MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY (MIST)

COURSE CURRICULUM OF

B.Sc. in CIVIL ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING (CE)

JANUARY 2019

COMMITTEE FOR SYLLABUS REVIEW – CE DEPT, MIST

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

A. President

Col Md Masudur Rahman, BSP, SPP, afwc, psc
Head of CE Department
Military Institute of Science and Technology

B. Internal Members

1.

Col Md Kabirul Islam
Dean, Faculty of Civil Engineering, MIST
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Dr. G. M. Jahid Hasan
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এবং
৫২...তম সিন্ডিকেট সভায় অনুমোদিত হয়।

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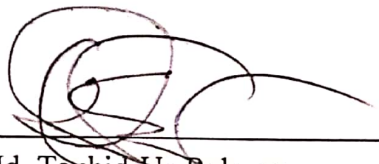
5. 

Dr. Md. Tauhid-Ur-Rahman
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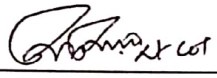
6. 

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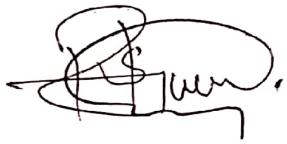
7. 

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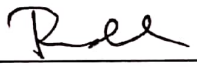
8. 

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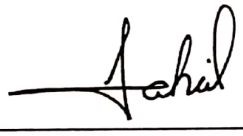
9. 

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C. Members (Science and Hum Departments, MIST)

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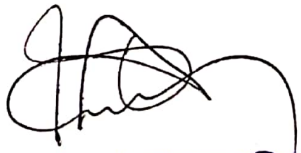

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DG, 24 Engineer Construction Brigade
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CHAPTER – 1

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 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 Rigour**-We strive for excellence with energy, commitment and passion.
d. **Pursuit of Innovation**-We cultivate creativity, adaptability and flexibility in our students, faculty and staff.

1.4. Eligibility of Students for Admission in MIST

The students must fulfill the following requirements:

1.4.1. Bangladeshi Students

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

a. 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.
b. 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.
c. Applicants who have passed HSC or Equivalent examination in the current year or one year before the notification for admission can apply.
d. Sex: Male and Female.

1.4.2. 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:

a. Educational qualifications as applicable for Bangladeshi civil students or equivalent.
b. Must have security clearance from respective Embassy/High Commission in Bangladesh.
c. Sex: Male and Female.

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

Liton Chandra Sarker
Deputy Inspector of College
Bangladesh University of Professionals

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	A	Civil Engineering (CE)	60
2		Computer Science and Engineering (CSE)	60
3		Electrical, Electronic and Communication Engineering (EECE)	60
4		Mechanical Engineering (ME)	60
5		Aeronautical Engineering (AE)	50
6		Naval Architecture and Marine Engineering (NAME)	40
7		Biomedical Engineering (BME)	40
8		Nuclear Science and Engineering (NSE)	40
9		Civil & Environmental Engineering	60
		Civil & Water Resources Engineering	
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 (BSc 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 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/programme 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.

CHAPTER - 2

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.

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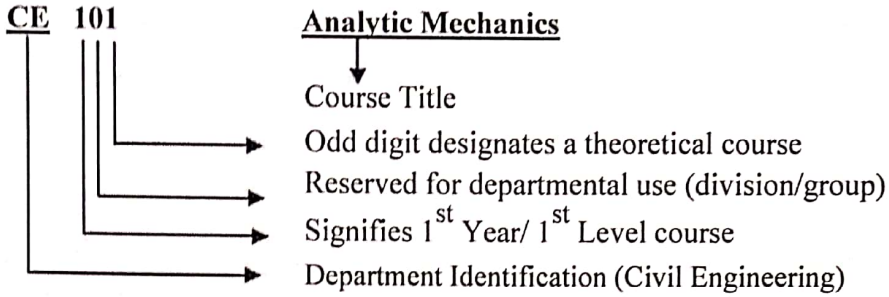
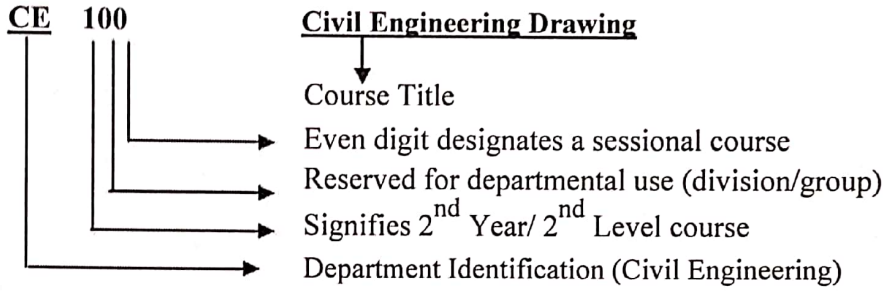
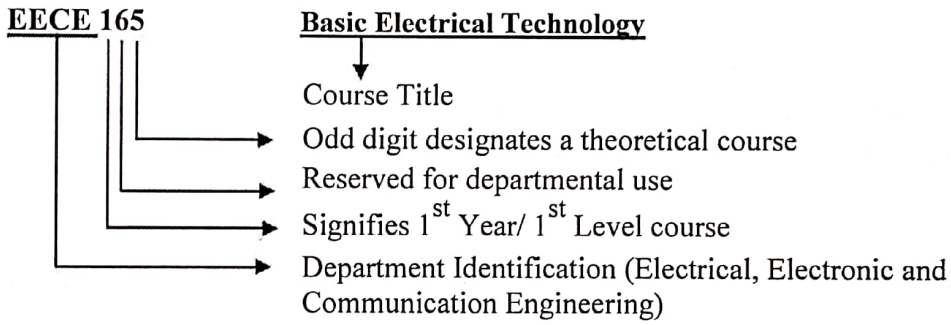
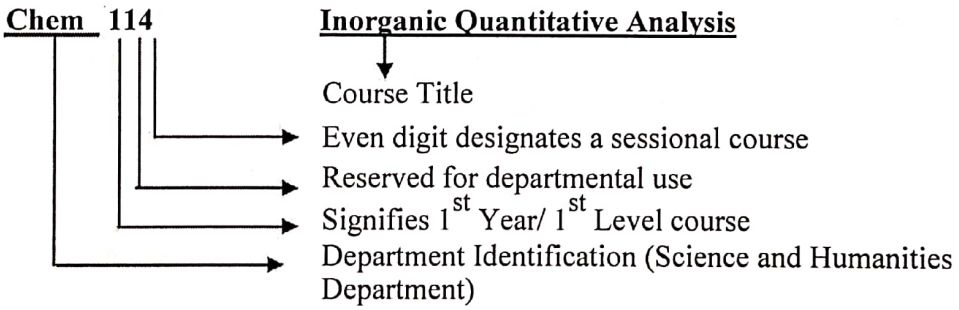
The course designation system is illustrated as Follows:









