Calculation of Soil, Water and Vegetation Indices, Remote Sensing in Hydro meteorological Disasters (Monitoring of Flood, Drought and Storms), Remote Sensing Application in Geohazard (Earthquake /Landslide), Introduction to ERDAS Imagine software.

Text and Ref Books:

1. Remote Sensing and GIS, Basudeb Bhatta.
2. Manuals developed by ESRI.
3. Advanced Remote Sensing and GIS Training manual developed by CEGIS, USFS and BFD.

EWCE	**Design of Hydraulic Structures**
465	**3.00 Credits. 3 Hrs/Wk**

Course Outcomes:

Students will be able to

1. Demonstrate the hydraulics and water resources background in water structures design applications
2. Develop understanding of the basic principles and concepts of analysis and design of different hydraulic structures
3. Apply basic design calculations of different hydraulic structures

Course Contents:

Theories of seepage, principles of design of hydraulic structures, types of hydraulic structures. Design of dams, barrages, weirs, spillways, energy dissipaters and spillway gates. Cross-drainage works.

Forces of waves and tides in design of coastal and harbor structures. Structure types, design criteria, material used, deterioration due to marine environment, repair and rehabilitation of coastal structures. Planning and design of shore protection works, sea walls, groins, jetties, wave breakers, layout of ports.

Text and Ref Books:

1. Hydraulic Structures – Garg
2. Open Channel Hydraulics – V. T. Chow

EWCE	Hydraulic Structure Design Sessional
466	**1.50 Credits. 3 Hrs/Wk**

Course Outcomes:

Students will be able to

1. Estimate design storm, runoff volume and other hydrologic parameters for a catchment area 2. Design and construct small hydraulic structure with stilling basin, cutoff wall and loose protections.
3. Compute design loads, pressures and analyze stability of a hydraulic structure.
4. Produce lab report with proper results, discussions and conclusion

Course Contents:

Types of hydraulic structures; principles of design; design of different types of hydraulic structures: regulators; dams; barrages; cross-drainage works. Design of Guide bund (Guide bank).

Text and Ref Books:

1. Hydraulic Structures – Garg
2. Open Channel Hydraulics – Chow
3. Principles of River Engineering – Garg
4. Principles of River Engineering – Chang
5. Principles of Water Resources Planning – Dr. Ainun Nishat (BUET)

EWCE	Integrated Water Resource Management
467	**3.0 Credits. 3 Hrs/Wk**

Rationale:

The course introduces students to Integrated Water Resources Management (IWRM). The purpose of this course is to give the students of water resources management a wider understanding of IWRM and the procedures and tools available for its implementation.

Course Objectives:

1. Introduce the basic principles and practice of IWRM
2. Analyze the functions of natural and anthropogenic factors in water resources management
3. Create an appreciation of water conservation and management interactions
4. Introduce transboundary issues in water resources management
5. Create an understanding of water as a social and economic good
6. Enhance student's capacity to plan water resource development
7. Provide an understanding of principles of catchment management including policies, strategies and institutional arrangements for IWR
8. Introduce measures to protect water resources including laws and regulations governing water resources

Course Outcomes:

Students will be able to

1. Explain the basic principles and practice of IWRM;
2. Asses the role of natural and anthropogenic factors in water resources management
3. Understand water demand/use and management interactions;
4. Discuss the role of Water Conservation, Treatment and Reuse
5. Discuss transboundary issues in water resources management
6. Explain water as a social and economic good
7. Plan water resource development
8. Explain the principles of catchment management
9. Explain policies, strategies and institutional arrangements for IWRM
10. Explain measures to protect water resources including laws and regulations governing water resources
11. Critically appraise the existing procedures for water resources management and suggest improvements

Course Contents:

IWRM Concept and Principles: Impacts of fragmented approach and importance of integration; Implementing IWRM, Planning fundamentals and processes: Multi-criteria analysis: Functions of water resources systems: Introduction to Demand Management. Water management and sustainable development: concepts and challenges; Case studies.

Basin-wide management and water sharing: Water resources management and development issues in co-riparian countries; Water management interventions and regional implications; Development and codification of international law; Benefits of integrated basin management.

Text and Ref Books:

1. McDonald, A.T and Kay, D (1998). Water Resources: Issues and Strategies. Longman Scientific and Technical.
2. Chapman, D. (1992). Water management and Environmental Engineering. Chapman and Hall.
3. Feachem, R, McGarry, M. and Mara, D (1977). Water, Wastes and Health in Hot Climates. Wiley.
4. The World Bank, Washington, D.C (2000) Water Resources Management, A World Bank Policy Paper, Global Water Partnership.
5. UN-ESCAP (1996). Integrated Water Resources Management, TAC Background Papers No. 4, Global Water Partnership Technical Advisory Committee, Sweden.
6. Morgan, P. (1990). Rural Water Supply and Sanitation. McMillan.

EWCE	Water Modeling Sessional
468	1.50 Credits. 3.0 Hrs/Wk

Rationale:
This course will develop a quantitative approach to understand, estimate, and predict the different components of the hydrologic cycle.

Course Objectives:
1. Modeling of the following processes will be discussed in this course: interception, snow melt, evapotranspiration, infiltration, groundwater flow, overland runoff, streamflow, sediment erosion and deposition, and transport of contaminants in streams.
2. The course discusses in detail multiple model representations of hydrologic processes, and limitations and uncertainty associated with each.

Course Outcomes:
Students will be able to
1. Possess an in-depth understanding of how and where a given model can be used, and will be prepared to address water quantity (e.g. floods, droughts, climate change impacts etc.) using hydrologic modelling software.
2. Assess the water quality (e.g. contamination of groundwater, lakes and river due to point and non-point sources) problems using computer models.