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.

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.

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.

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.

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 Comdt, a lesser number of credit hours to suit individual requirements. Such cases are also applicable to students of Level 4 requiring less than 15 credit hours for graduation.

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 and a term final examination. The assessments for sessional courses are made by evaluating performance of the student at work during the class, viva-voce during laboratory hours and quizzes. Besides that, at the end there will be a final lab test. Each course has a certain number of credits, which describes its corresponding

weightages. A student's performance is measured by the number of credits completed satisfactorily and by the weighted average of the grade points earned. A minimum grade point average (GPA) is essential for satisfactory progress. A minimum number of earned credits also have to be acquired in order to qualify for the degree. Letter grades and corresponding grade points will be given as follows:

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

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

2.17. Distribution of Marks

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

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

Continuous Assessment (Homework/Assignment/Quizzes/CTs/Midterm/Class participation etc.)	30%
Final Examination	70%
Total	**100%**

Note: Distribution of marks may change 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. Basis for awarding marks for class attendance.

This will be as follows:

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

2.19. Collegiate and Non-collegiate

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.

2.20. Calculation of GPA

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

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

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

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

2.21. 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
CE 100	1.50	A-	3.50	5.250
CE 103	3.00	A+	4.00	12.000
CHEM 103	3.00	A	3.75	11.250
MATH 137	3.00	B	3.00	9.000
HUM 155	3.00	B-	2.75	8.250
HUM 165	3.00	B	3.00	9.000
PHY 105	3.00	A+	4.00	12.000
CE 210	1.50	A	3.75	5.625
Total	21.00			72.375

GPA = 72.375/21.00 = 3.45

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

Level	Term	Credit 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

2.22. 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.

2.23. Minimum Earned Credit and GPA Requirement for Obtaining Degree

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

2.24. 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.

2.25. 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 for completing the degree requirement.

2.26. 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.

2.27. 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.

2.28. Time Limits for Completion of Bachelor's Degree

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

2.29. 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 and one is required to attend the classes 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.

2.30. Teacher-Student Interaction

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

2.31. 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).

2.32. 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.

2.33. 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 22wk or so), Term Final Examination will be held. Students will appear in the Term Final Examination for all the theory courses they have taken in the Term.
b. **Short Term Examination:** Short Term may be conducted after one week completion of Term 2 final examination. Students will be allowed to take maximum three theoretical courses in the Short Term. Examination will be conducted at the end of Short Term (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

30% marks. Maximum two theory courses may be taken as self-study course by a student. Highest achieved grade for these courses will be B+. In that case a student will be allowed to take maximum 24 credit instead of 15 in the last Term of his/her graduation.

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

2.34. 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 70% marks like Term Final examination. Remaining 30% marks on continuous assessment earned previously in that particular course will be counted. If a student fails in a course more than once in regular terms, then best one of all continuous assessment marks will be counted.
c. A student will be allowed to take one course at a time for each supplementary examination, but in the graduating Term one student can take two courses if required.
d. Highest grade of supplementary examination will be 'B+'.
e. Registration for supplementary courses to be done during the mid-term break of Term 1, paying the required fees.
f. Examination will be completed after Term I End break within three weeks of Term II.
g. If any student fails in a course, he can clear the course retaking it 2nd time or, he can clear the examination appearing at the supplementary examination as well. But anyone fails twice in a course consecutively, he has to take approval of Academic Council of MIST for appearing third/last time in a course and need to pay extra financial penalty.
h. If anyone fails in the sessional course, that course cannot be cleared in the supplementary examination.
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 30% marks at the end of the Term. For remaining 70% marks written examination will be taken with the Term Final Examination.
e. Assigned teacher for self-study examination will be responsible for setting questions of 70% marks and other examination formalities.
f. Question Setting, Moderation, and Result Publication to be done with courses of Term Final Examination.
g. Grading of Self Study course and examination will be maximum 'B+'.

Special Referred Examination. Following rules will be followed:

a. Immediately after the finalization of result of Term-2 final exam of 2017, for all failed/leftover courses, special referred examination will be arranged and students will have to register the courses for the examination by paying required fees and charges. Following the registration, Admit Card will be issued.
b. Examination will be held before commencement of Term-1 of 2018.
c. One student can appear at all of his failed courses (Referred/Backlog) in the Referred Examination including present level-repeat students.
d. Highest grade for all courses in this Examination will be 'B+'.
e. Question Setting, Moderation and Result Publication will be done following the same rules of Term Final Examination as per Examination Policy.
f. Separate Tabulation Sheet will be made for this special referred examination.

Liton Chandra Sarker
Deputy Inspector of College
Bangladesh University of Professionals

2.35. 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.