Course Contents:
Introduction to hydrologic modeling, hydrology of small catchments, introduction to different rainfall-runoff models and modeling techniques, hands on training on hydrologic models.

Text and Ref Books:
1. Mathematical Models of Large Watershed Hydrology, Vijay P. Singh, Donald K. Frevert.
2. Distributed Hydrologic Modeling Using GIS, Baxter E. Vieux.
3. Hydrological Data Driven Modelling: A Case Study Approach, Renji Remesan, Jimson Mathew

EWCE	Mathematical Modeling in Water Resources Engineering
469	2.00 Credits. 2 Hrs/Wk

Rationale: This course is an introduction to mathematical modeling to use elementary functions to investigate and analyze rela-world data, applied problems and questions, supported by the use of appropriate technology, and on effective communication of quantitative concepts and results.

Course Objectives:
1. To model situations from a variety of settings in generalized mathematical forms;
2. To express and manipulate mathematical information, concepts, and thoughts in
3. verbal, numeric, graphical and symbolic form while solving a variety of problems;
4. To solve multiple-step problems through different modes of reasoning;
5. To properly use appropriate technology in the evaluation, analysis, and synthesis of

information in problem-solving situations;
6. To extract quantitative data from a given situation, translate the data into information in various modes, evaluate the information, abstract essential information, make logical deductions, and arrive at reasonable conclusions;

Course Outcomes:
Students will be able to
1. Solve applications using a variety of problem solving strategies including geometric and algebraic techniques, linear and non-linear equations, statistical methods etc.
2. Use computational tools to develop their models and evaluate their efficacy.

Course Contents:
Concepts of mathematical modeling; differential equations and solution techniques: method of characteristics, finite difference and finite element methods, consistency, stability and convergence of numerical schemes; schematization and boundary conditions, calibration and validation; practical application in modeling river flow, groundwater flow, coastal water and advection-dispersion processes.

Text and Ref Books:
1. An Introduction to Mathematical Modeling, Edward A. Bender.
2. Mathematical Modeling and Simulation, Kai Velten.

EWCE	**Coastal Engineering**
471	**3.00 Credits. 3 Hrs/Wk**

Rationale:
The students will be acquainted with the key concepts, basic analysis and design techniques in Coastal Engineering.

Course Objectives:
1. To understand and quantify ocean wave processes including wave generation, propagation, refraction, shoaling, diffraction, and breaking.
2. To learn ocean wave properties important to coastal engineering, including wave heights, speeds, induced water velocities, pressures, making appropriate approximations for deep and shallow waters.
3. To characterize tides and quantify basic coastal sediment transport processes and rates
4. To analyze coastal sites and to estimate hydrodynamic forces on simple structures.
5. Design simple shore protection structures
6. Identify different shoreline protection methods

Course Outcomes:
Students will be able to -
1. Understand the ocean: waves, currents, tides and water levels;
2. How waves and currents move sediment and impact shorelines and structures; and

3. How to put all of this together to design shoreline protection structures/coastal projects.

Course Contents:
Coast and coastal features; tides and currents; tidal flow measurement; waves and its characteristics; forces of waves and tides in the design of coastal and harbour structures: coastal water level fluctuation - storm surge, tsunami and basin oscillation; coastal zone processes; deltas and its characteristics; estuary and estuary control, docks and harbors; design of shore protection works.

Text and Ref Books:
1. Basic Coastal Engineering, Robert M. Sorensen.
2. Coastal Engineering Manual, U.S. Army Corps of Engineers.
3. Shore Protection Manual, U S. Army Coastal Engineering Research.

EWCE	**Waterway Engineering**
473	**2.00 Credits. 2 Hrs/Wk**

Rationale:
The students will be acquainted with waterway systems, route types, waterway deterioration and improvement measures, river ports development, vessels etc.

Course Objectives:
1. To learn about various water way systems, navigation requirements and navigation aids.
2. To identify the causes of waterway deterioration, measures to improve the waterway conditions
3. To study about various water vessels
4. To learn about river ports, problems in river port development and solution measures
5. To learn about the waterway system of Bangladesh

Course Outcomes:
Students will be able to
1. Learn about various water way systems, navigation requirements and navigation aids.
2. Identify waterway deterioration causes, measures to improve the waterway conditions
3. Know about various water vessels
4. gather knowledge about river ports, problems in river port development and port management

Course Contents:
Introduction to waterways system; route classification; river types; causes of deterioration of waterways; measures of improving waterways; navigational aids; purpose; buoys; channel markers; light houses; radar reflectors etc; river ports; facilities; developments and problems; island vessels; waterways of Bangladesh.

EWCE	Urban Hydrology
475	2.00 Credits. 2 Hrs/Wk

Rationale:

This course will provide a detailed knowledge of the main processes in urban areas during rain events, design storms, losses, inlet systems, hydraulic calculus and CSO problems, and the tools to develop a project of a sewer system emphasizing the hydrologic and hydraulic behavior.

Course Objectives:

1. Introduce the concept of Urban Drainage and the objectives associated to the drainage system
2. Introduce the main design criteria used in drainage systems
3. Description of the different loss processes in urban environment

Course Outcomes:

Students will be able to

1. The ability to plan, dimension, construct and maintain hydraulic works.
2. The ability to plan, evaluate and regulate the use of surface water and groundwater resources.

Course Contents:

Introduction to hydrological cycle, Rainfall-runoff design methods: Unit hydrograph theory and urban hydrology applications, Flood frequency: Introduction to frequency analysis and urban hydrology applications, Hydraulics: Revision of basic principles, Rainfall: Data needs and analysis, Storm weather: Quantities, estimation, design methods, Wastewater: Quantities, estimation, design methods, Combined sewers: Role, overflow, storage, urban pollution management, Flow & quality models: Current and recent models using in practice, Storm weather management/Sustainable urban drainage: Source control techniques, towards sustainability, catchment models and design approaches: small, medium, large.

Text and Ref Books:

1. Urban Hydrology, Hydraulics and Stormwater Quality, Akan and Houghtalen
2. Hormoz Pazwash. Urban Storm Water Management. CRC Press, 2011.
3. A Osman Akan, Robert J. Houghtalen. Urban Hydrology, Hydraulics, and Stormwater Quality: Engineering Applications and Computer Modeling. New York: J. Wiley, 2003.
4. Kiran Tota-Maharaj. Permeable Pavements for Urban Stormwater Runoff Enhancement and Reuse. VDM Verlag Dr. Müller, 2011.
5. Martin P. Wanielista, Yousef A. Yousef. Stormwater Management. New York: Wiley-Interscience, 1992.

EWCE	Climatology
477	**2.00 Credits. 3 Hrs/Wk**

Rationale:

The course aims to provide the students with an integrated and advanced knowledge on the Earth's climate as well as its changes. Specific emphasis is given to the acquisition of a deep understanding of physical climate processes and principles and laws that govern climate.

Course Objectives:

1. Introduction to meteorology and climatology.
2. Meteorology topics include energy balance, moisture and cloud development in the atmosphere, atmospheric dynamics, small and large scale circulations, storms and cyclones, and weather forecasting.
3. Climatology topics include the interaction between the atmosphere and oceans over long time periods, climate classification, and the potential for climatic change.

Course Outcomes:

Students will be able to

1. Learn the definition and characteristics of climate as well as the differences and similarities of Climate science with other Atmospheric sciences, with emphasis to the definition and priorities of contemporary Climatology and climate
2. Be up to date about the recent state of the Earth's climate and the means and methods of its observation and monitoring, emphasizing the nature and patterns of the changes that climate has undergone after the industrial revolution.

Course Contents:

The global climate system: global heat and water balance; atmospheric and ocean circulation; interaction of ocean and atmospheric processes — annual cycle; monsoon circulation; tropical cyclones; ENSO (El Nino-Southern Oscillation) cycle; instrumentation and measurement of climate data; sources of climate data and information; climatic zones, climate models; climate variability and climate change; anthropogenic effects on climate- greenhouse warming, ozone layer depletion and sea level changes.

Text and Ref Books:

1. Physical Climatology (in greek), H. S. Sahsamanoglou and A. A. Bloutsos, Zitis Publications, Thessaloniki, Greece (1998).
2. Meteorology and Climatology courses (in greek), A. Flocas, Zitis Publications, Thessaloniki, Greece (1997).
3. Electronic notes, N. Hatzianastassiou (yearly updated).
4. Global Physical Climatology, D. L. Hartmann, Academic Press, San Diego, California, USA (1994).
5. Contemporary Climatology, A. Henderson-Sellers and P. J. Robinson, Longman Scientific & Technical, United Kingdom (1986).
6. Radiation and climate, I. M. Vardavas and F. W. Taylor, Oxford Science Publications, United Kingdom (2011)

EWCE	Climate Change and Disaster Management
481	2.00 Credits. 2 Hrs/Wk

Rationale:
The course introduces students to various types, nature, sources, causes and impacts of Environmental hazards experienced in Bangladesh. The purpose of this course is to give the students of Disaster management: History of natural disaster, Classification of natural disasters, sources of natural disaster, causes and effects of natural disasters.

Course Objectives:
The main objective of the course is to provide a better understanding of the implications of climate change for disaster risk management. It reviews the causes, trends and impacts and introduces options – methods, tools - to consider for integrating climate change in disaster risk management.

Course Outcomes:
Students will be able to
1. Assess the various types of natural hazard
2. Deal with disaster management

Course Contents:
Brief description of various types, nature, sources, causes and impacts of Environmental hazards experienced in Bangladesh. Cyclones, storm surges, tsunami, flood, salinity intrusion due to sea level rise, water logging and inundation, food insecurity, river bank erosion, river sedimentation problem, extreme droughts, groundwater level depletion, agricultural damages, shortages of fresh water in coastal region, Disaster management: History of natural disaster, Classification of natural disasters, sources of natural disaster, causes and effects of natural disasters.

Text and Ref Books:
1. Environmental Studies and Disaster Management; Resilience in Action: Challenges and Solutions to Climate Change in Bangladesh by Samiya Selim, Basundhara Tripathy and Meherun Ahmed
2. Handbook Of Disaster Risk Reduction & Management: Climate Change And Natural Disasters by Madu Christian N

EWCE	Building Services
483	2.0 credits, 2.0 hours/week

Rationale:
This course introduces students to plumbing system – water supply, waste water drainage, storm drainage, house wiring, air conditioning, lift, generator, firefighting etc in a multistoried building. This will help the students to design the services in a building in their professional life.

Course Objectives:

1. To learn about the major facilities/ services required for better living in buildings, especially in high rise buildings including plumbing, wiring and other electrical and mechanical installations.
2. To study and design of the necessary building services - water supply system, waste water and storm drainage system and water storage system.
3. To design rain water harvesting system, firefighting facilities etc.

Course Outcomes:

Students will be able to -

1. Estimate water requirement and use for various purposes in different types of building usage.
2. Design plumbing system for water supply, sewage and storm sewage, ventilation, fire fighting, air conditioning.
2. Understand the design basics for lift installation, generator.
3. Design rain water harvesting system and other electrical and mechanical installations in buildings.
4. To design rain water harvesting system.