Liton Chandra Sarker
Deputy Inspector of College
Bangladesh University of Professionals

CHAPTER – 3

3. DEPARTMENT OF CIVIL ENGINEERING (CE)

3.1. Introduction to the Program

The CE Department of MIST, standing on the four pillars of morale: fundamentals, innovation, excellence and advancements, holds its glory of being the pioneer department of MIST. By creating a positive learning environment and sharing the most up-to-date technological knowledge and skills, the department of CE produces next-generation top-notch engineers and leaders for the nation. Since its commencement in 1999 with only 40 military students, this department has emerged to house and train 339 engineering students in undergraduate level at current time. It is the first ever department of MIST to receive the accreditation from the Board of Accreditation for Engineering and Technical Education (BAETE) in 2008. Again in 2018, the department received highest grade from BAETE during the re-accreditation process. This department has again pioneered the Post Graduate program by introducing the MSc / MEngg and PhD in 2012 and 2013 respectively. This department is enriched with highly experienced and disciplined teaching staffs having wide vision. At present, 33 faculties are serving in this department of whom 8 are PhD qualified from home and abroad. 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 infrastructural development. All-in-all, within a very short span of time, the CE 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 B.Sc in Civil Engineering (CE) program comprises a total of 162.00 credits and 209.00 contact hours & 07 weeks of field work and internship. A student of this program can specialize in seven (07) different subjects, such as structural engineering, geotechnical engineering, water resource engineering, materials engineering, coastal engineering, transportation engineering and environmental engineering.

3.2. Vision and Mission of the Program

Vision:

To become a recognized leader in producing highly competent civil engineers by imparting quality education, promoting useful research and striving to induce social responsibilities, ethical values and leadership to enhance quality of life for people of the nation and the world.

Mission:

a. To provide a high quality learning environment for students in both undergraduate and postgraduate levels through a broad-based, rigorous curriculum, emphasizing theoretical and practical concepts to gain fundamental and specialized engineering knowledge, while they develop skills in critical thinking, communication, leadership and lifelong learning.

b. To create opportunities for students and faculty to conduct basic and applied research that contributes to society by advancing sustainable engineering principles and practices.
c. To provide civil engineering leadership and service to the nation, the profession and society at large with strong professional values, and disciplined work ethics.

3.3. Program Educational Objectives (PEOs)

The Department of Civil Engineering (CE) 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.

3.4. Learning Outcomes

Based on the suggestion of Board of Accreditation for Engineering and Technical Education (BAETE), Bangladesh, the Bachelor of Science in Civil Engineering (CE) program 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.

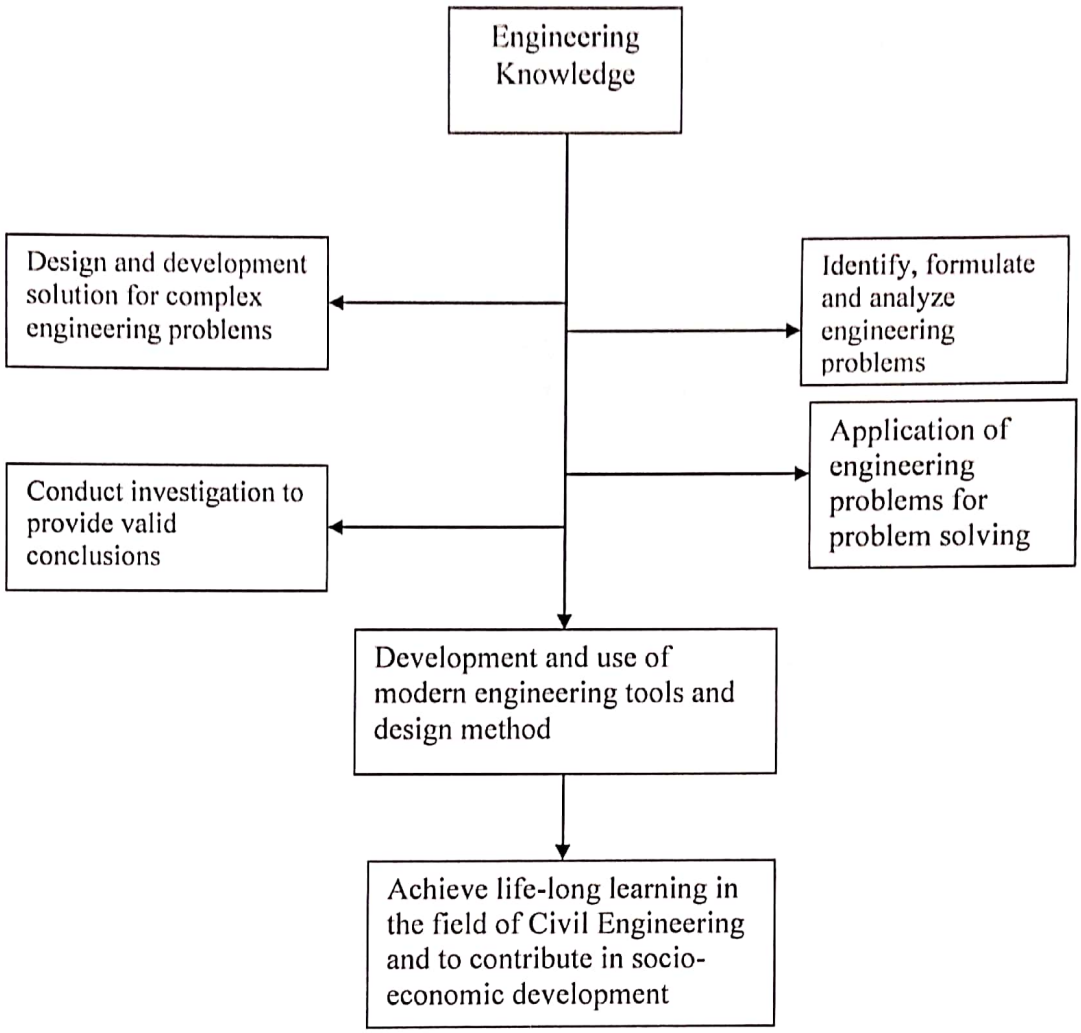
xi. PO11 Project management and finance: Able to demonstrate knowledge and understanding of engineering and management principles and apply these to one's work as a team member or a leader to manage projects in multidisciplinary environments.

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.