Course Contents:

Introduction to plumbing, water requirements in a building, water supply and distribution in buildings; plumbing of multistoried buildings, design and construction of septic tanks, soak wells and subsurface drain fields; House wiring; air conditioning (HVAC); lift installation; air handling unit, generator and other electrical and mechanical installations in building, rain water harvesting unit, solar panel, fire-fighting, fire escape.

Text and Ref Books:

1. Building services engineering – David V. Chadderton, 6th Ed.
2. Building services handbook – Roger Greeno, 7th Ed, Fred Hall

EWCE	**Environmental Management System**
485	**2.0 credits, 2.0 hours/week**

Rationale:

This course introduces students to environmental management system (EMS) requirements, standards, implementation steps, tools and techniques. This will help the students to apply EMS basics and requirement in designing as well as implementing projects in their professional life.

Course Objectives:

1. To make the students understand about requirements and steps of EMS
2. To familiarize the students with various EMS models
3. To learn about EMS standards, techniques and process tools

Course Outcomes:

Students will be able to -

1. Identify the requirements and elements of EMS
2. Understand the environmental management models
3. Get acquainted with EMS standards, implementation steps, process tools and techniques

Course Contents:

Introduction to Management Systems, Requirements and Elements of Environmental Management Systems (EMS), The ISO 14001 EMS Model (Current and Proposed to High Level Structure), Scope and Applicability of ISO 14001 and ISO 14004, Purpose, Scope and Benefits of EMS Standards, EMS Implementation, General Requirements of ISO 14001, EMS Tools and Techniques.

Text and Ref Books:

1. Environmental Management System: Principles & practice - David hunt, Catherine Johnson

5.2. Courses Offered by Faculty of Science and Humanities

CHEM	Chemistry
101	**3.00 Credits. 3 Hrs/Wk**
	Rationale: The purpose of this course will be to develop basic knowledge on introductory chemistry which will be useful in various courses later on. **Course Outcomes:** Students will be able to – 1. Define the different parameter and concepts regarding atomic structure, periodic table, chemical bonding, acids and bases. 2. Define the different types of solutions. 3. Apply different theory on chemical bonding and hybridization to evaluate structure of molecules. 4. Classify and explain water pollution and chemistry of halogen, alkali metals, alkaline earth metals, non-metals and heavy metals. 5. Explain chemical equilibrium, thermo-chemistry, chemical and ionic equilibria, electrochemical cells. 6. Describe basic concepts and basic operations of cements, silicates and limes. **Course Contents:** Atomic structure and quantum theory: Bohr's theory, Heisenberg's uncertainty principle, Schrödinger's wave equation, electronic configurations and properties of atoms; electronic configurations and properties of molecules: chemical bond, valence bond theory molecular orbital theory, shape of molecules, bond length, bond energy; chemistry of halogen, alkali metals, alkaline earth metals, non-metals and heavy metals; modern concepts of acids and bases; different types of solutions; properties of dilute solution; thermo-chemistry; electrochemistry: voltaic cells, electrolytic cells; colloids and colloidal solution; chemical and ionic equilibria; chemistry of water; chemistry of water pollution; chemistry of cements, silicates and limes. **Text and Ref Books:** 1. Principles of Physical Chemistry - M Mahbubul Haque 2. A textbook of Engineering Chemistry– S.S. Dora 3. Snatok Ajaibo Rosaion – Sayen Ahmed and Latif Hossain

CHEM	Inorganic Quantitative Analysis
102	**1.50 Credits. 3 Hrs/Wk**
	Rationale: The purpose of this course will be to develop basic knowledge on inorganic chemistry which will be useful in various courses later on. **Course Outcomes:** Students will be able to –

	1. Define the different parameters regarding acid and base neutralization, titration and quantitative analysis of metals etc. and others key words like primary standard substances, secondary standard substances, molarity, normality, indicator, equivalent weights and so on. 2. Explain the different phenomena regarding iodimetric and iodometric method, complexometric titration etc. 3. Estimate zinc, ferrous content in water sample by using various titrimetric methods. 4. Summarize a report of any project work and apply in real life. 5. Produce lab report with proper appearance, format, grammar, introduction, objective and procedure. Ability to produce lab report with proper results, discussions and conclusion 6. Function as an effective team player with the capability to lead in the group project **Course Contents:** Basic Lab. Use, Process of dilution, Preparation of reagents, Volumetric analysis: acidimetry-alkalimetry; titrations involving redox reactions, determination of Cu, Fe and Ca volumetrically; determination of Ca and Mg in water.

PHY	**Physics**
103	**3.00 Credits. 3 Hrs/Wk**
	Rationale: This course will be useful for developing basics in periodic motion, harmonic motion, oscillations, different laws of thermodynamics, wave motion, etc, which will be useful for understanding dynamics of structures in later semesters, as well as professionally. **Course Outcomes:** Students will be able to – 1. Apply the knowledge of defining the different parameters such as periodic motion, simple harmonic motion, damped, undamped oscillations, different laws of thermodynamics. 2. Apply the knowledge of explaining the wave motion for different systems along with energy, different theory regarding thermodynamics such as kinetic theory, entropy, Carnot engine etc. 3. Solve problems regarding wave motion for different systems, analytical problems regarding thermodynamics related to engineering study **Course Contents**: Waves and oscillations: Simple harmonic oscillation, combination and composition of simple harmonic motion, Lissajous figures, spring-mass system, Torsional pendulum, undamped, damped and forced oscillations, resonance. Wave motion: transverse and longitudinal nature of waves, progressive and standing waves, intensity of a wave, energy calculation of progressive and standing waves, phase and group velocities, sound waves.

	Structure of Matter: Crystalline and non-crystalline solids, single crystal and polycrystalline solids, unit cell, crystal systems, bonds in solid, co-ordination number, NaCl and CsCl structure, packing factor, Miller indices, reciprocal lattice, Bragg's Law, X-ray diffraction, defects in solid, calculation of cohesive and bonding energy, introduction to band theory, distinction between metal, semiconductor and insulator. Environmental Physics: Laws of thermodynamics and the human body, energy transfers, entropy, structure and composition of the atmosphere, atmospheric pressure, Ozone, terrestrial radiation, Earth as a black body, hydrosphere, hydrologic cycle, water in the atmosphere, physics of cloud formation, fog and dissipation of fog, thunderstorms, physics of wind creation, principal forces acting on air masses, Cyclones and anticyclones, physics of ground, fossil fuels, nuclear power, renewable resources, energy demand and conservation. **Text and Ref Books:** 1. Fundamentals of Physics - Haliday, Resnick and Walker 2. Physics part-I - Resnick and Halliday 3. Physics part-II - Resnick and Halliday 4. Heat and Thermodynamics - Brijlal and Subramannyam 5. A Text Book of Sound - Brijlal and Subramannyam 6. Waves and Oscillation - Brijlal and Subramannyam

PHY	**Physics Laboratory**
104	**1.50 Credits. 3 Hrs/Wk**
	Rationale: This course will be useful for developing in hand knowledge on different phenomena regarding waves and oscillations, optics mechanics, electricity and heat. **Course Outcomes:** Students will be able to – 1. Explain the different phenomena regarding Waves and Oscillations, optics Mechanics, electricity and Heat 2. Set up experiment, conducts experiment, collect data and manage time 3. Produce lab report with proper appearance, format, grammar, introduction, objective and procedure. Ability to produce lab report with proper results, discussions and conclusion 4. Function as an effective team player with the capability to lead in the group project **Course Contents:** Determination of line frequency by Lissajous figures using an oscilloscope and a function generator and verification of the calibration of time/div knob at a particular position for different frequencies; determination of frequency of a tuning fork by Melde's apparatus; determination of the spring constant and the effective mass of a loaded spring; to draw magnetic induction versus current curve for a circular coil using Biot-Savart law and hence to verify tangent law; determination of the moment of inertia

	of a fly wheel about its axis of rotation; determination of rigidity modulus of the material of a wire by static method; determination of the pressure-coefficient of air by constant volume air thermometer; determination of the thermal conductivity of a bad conductor by lee's method; to plot the thermo-electromotive force vs temperature (calibration) curve for a given thermocouple (e5); determination of the melting point of a solid using the calibration curve obtained in experiment-e5; determination of the mechanical equivalent of heat by electrical method; determination of the focal length of (i) a convex lens by displacement method and (ii) a concave lens by an auxiliary lens method; determination of the radius of curvature of a plano-convex lens by Newton's ring method; determination of specific rotation of sugar solution by a polarimeter; to verify Malus' law of polarization; determination of the threshold frequency for the material of a photocathode and hence find the value of the Planck's constant; determination of lattice constant by x-ray. **Text and Ref Books:** 1. Practical Physics –Dr. Giasuddin 2. Practical Physics –C.L Arora

MATH	**Differential and Integral Calculus, Matrices**
107	**3.00 Credits. 3 Hrs/Wk**
	Rationale: Purpose of this course is to improve basic knowledge of students in differential and integral calculus, matrices. **Course Objectives:** The course aims to develop a good conceptual and visual understanding of the fundamentals of the mathematics of differential and the beginning of integral calculus and matrices as applied in engineering contexts. **Course Outcomes:** Students will be able to – 1. Apply the knowledge to define the limit, continuity and differentiability of functions. 2. Apply the concept to evaluate indefinite and definite integrals 3. Evaluate maxima and minima, radius of curvature, the length, area, volume 4. Apply the knowledge of matrices to solve system of linear equations. **Course Contents:** Differential calculus: limit, continuity and differentiability; successive differentiation and Leibnitz's theorem; expansion of functions; indeterminate forms; partial differentiation; Euler's theorem; tangent and normal; maxima and minima of functions of single variables. Integral calculus: integration by parts; standard integrals; integration by the method of successive reduction; definite integrals; beta function; gamma function; multiple integrals.

	Matrices: definition of different kinds of matrices; algebra of matrices; inverse of matrix; rank and elementary transformation of matrices; solution of system of linear equations; Eigen values and Eigen vectors; Cayley-Hamilton theorem. **Text and Ref Books:** 1. A Text Book on Differential Calculus — Mohammad & Bhattacharjee 2. Integral Calculus— Das and Mukherjee 3. Matrices and Linear Transformations— Mohammad Iman All 4. Matrices - M..L. Khanna 5. An Introduction to Matrices - S. C. Gupta 6. Matrices - Frank Ayres, Jr. (Schaum Series)

MATH	**Differential Equations and Statistics**
109	**3.00 Credits. 3 Hrs/Wk**
	Rationale: Purpose of this course is to introduce basic knowledge to identify and solve ordinary and partial differential equations. **Course Outcomes:** Students will be able to – 1. Apply the knowledge to identify and solve ordinary differential equations. 2. Apply the knowledge to identify and solve partial differential equations 3. Apply the boundary value problems, continuous and discontinuous probability distribution, exponential distribution in engineering fields **Course Contents:** Ordinary differential equation: formation of differential equations; solution of first order differential equations by various methods; solution of differential equation of first order but higher degrees; solution of general linear equations of second and higher orders with constant co-efficient; solution of Euler's homogeneous linear differential equations. Partial differential equation: introduction, linear and non-linear first order differential equations; standard forms; linear equations of higher order; equations of the second order with variable co-efficient. Statistics: measures of central tendency and standard deviation; moments, skewness and kurtosis; co-relation and regression analysis; elementary probability theory and discontinuous probability distribution; continuous probability distributions, e.g. normal and exponential distribution. **Text and Ref Books:** 1. Ordinary and Partial Differential Equation - M. D Raisinghania 2. Integral Calculus and Differential Equations - Mohammad and Bhattacharjee 3. Differential Equation - P N Chatterjee 4. Differential Equation - M L Khanna 5. Differential Equation – B D Sharma 6. Mathematical Physics — H K Dass