3.5. Generic Skills

a. Apply the principles and theory of civil engineering knowledge to the requirements, design and development of different aviation 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

3.6. Curriculum/ Skill mapping



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CHAPTER – 4

4. COURSE CURRICULUM OF BACHELOR IN CIVIL ENGINEERING

Considering the program outcome mentioned in the Chapter 3, the course schedule for the undergraduate students of the Department of Civil Engineering (CE) is designed and described in this chapter.

4.1. Summary of Course Curriculum

Level/ Term	Humanities	Math	Basic Science	Dept Engg courses	Optional courses	Total
1-I	3.00	3.00	6.00+1.50	4.00+1.50	-	19.00
1-II	3.00	3.00	6.00+3.00	3.00+3.00	-	21.00
2-I	2.00	3.00	-	9.00+6.00	-	20.00
2-II	-	-	-	15.00+6.00	-	21.00
3-I	-	-	-	17.00+3.00	-	20.00
3-II	-	-	-	16.00+4.50	-	20.50
4-I	-	-	-	14.00+6.50	-	20.50
4-II	-	-	-	2.00+7.00	8.00+3.00	20.00
% Of Total Course	4.94%	5.56%	10.19%	72.53%	6.79%	-
Total Credit Hrs	8.00	9.00	16.50	117.50	11.00	162.00

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.)	IDP (Cr. Hrs)	Cr Hrs
1	1st	I	5	15	3	4.0	-	-	-	19.0
2		II	5	14	5	7.0	-	-	-	21.0
3	2nd	I	5	14	4	6	-	-	-	20.0
4		II	5	15	4	6	-	-	-	21.0
5	3rd	I	5	17	2	3	-	-	-	20.0
6		II	5	16	3	4.5	-	-	-	20.5
7	4th	I	4	14	2	3	1.5	-	2	20.5
8		II	5	10	2	3	3	1	3	20.0
									Total =	162.0

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	8.00	15.00	4.00	23.00	19.00
1/II	14.00	14.00	14.00	7.00	28.00	21.00
2/I	14.00	12.00	14.00	6.00	26.00	20.00
2/II	15.00	12.00	15.00	6.00	27.00	21.00
3/I	17.00	6.00	17.00	3.00	23.00	20.00
3/II	16.00	9.00	16.00	4.50	25.00	20.50
4/I	14.00	13.00	14.00	6.50	27.00	20.50
4/II	10.00	20.00	10.00	10.0	30.00	20.00
Total	115.00	94.00	115.00	47.00	209.00	162.00

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. Credits allotted to the thesis will be 4.5 corresponding to 9 contact hours.

4.5. Integrated Design Project (IDP)

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. Term wise Distribution of Courses

LEVEL-1, TERM-I

Course No	Course Name	Type of Course	Contact hours	Credits
Phy 101	Physical Optics, Waves and Oscillation, Heat and Thermodynamics	Theory	3	3
Math 137	Differential and Integral Calculus	Theory	3	3
Chem 103	Chemistry I	Theory	3	3
Hum 155/Hum 165/Hum 175	Sociology/Government/Moral Philosophy	Theory	2	2
CE 101	Analytical Mechanics	Theory	4	4
	Subtotal (Theory)		**15.00**	**15.00**
Hum 186	Developing English Language Skills I	Sessional	2	1.0
Shop 132	Workshop Sessional	Sessional	3	1.5
CE 100	Civil Engineering Drawing	Sessional	3	1.5
	Subtotal (Sessional)		**8.00**	**4.0**
	Total = Contact hours: 23.00; Credits: 19.00			

LEVEL-1, TERM- II

Course No	Course Name	Type of Course	Contact hours	Credits
Hum 153	Accounting	Theory	2	2
Phy 105 / Chem 105	Structure of Matter, Electricity and Magnetism and Modern Physics / Chemistry II	Theory	3	3
Math 139	Differential Equations and Statistics	Theory	3	3
EECE 165	Basic Electrical Technology	Theory	3	3
CE 103	Surveying and spatial information Engineering	Theory	3	3
	Subtotal (Theory)		**14.00**	**14.00**
Hum 188	Developing English Language Skills II	Sessional	2	1.0
Phy 102	Physics Laboratory	Sessional	3	1.5
Chem 114	Inorganic Quantitative Analysis	Sessional	3	1.5
CE 102	Computer Aided Drawing	Sessional	3	1.5
CE 104	Practical Surveying	Field Work	3*	1.5
	Subtotal (Sessional & Field Work)		**14.00**	**7.00**
	Total = Contact hours: 28.00; Credits: 21.00			

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

LEVEL-2, TERM-I

Course No	Course Name	Type of Course	Contact hours	Credits
Hum 217	Engineering Economics	Theory	2	2
Math 237	Laplace Transform, Vector Analysis and Matrices	Theory	3	3
CE 203	Engineering Geology & Geomorphology	Theory	3	3
CE 211	Mechanics of Solids I	Theory	3	3
CE 261	Fluid Mechanics	Theory	3	3
	Subtotal (Theory)		**14.00**	**14.00**
CE 200	Details of Construction	Sessional	3	1.5
CE 204	Computer Programming Sessional	Sessional	3	1.5
CE 210	GIS and Remote sensing	Sessional	3	1.5
CE 262	Fluid Mechanics Sessional	Sessional	3	1.5
	Subtotal (Sessional)		**12.00**	**6.00**
	Total = Contact hours: 26; Credits: 20.00			

LEVEL-2, TERM-II

Course No	Course Name	Type of Course	Contact hours	Credits
CE 201	Engineering Materials	Theory	3	3
CE 205	Numerical Methods for Engineering	Theory	3	3
CE 207	Applied Mathematics for Engineers	Theory	3	3
CE 209	Professional Practices & Communication	Theory	3	3
CE 213	Mechanics of Solids II	Theory	3	3
	Subtotal (Theory)		**15.00**	**15.00**
CE 206	Engineering Computations Sessional	Sessional	3	1.5
CE 208	Quantity Surveying	Sessional	3	1.5
CE 212	Structural Mechanics & Materials Sessional	Sessional	3	1.5
CE 214	Architectural, Engineering and Planning Appreciation	Sessional	3	1.5
	Subtotal (Sessional)		**12.00**	**6.00**
	Total = Contact hours: 27; Credits: 21.00			

LEVEL-3, TERM-I

Course No	Course Name	Type of Course	Contact hours	Credits
CE 301	Project Planning & Construction Management	Theory	3	3
CE 311	Structural Analysis & Design I	Theory	4	4
CE 315	Design of Concrete Structures I	Theory	3	3
CE 331	Environmental Engineering I	Theory	3	3
CE 341	Principle of Soil Mechanics	Theory	4	4
	Subtotal (Theory)		**17.00**	**17.00**
CE 332	Environmental Engineering Laboratory	Sessional	3	1.5
CE 342	Geotechnical Engineering Sessional I	Sessional	3	1.5
	Subtotal (Sessional)		**6.00**	**3.00**
	Total = Contact hours: 23; Credits: 20.00			

LEVEL-3, TERM-II

Course No	Course Name	Type of Course	Contact hours	Credits
CE 317	Design of Concrete Structures II	Theory	3	3
CE 319	Design of Steel Structures	Theory	3	3
CE 333	Environmental Engineering II	Theory	4	4
CE 351	Fundamentals of Transportation Engineering	Theory	3	3
CE 361	Open Channel Hydraulics	Theory	3	3
	Subtotal (Theory)		**16.00**	**16.00**
CE 316	Concrete Structures Design Sessional I	Sessional	3	1.5
CE 320	Steel Structures Design Sessional	Sessional	3	1.5
CE 362	Open Channel Hydraulics Sessional	Sessional	3	1.5
	Subtotal (Sessional)		**9.00**	**4.5**
	Total = Contact hours: 25; Credits: 20.5			

LEVEL-4, TERM-I

Course No	Course Name	Type of Course	Contact hours	Credits
CE 411	Structural Analysis & Design II	Theory	3	3
CE 441	Foundation Engineering	Theory	3	3
CE 451	Highway Materials, Pavement Design and Railway Engineering	Theory	4	4
CE 463	Hydrology and Irrigation Engineering	Theory	4	4
	Subtotal (Theory)		**14.00**	**14.00**
CE 410	Concrete Structures Design Sessional II	Sessional	3	1.5
CE 452	Highway Materials, Mix Design and Traffic Engineering Sessional	Sessional	3	1.5
CE 400	Thesis	Thesis	3	1.5
CE 450	Integrated Design Project	Project	4	2
	Subtotal (Thesis, Sessional & Project)		**13.00**	**6.50**
	Total = Contact hours: 27.00; Credits: 20.50			

LEVEL-4, TERM-II

Course No	Course Name	Type of Course	Contact hours	Credits
CE 403/ CE 405	Socio-economic Aspects of Development Project/Business and Career Development	Theory	2	2
	Subtotal (Theory)		**2.00**	**2.00**
CE 400	Thesis	Thesis	6	3
CE 402	Civil Engineering Students' Internship Programme (CESIP)	Internship	2^{+}	1
CE 450	Integrated Design Project	Project	6	3
	Subtotal (Thesis, Internship & Project)		**16.00**	**7.00**
	Total = Contact hours: 16.00; Credits: 9.00			

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

List of Elective Courses for Structural Discipline (Any Two Theory & One Sessional)

Sl	Course Code	Course Name	Level/ Term	Type of Course	Contact hours	Credits
1.	CE 413	Design of Steel-Concrete Composite Structure	4-II	Theory	2	2
2.	CE 415	Prestressed Concrete	4-II	Theory	2	2
3.	CE 417	Design of Concrete Structures III	4-II	Theory	2	2
4.	CE 419	Introduction to Finite Element Method	4-II	Theory	2	2
5.	CE 421	Dynamics of Structures	4-II	Theory	2	2
6.	CE 423	Structural Safety	4-II	Theory	2	2

Sl	Course Code	Course Name	Level/ Term	Type of Course	Contact hours	Credits
7.	CE 425	Seismic Design of Structures	4-II	Theory	2	2
8.	CE 427	Advanced Solid Mechanics	4-II	Theory	2	2
	Subtotal (Theory)				**4.00**	**4.00**
9.	CE 412	Computer Aided Analysis and Design of Structures Sessional	4-II	Sessional	3	1.5
	Subtotal (Sessional)				**3.00**	**1.50**
	Total = Contact hours: 7.00; Credits: 5.50					

List of Elective Courses for Environment Discipline (Any Two Theory & One Sessional)

Sl	Course Code	Course Name	Level/ Term	Type of Course	Contact hours	Credits
1.	CE 433	Solid and Hazardous Waste Management	4-II	Theory	2	2
2.	CE 435	Environmental Pollution Management	4-II	Theory	2	2
3.	CE 431	Natural Resources and Renewable Energy	4-II	Theory	2	2
4.	CE 437	Climate Change and Disaster Management	4-II	Theory	2	2
5.	CE 439	Environmental Impact Assessment and Sustainability	4-II	Theory	2	2
	Subtotal (Theory)				**4.00**	**4.00**
6.	CE 432	Design of Water Supply, Sanitation and Sewerage Systems	4-II	Sessional	3	1.5
	Subtotal (Sessional)				**3.00**	**1.50**
	Total = Contact hours: 7.00; Credits: 5.50					

List of Elective Courses for Geotechnical Discipline (Any Two Theory & One Sessional)

Sl	Course Code	Course Name	Level/ Term	Type of Course	Contact hours	Credits
1.	CE 443	Earth Retaining Structures	4-II	Theory	2	2
2.	CE 445	Elementary Soil Dynamics	4-II	Theory	2	2
3.	CE 447	Soil-Water Interaction	4-II	Theory	2	2
4.	CE 449	Numerical Methods in Geotechnics	4-II	Theory	2	2
	Subtotal (Theory)				**4.00**	**4.00**
4.	CE 442	Geotechnical Engineering Sessional II	4-II	Sessional	3	1.5
	Subtotal (Sessional)				**3.00**	**1.50**
	Total = Contact hours: 7.00; Credits: 5.50					