	7. Differential Equation — Schaum's Series 8. Mathematical Methods — Sharma & Gupta 9. Statistics and Probability - Spiegel (Schaum Series) 10. Business Statistics - M. P. Gupta and S. P. Gupta 11. Statistics and Probability in Modern Life - Joseph Newman 12. Probability and its Applications - H. C. Saxena 13. Elementary Statistics - H. C. Saxena

HUM	**Communicative English**
106	**1.50 Credits. 3 Hrs/Wk**
	Course Contents: Listening Skills and Note Taking: Listing to recorded texts and class lectures and learning to take useful notes based on listening. Developing Speaking Skill: Communicative expression for personal identification, life at home/dormitory, advice and opinion, instruction and directions, requests, complaints, apologies, describing people and places, narrating events. Tutorial Discussion: On a given topic to test the proper use of phonetics, pronunciation, grammar, logic and confidence. Public Speaking: Demonstration by teacher for a short specific period, speaking by students (each student minimum twice) on different easy given topics well in advance as per a schedule maximum for 3 to 4 minutes for each student, Debriefing on public speaking. Extempore: Minimum two presentations by each student for duration of maximum 3 to 4 minutes, Debriefing on extempore presentation. Presentation: On a given professional topic or on a given research paper using power point for 40 minutes followed by question and answer session, group presentation on different given topics by the students using power point. **Text and Ref Books:** 1. Langan, J. (2005). College Writing Skills with Readings (6th Ed). McGraw-Hill Publication 2. Interactions 1 (Reading), John Langan, Latest edition, McGraw-Hill Publication

HUM	**English**
107	**2.00 Credits. 2 Hrs/Wk**
	Rationale: This course has mainly been designed to improve speaking and oral communication skills of the students. The course includes instructions and experience in speech preparation and speech delivery within various real life situations, formal and informal. Emphasis will be given on various speeches, such as informative, persuasive and interactive. Upon completion of this course, students are expected to be able to communicate at various situations, participate in group activities and prepare formal

speech for academic, professional and social purposes. This course also incorporates classroom instructions to provide guidelines on presentations and communication skills. In addition, the course emphasizes on providing constructive feedback on students‘ oral performances.

Course Objectives:

1. To improve students‘ oral communication skills to communicate accurately in various situations;
2. To provide instructions and necessary guideline to practice in general, classroom and real life conversation while engaging students in different kind of speaking activities;
3. To develop students‘ interpersonal skills engaging them in various group interactions and activities;
4. To help students to overcome their inhibitions, shyness and nervousness in speaking;
5. To practice and improve students‘ listening skills;
6. To improve students‘ pronunciation in order to improve their level of comprehensibility in both speaking and listening;
7. To strengthen students‘ presentation skills to prepare them for different kinds of public speaking;
8. To strengthen students‘ self-evaluation skills to monitor and develop their own language progress and initiate self-improvement;
9. To encourage a positive attitude towards the language and to develop students’ self-confidence.

Course Contents:

General Discussion: Introduction, various approaches to learning English, characteristic of good learners, styles and strategies.

Grammar and Usage: Construction of sentences, vocabulary, diction, synonyms and antonyms, grammatical errors, WH questions, sentence variety and style, conditionals. Academic word lists, collocation, phrases and idioms.

The phonetics: IPA, English vowels and consonants, weak forms, assimilation and elision, differences between British, American and other accents, accentuation and intonation, Common Mistakes in English pronunciation.

Reading Skill. Discussion, readability, scan and skin reading. Generating ideas through purposive reading, reading selective stories, comprehension. Reading and identifying differences between different genres of texts, critical reading.

Speaking Skill. Practicing dialogue, storytelling, describing pictures, charts/graphs, sharing anecdotes.

Writing Skill:

Introduction: Principles of effective writing, organization, planning and development of writing of composition, paragraph, précis and amplification. Writing technical journal articles.

General Strategies for the writing process: Generating ideas, stating problems, drafting and finalizing, revising and editing.

Report Writing: Defining a report, classification of reports, structure of a report and writing of report.

Approaches to Communication: Communication today, business communication,

	tenders and quotations, journal articles, job letters and official letters. Writing arguments, biographies, memories, describing charts etc. **Text and Ref Books:** 1. Jones, L. (1981). Functions of English. (Student's Book, 2nd Ed.) Melbourne, Australia: Cambridge University Press. 2. Dixon, R.J. (1987). Complete course in English. (Book 4). New Delhi, India: Prentice Hall of India. (For book presentation) 3. Langan, J. (2005). College Writing Skills with Readings (6th Ed). McGraw-Hill Publication 4. Interactions 1 (Reading), John Langan, Latest edition, McGraw-Hill Publication 5. Hand-out will be provided by the instructors.