List of Elective Courses for Transportation Discipline (Any Two Theory & One Sessional)

Sl	Course Code	Course Name	Level/ Term	Type of Course	Contact hours	Credits
1.	CE 453	Traffic Engineering Design and Management	4-II	Theory	2	2
2.	CE 455	Pavement Management, Drainage and Airport Engineering	4-II	Theory	2	2
3.	CE 457	Urban Transportation Planning & Management	4-II	Theory	2	2
4.	CE 459	Intelligent Transportation System	4-II	Theory	2	2
5.	CE 461	Railway Engineering	4-II	Theory	2	2
	Subtotal (Theory)				**4.00**	**4.00**
6.	CE 454	Traffic Studies and Pavement Design Sessional	4-II	Sessional	3	1.5
	Subtotal (Sessional)				**3.00**	**1.50**
	Total = Contact hours: 7.00; Credits: 5.50					

List of Elective Courses for Water Discipline (Any Two Theory & One Sessional)

Sl	Course Code	Course Name	Level/ Term	Type of Course	Contact hours	Credits
1.	CE 465	Groundwater Engineering	4-II	Theory	2	2
2.	CE 467	Flood Mitigation and Management	4-II	Theory	2	2
3.	CE 469	River Engineering	4-II	Theory	2	2
4.	CE 471	Hydraulic Structures	4-II	Theory	2	2
5.	CE 473	Coastal Engineering	4-II	Theory	2	2
	Subtotal (Theory)				**4.00**	**4.00**
6.	CE 472	Hydraulic Structures Design Sessional	4-II	Sessional	3	1.5
	Subtotal (Sessional)				**3.00**	**1.50**
	Total = Contact hours: 7.00; Credits: 5.50					

	Total = Contact hours: 16+7+7 = 30.00; Credits: 9+5.5+5.5 = 20.00

CHAPTER – 5

5. DETAILED CURRICULUM OF UNDERGRADUATE COURSE

5.1. Courses Offered by Humanities Department

Hum 153: Accounting

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

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:

1. Student will be able to demonstrate an understanding of the facts of financial accounting
2. Student will be able to demonstrate an understanding of the facts of cost accounting.
3. Student will be able to 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" by – R H Garrison
2. "Accounting Principles" by – Jerry J Weygandt

Hum 155: Sociology

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

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:

1. Student will be able to identify the nature, scope and perspectives of sociology
2. Student will be able to distinguish between stages of social research and research methods.
3. Student will be able to define socialization and personality development through previous knowledge of perspectives of sociology
4. Student will be able to 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. Student will be able to 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:

Nature, scope and perspectives of sociology; stages of social research and research methods; culture and civilization; socialization and personality development; globalization; media and individual; social organization and social problem; social stratification; industrial revolution, capitalism and socialism; work and economic life; environment and human activities; climate change and global risk; population and human society; urbanization and city development; social change and technology.

Text and Ref Books:

1. "Sociology - Primary Principles" by - CN Shankar Rao
2. "Sociology – A Guide to Problems & Literature" by – Bottomore
3. "Sociology " by – Samuel Koening

Hum 165: Government

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Rationale:

The course will be helpful for developing critical thinking, communication, social and personal responsibility.

Course Objectives:

1. Critical thinking: gather, analyze, evaluate and synthesize information relevant to a question or issue.

2. Communication: develop, interpret and express ideas through effective written communication.
3. Social responsibility: demonstrate knowledge of civic responsibility.
4. Personal responsibility: demonstrate the ability to evaluate choices, actions and consequences as related to ethical decision-making.

Course Outcomes:

1. Students will be able to explain the origin and development of the Bangladesh Constitution and constitutional democracy.
2. Students will be able to describe the effects that historical, social, political, cultural, and global forces had on the Bangladesh Constitution.
3. Students will be able to describe the national issues and policies.
4. Students will be able to analyze political issues, demonstrate critical thinking skills, and develop a critical approach to the study of government.

Course Contents:

Introduction: Scope; fundamental concepts of government and politics; society, nation, nationalism; State: Origin of the state; Elements of state and concept of sovereignty; Functions of modern welfare state; Citizenship: methods, rights and duties of a good citizen; Forms of government: Classifications, Communism, Socialism; Capitalism, Welfare State, democracy and dictatorship, parliamentary and presidential, unitary and federal; Organs of government: legislature, executive, judiciary, bureaucracy and separation of powers; Political Process: Political Party and interest group; the electorate; public opinion, Good governance and E-governance; Constitution of Bangladesh: Characteristics, Major Amendments' and Government functionaries; National issues and policies: National issues and policies in the changing society of Bangladesh; emphasizing on Foreign, Development, Demographic, Industrial and Agricultural policies.

Text and Ref Books:

1. Local Government of Bangladesh – by Kamal Siddiqui
2. The Bangladesh Code
3. Governance – by Abdul Hasnat Hye

Hum 175: Moral Philosophy

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Rationale:

This course has mainly been designed to highlights ethics for engineers in different types of work roles and prepares the engineer for potential ethical dilemmas.

Course Objectives:

The course aims at providing basic knowledge of ethics for engineers in different types of work roles and prepares the engineer for potential ethical dilemmas in their future profession.

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Course Outcomes:

1. Student should be able to describe theories and tools in the field of ethics, both traditional moral philosophy and more modern theories, as well as the connections between ethics and other fields of knowledge.
2. Student should be able to identify ethical problems and dilemmas in technological and organizational contexts.

Course Contents:

Introduction to Moral Philosophy; Concept of Moral and Morality; Role of Ethics and Morality for Character Building, Morality of teaching and teaching of Morality; Theory of Motivation, Reward and Punishment; Nature and scope of Educational Philosophy; Theory of Intellect and Tn Intelligences; Values and Desire and Conflict of Desire; Ethics of Virtue and Ethics of Right Action.

Philosophy of Religion; Morality and immorality in the light of Religion; Faith and reason; Education and acquisition of knowledge in the light of religion; Characteristics of an Ideal man; Good deeds and Service of mankind; Justice and Righteousness; Human rights in Religion; Loyalty and discipline in light of Religion; Basic qualities of commander in the light of religion.

Text and Ref Books:

1. A Manual of Ethics by Dr Jadunath Sinha
2. Ethics by William K Frankena
3. Philosophy an Introduction to the art of Wondering by James L Cristian
4. Philosophy of Religion and Anthology by Louis P Pojman

Hum 186: Developing English Language Skills I

2.00 Contact Hour; 1.0 Credit Hours; Pre-requisite: None.

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 Outcomes:

By the end of this course, students are expected to be able to:

1. Communicate in wide range of situation;
2. Comprehend any kinds of speech efficiently that they listen to;
3. Improve their pronunciation;
4. Give formal presentation;
5. Respond in English to any expected and unexpected situations;
6. Produce effective speech in various interactions.

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. Materials provided by the instructor.

Course Contents:

Introducing yourself and others; using greetings, describing people/place/things; asking and answering questions, Expressing likings and disliking (food, fashion etc.); discussing everyday routines and habits, making requests/offers/invitations/excuses/apologies/complaints, asking and giving directions; describing personality, discussing and making plans (for a holiday or an outing to the cinema); reading newspapers and presenting their opinions; practicing storytelling, narrating personal experiences; introducing presentation skills, extempore talk, telephone conversations (role play in group or pair); practicing different professional conversation (role play of doctor-patient conversation, teacher –student conversation); problem solving, peer interviews/job interviews; summarizing movies/books and describing various aspects or parts of these (character description, conflict of the movie, resolution of the book); debate and put forward an argument; selected stories for presentation.

Hum 188: Developing English Language Skills II

2.00 Contact Hour; 1.0 Credit Hours; Pre-requisite: None.

Rationale:

This course is designed for the students to develop their competence in communication skills for academic purposes especially in reading and writing. The approach will be communicative and interactive and will involve individual, pair and group work. Students

will be exposed to different types of texts to develop efficient reading skill. Reading will also involve activities and discussions leading to effective writing. Students will write paragraphs and will also be trained to edit and revise their own as well as their peer's writing. The course incorporates a wide range of reading texts to develop students' critical thinking which is one of the most essential elements required to write a good piece of academic writing. Emphasis is particularly put on the various forms of essay writing such as descriptive, narrative, cause-effect, compare-contrast, and argumentative. Besides, students will be given input on communicative aspects of English writing as a way of preparing them to meet the demands of professional writing. A research paper is another requirement of the course that focuses mainly on academic research strategies e.g. applying the skills of summarizing and paraphrasing.

Course Objectives:

1. To give the students exposure to different types of texts in English in order to make them informed and critical reader.
2. To gain an understanding of the underlying writing well-organized paragraphs and also to teach how to edit and revise their own as well as peer's writing.
3. To teach grammar and vocabulary in a contextualized way.
4. To teach how to write formal letters for a range of academic purposes.
5. To develop skills to communicate effectively and professionally.

Course Outcomes:

1. Students will develop their reading skills through various reading techniques which will enable them to understand, analyze and evaluate reading texts.
2. By practicing writing different types of paragraphs, students are going to acquire a good command over structure and techniques of paragraph writing.
3. Vocabulary and grammatical structure from extensive reading will help to develop student's ability to express themselves through writing for academic and other purposes.
4. Students will acquire skills in summarizing, paraphrasing, synthesizing and explaining information from different sources.
5. Employ strategies of pre-writing, drafting, and revising, taking into consideration rhetorical purpose, the knowledge and needs of varied writing contexts, and the feedback of instructors and peers.
6. Demonstrate the knowledge of genre conventions and structure (e.g., introductions, paragraphing, transitions) in ways that serve the development and communication of information and ideas.
7. Edit such that choices in style, grammar, spelling, and punctuation contribute to the clear communication of information and ideas.
8. Reflect on what contributed to their writing process and evaluate their own and their peers' work.
9. Become an academic writer and critic of any text written in English.
10. Participate successfully in the discourse of the specific community and beyond.

Course Contents:

Reading: Reading techniques: scanning, skimming, predicting, inference, analysis, summarizing and interpretation of texts; Academic reading: comprehension from subject related passages, article reading, research paper reading, newspaper reading, reading selected short stories, Reading for book review, report review, case study review, Reading from departmental text for literature review.

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Writing: Introductory discussion on writing, prewriting, drafting, topic sentence, paragraph development, paragraph structure, describing a person/scene/picture, narrating an event, paragraph writing, Compare-contrast and cause- effect paragraph, Essay writing: writing steps, principles and techniques, outlining, revising, editing, proofreading etc., narrative and descriptive essays, comparison-contrast and cause – effect essays, argumentative essay, summary, paraphrase, E-mail, Report: purpose of a report, classification of report, organizing a report, writing short report, analysis and illustration of report, problems in writing reports, term paper writing: introduction to writing of a term paper and its methodologies.

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
3. Hand-out will be provided by the instructors.

Hum 217: Engineering Economics

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

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 analyse 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:

Microeconomics: Definition of economics; Resource allocation – Production Possibility Frontier (PPF): Market, Global Market and Government in a modern economy; Basic elements of demand and supply; Choice and utility; Indifference curve technique; Free market economy; Theory of production; Analysis of cost, Firms' Equilibrium, Short run long run cost curves.

Macroeconomics: Key concepts of macroeconomics; Saving, consumption, investment; National income analysis; Inflation, Unemployment, Cost benefit analysis, NPV, IRR, Payback period.

Development: Theories of developments, Banking system of Bangladesh, National Budget, Development partners (World Bank, Asian Development Bank, World Trade Organization, International Monetary Fund).