MATH	**Laplace Transform, Vector Analysis and Coordinate Geometry**
201	**3.00 Credits. 3 Hrs/Wk**
	Rationale: Purpose of this course is to develop basic knowledge of students in Laplace transform, vector analysis and coordinate geometry. **Course Outcomes:** Students will be able to – 1. Define Laplace transform, inverse Laplace transform, different types of matrices, and their properties. 2. Explain differentiation and integration of vector valued functions in Cartesian, cylindrical and spherical geometry. 3. Calculation of length, volume and area of objects related to engineering study by using vector 4. Apply Laplace transform to ODE and PDEs. 5. Apply the basics of coordinate geometry for axis transformation. **Course Contents:** Laplace transforms: definition of Laplace transforms, sufficient conditions for existence of Laplace transforms; inverse Laplace transforms; Laplace transforms of derivatives; the unit step function; periodic function; some special theorems on Laplace transforms; partial fraction; solutions of differential equations by Laplace transforms. Vector analysis: Scalar and vector product of two vectors and their geometrical interpretation; triple products and multiple products of vectors; linear dependence and independence of vectors; definition of line, surface and volume integral; gradient, divergence and curl of point functions; Gauss's theorem, Stroke's theorem, Green's theorem and their applications. Coordinate geometry: Transformation of axis, pair of straight line. **Text and Ref Books:** 1. College Mathematical Methods (Vol –II) — Md. Abdur Rahman 2. Laplace Transforms — Murray R Spiegel (Schaum's Outline Series)

	3. Laplace and Fourier Transforms— M. D. Raishanghania. 4. Complex Variables - M L Khanna 5. Vector Analysis - Dr. Muhammad Abdus Sattar 6. Vector Analysis - M. D. Raisinghania 7. Vector Analysis with applications - Md Ali Ashraf and Md Abdul Khaleq Hazra 8. Vector Analysis - Murray R Spiegel (Schaum Series)

MATH	**Applied Mathematics for Engineers**
203	**3.00 Credits. 3 Hrs/Wk**
	Rationale: In this course students will be introduced to various methods to solve various civil, environmental and water resources engineering problems dealing with probability and statistics. Students will also be able to evaluate uncertainty in engineering systems. **Course Objectives:** This course will: 1. Present the basic concepts of probability distributions, Bayesian inference and relevant statistical methods. These concepts comprise foundational material utilized heavily in later year courses, particularly in water, structural, and geotechnical engineering. 2. Formulate engineering problems dealing with probability and statistics into mathematical frameworks and solve the resulting models. **Course Outcomes:** Upon successful completion of this course, students should be able to: 1. Apply probability distribution theory and Bayesian inference to engineering problems dealing with probability and statistics. 2. Develop and run simple probabilistic models to evaluate uncertainty in engineering systems. **Course Contents:** Review of differential equations; power series solution of differential equations and their applications: Frobenius method, Legendre's polynomials, gamma function, Bessel's function; integral form of differential equation and its application to engineering problem solving. Fourier series and its properties, application to engineering problem solving; Fourier integral; Fourier transforms and their uses in solving boundary value problems; diffusion equation, wave equation, Laplace equation and their applications. Application of statistical methods to engineering problems: Random variables; discrete and continuous probability distributions; functions of random variables and derived distributions; expectation and moments of random variables; point estimation of distribution parameters: methods of moments and maximum likelihood, Bayesian analysis; confidence intervals; hypothesis tests; nonparametric statistical tests; simple and multiple linear regression and basic models and model selection; uncertainty and reliability analysis.

	Text and Ref Books: 1. Introduction to Probability and Statistics for Engineers and Scientists –Sheldon M. Ross

HUM	**Accounting**
205	**2.00 Credits. 2 Hrs/Wk**
	Rationale: The purpose of this course is to serve as an introduction to basics of accounting, analysis, recording, summarizing and reporting. **Course Objectives:** This course aims to provide students with a broad understanding of accounting, the analysis, recording, summarizing, and reporting, and the use of accounting information for decision making, planning, performance measurement and control. **Course Outcomes:** Student will be able to – 1. Demonstrate an understanding of the facts of financial accounting 2. Demonstrate an understanding of the facts of cost accounting. 3. Apply the accounting concepts to prepare financial statements. **Course Contents:** Financial accounting: objectives and importance of accounting; accounting as an information system; basic accounting principles; accounting equation; recording system; accounting cycle; journal, ledger, trial balance; preparation of financial statements considering adjusting entries; financial statement analysis and interpretation. Cost accounting: cost concepts and classification; cost-volume-profit analysis; contribution margin approach and its application, break-even analysis, target profit analysis, operating leverage; absorption costing vs variable costing; job order costing; capital budgeting; long run planning and control. **Text and Ref Books:** 1. Managerial Accounting – R H Garrison 2. Accounting Principles – Jerry J Weygandt

HUM	**Economics**
207	**2.00 Credits. 2 Hrs/Wk**
	Rationale: This course is designed for the students to develop their competence in engineering economic analysis and its role in problem solving. **Course Objectives:** 1. The objective of this course is to teach the concepts of engineering economic analysis and its role in solving problems.

	2. It is designed to provide engineers with the tools needed for rigorous presentation of the effect of the time value of money on engineering decision making. **Course Outcomes:** On successful completion of the course students will be able to: 1. Define, estimate and analyze engineering project costs 2. Develop, evaluate, and compare engineering project cash flows 3. Formulate and apply interest factors to real life engineering problems 4. Evaluate engineering alternatives by economic analysis techniques and models 5. Discuss and solve advanced economic engineering analysis problems including taxation and inflation **Course Contents:** Economics and engineering; microeconomics and macroeconomics; theory of demand and supply and their elasticities; demand estimation; price determination; indifference curve technique; theory of production; theory of cost and cost estimation; market structure; national income accounting, depreciation; circular flow of income and expenditure; cost-benefit analysis; payback period, NPV, IRR, inflation; economic feasibility of engineering undertakings. **Text and Ref Books:** 1. Economics - Samuelson 2. Economics - John Sloman 3. Economic Development - Michael Todaro

HUM	**Sociology**
209	**2.00 Credits. 2 Hrs/Wk**
	Rationale: The purpose of this course is to serve as an introduction to concepts, theories, and methods of the behavioral and social services. **Course Objectives:** 1. To teach student the concepts, theories, and methods of the behavioral and social services. 2. To introduce students to the basic social processes of society, social institutions and patterns of social behavior. 3. To enable students to cope effectively with the socio-cultural and interpersonal process of a constantly changing complex society. **Course Outcomes:** Student will be able to – 1. Identify the nature, scope and perspectives of sociology 2. Distinguish between stages of social research and research methods. 3. Define socialization and personality development through previous knowledge of perspectives of sociology

4. Evaluate social stratification; industrial revolution, capitalism and socialism, culture and civilization; socialization and personality development; globalization; media and individual; social organization and social problem
5. Identify the urbanization and city development, changes in society and technology through the knowledge of work and economic life of common individuals, environment and human activities, climate change and global risk, population and human society.

Course Contents:
Basic concepts of sociology; science, technology and social evolution; globalization and changing world; techniques of production, culture and civilization, population and world resources; historical background of emergence of Bangladesh, socialization; poverty social exclusion and welfare; Gender and development; Crime, deviance and social control; sustainable development, people's participation; group and organization, Equity and Social justice.

Text and Ref Books:
1. Sociology - Primary Principles - CN Shankar Rao
2. Sociology – A Guide to Problems & Literature– Bottomore
3. Sociology– Samuel Koening

5.3. Courses Offered by Department of Electrical, Electronic and Communication Engineering (EECE)

EECE	Basic Electrical Technology
167	3.00 Credits. 3 Hrs/Wk

Rationale:

The purpose of this course is be to develop basic knowledge on current, voltage and resistance in electrical networks and circuits, etc. which will be useful in various engineering projects later on.

Course Outcomes:

Students will be able to –

1. Identify the electrical units and standards.
2. Identify the measuring instruments like ammeters, voltmeters, watt meters and multi-meter.
3. Apply the knowledge of series, parallel, node and mesh current analysis to measure current, voltage and resistance in electrical networks and circuits.
4. Apply the concept of AC circuit analysis to find instantaneous current, voltage and power, effective current, voltage and average power.
5. Recognize the electrical wiring for residential and commercial loads. 6. Recall the basic principles and application of different types of electrical machines (Generator, motor, alternator, transformer) as well as electrical devices with simple application (diodes and rectifiers).

Course Contents:

Electrical units and standards;

Electrical networks and circuit solutions: Series, parallel, node and mesh current analysis; Measurement of electrical quantities: current, voltage, resistance.

Measuring instruments: Ammeters, voltmeters, watt meters and multi-meter.

AC circuit analysis: Instantaneous current, voltage and power, effective current and voltage, average power. Phasor algebra: single phase RLC circuits, balanced three phase circuits.

Introduction to electrical wiring for residential and commercial loads. (Illumination and lighting, Air Conditioning, heating, lifts, intercom, public address system, telephone system and LAN, security system including CC TV, stand by generator and substation design considerations.)

Basic principles and application of different types of electrical machines (Generator, motor, alternator, transformer)

Introduction to electrical devices with simple application: diodes, rectifiers.

Text and Ref Books:

1. Introductory Circuit Analysis - R.L. Boylestad; Prentice Hall of India Private Ltd.
2. Introduction to Electrical Engineering – Robert P. Ward; Prentice Hall of India Private Ltd.
3. Alternating Current Circuits- Russell M Kerchner and George F Corcoran; John Wiley & Sons
4. A Text Book of Electrical Technology- B L Theraja and A K Theraja; S.Chand & Company Ltd.

5.4. Courses Offered by Department of Mechanical Engineering (ME)

Shop	Workshop Sessional
142	**1.50 Credits. 3 Hrs/Wk**

Rationale:
In this course students will be introduced with different wood working tools, bench tolls, hand tools and machine tools. Students will be also presented with welding techniques. This training will be useful for the students in later projects.

Course outcomes:
Students will be able to –
1. Recognize wood working tools, common bench tools, hand tools and machine tools.
2. Identify the machines used in welding and machine shops and label them with their functions.
3. Demonstrate a job with proper planning and estimating.
4. Produce lab report with proper appearance, format, grammar, introduction, objective and procedure. Ability to produce lab report with proper results, discussions and conclusion.

Course Contents:
Carpentry shop (3/2 hrs/week)
Wood working tools; wood working machine: band saw, scroll saw, circular saw, jointer, thickness planer, disc sander, wood lathe; types of sawing; common cuts in wood works; types of joint; defects of timber: natural defects and artificial defects; seasoning; preservation; substitute of timber; commercial forms of timber; characteristics of good timber; use of fastening; shop practice: practical job, planning and estimating of a given job.

Machine shop (3/4 hrs/week)
Kinds of tools; common bench and hand tools; marking and layout tools, measuring tools, cutting tools, machine tools, bench work with job; drilling, shaper, lathe and milling machines: introduction, type, size and capacity, uses and applications.

Welding shop (3/4 hrs/week)
Methods of metal joints: Riveting, grooving soldering, welding; Types of welding joints and welding practice; Position of arc welding and polarty: Flat, vertical, horizontal, overhead; Electric Arc welding and its machineries; Welding of different types of materials: Low carbon steel, cast iron, brass, copper, stainless steel, aluminium; Types of electrode, fluxes and their composition; Arc welding defects; Test of Arc welding: Visual, destructive and non-destructive tests.
Types of gas welding system and gas welding equipment; Gases and types of flame; welding of different types of materials; Gas welding defects; test of gas welding.