Text and Ref Books:

1. Economics by Samuelson
2. Economics by John Sloman
3. Economic Development by Michael Todaro

5.2. Courses Offered by Mathematics Department

Math 137: Differential and Integral Calculus

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

Purpose of this course is to improve basic knowledge of students in differential and integral calculus.

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 as applied in engineering contexts.

Course Outcomes:

1. Students will be able to apply the knowledge to define the limit, continuity and differentiability of functions.
2. Students will be able to apply the concept to evaluate indefinite and definite integrals
3. Students will be able to evaluate maxima and minima, radius of curvature, the length, area, volume

Course Contents:

Differential calculus: limit, continuity and differentiability; successive differentiation and Leibnitz's theorem; indeterminate forms; partial differentiation; Euler's theorem; tangent and normal; maxima and minima of functions of single variables.

Integral calculus: standard integrals; integration by the method of successive reduction; definite integrals; beta function; gamma function; multiple integrals; area, volume of solid revolution, area under a plain curve in Cartesian and polar coordinates, area of a region enclosed by two curves in Cartesian and polar coordinates.

Text and Ref Books:

1. "A Text Book on Differential Calculus" by — Mohammad & Bhattacharjee
2. "Integral Calculus" by — Das and Mukherjee

3. "Matrices and Linear Transformations" by — Mohammad Iman All
4. "Matrices" by - M..L. Khanna
5. "An Introduction to Matrices" by - S. C. Gupta
6. "Matrices" by - Frank Ayres, Jr. (Schaum Series)

Math 139: Differential Equations and Statistics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

Purpose of this course is to introduce basic knowledge to identify and solve ordinary and partial differential equations.

Course Outcomes:

1. Students will be able to apply the knowledge to identify and solve ordinary differential equations.
2. Students will be able to apply the knowledge to identify and solve partial differential equations
3. Students will be able to 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-efficients.

Statistics: measures of central tendency and standard deviation; moments, skewness and kurtosis; 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" by - M. D Raisinghania
2. "Integral Calculus and Differential Equations" by - Mohammad and Bhattacharjee
3. "Differential Equation" by - P N Chatterjee
4. "Differential Equation" by - M L Khanna
5. "Differential Equation" by – B D Sharma
6. "Mathematical Physics" by — H K Dass
7. "Differential Equation" by — Schaum's Series
8. "Mathematical Methods" by — Sharma & Gupta
9. "Statistics and Probability" by - Spiegel (Schaum Series)
10. Business Statistics" by - M. P. Gupta and S. P. Gupta
11. "Statistics and Probability in Modern Life" by - Joseph Newman
12. "Probability and its Applications" by - H. C. Saxena
13. "Elementary Statistics" by - H. C. Saxena

Math 237: Laplace Transform, Vector Analysis and Matrices

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

Purpose of this course is to develop basic knowledge of students in Laplace transform, vector analysis and different types of matrices and their properties.

Course Outcomes:

1. Students will be able to define Laplace transform, inverse Laplace transform, different types of matrices, and their properties.
2. Students will be able to explain differentiation and integration of vector valued functions in Cartesian, cylindrical and spherical geometry.
3. Students will be able to calculation of length, volume and area of objects related to engineering study by using vector
4. Students will be able to application of Laplace transform to ODE and PDEs and matrices to solve system of liner equations

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 (ODE and PDE) by Laplace transforms.

Vector analysis and Matrices: Introduction of vector analysis, scalars and vectors, equality of vectors; addition and subtraction of vectors; multiplication of vectors by scalars; position vector of a point; scalar and vector product of two vectors and their geometrical interpretation; triple products and multiple products of vectors; gradient, divergence and curl of point functions; line, surface and volume integrals; Green's theorem, Gauss's theorem, Stoke's theorem and their applications.

Definition of different kinds of matrices; inverse of matrix; rank and elementary transformation of matrices; solution of system of linear equations; linear dependence and independence of vectors; Eigen values and Eigen vectors; Cayley-Hamilton theorem.

Text and Ref Books:

1. "College Mathematical Methods" (Vol –II) by — Md. Abdur Rahman
2. "Mathematic Physics" by - B D Gupta
3. "Laplace Transforms" by — Murray R Spiegel (Schaum's Outline Series)
4. "Laplace and Fourier Transforms" by — M. D. Raishanghania.
5. "Complex Variables" by - M L Khanna
6. "Vector Analysis" by - Dr. Muhammad Abdus Sattar
7. "Vector Analysis" by - M. D. Raisinghania
8. "Vector Analysis with applications" by - Md Ali Ashraf and Md Abdul Khaleq Hazra
9. "Vector Analysis" by - Murray R Spiegel (Schaum Series)

5.3. Basic Science Courses Offered

Phy 101: Physical Optics, Waves and Oscillation, Heat and Thermodynamics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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 semester, as well as professionally.

Course Outcomes:

1. Students will be able to apply the knowledge of defining the different parameters such as periodic motion, simple harmonic motion, damped, undamped oscillations, interference, diffraction, polarization and prism, the different laws of thermodynamics.
2. Students will be able to apply the knowledge of explaining the wave motion for different systems along with energy, the techniques to derive different formula for interference, diffraction, polarization and prism, different theory regarding thermodynamics such as kinetic theory, entropy, Carnot engine etc.
3. Students will be able to solve problems regarding wave motion for different systems, problems regarding interference, diffraction, polarization and prism optical systems, analytical problems regarding thermodynamics related to engineering study

Course Contents:

Physical optics: theories of light; Young's double slit experiment, displacement of fringes and its uses, Fresnel bi-prism, interference at wedge shaped films, Newton's rings, interferometers; diffraction of light; Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and n-slits-diffraction grating; polarization; production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction, retardation plates, nicol prism, optical activity, polarimeters, polaroid.

Waves and oscillations: differential equation of a simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, Lissajous figures, spring-mass system, calculation of time period of torsional pendulum, damped oscillation, determination of damping co-efficient; forced oscillation, resonance, two-body oscillations, reduced mass, differential equation of a progressive wave, power and intensity of wave motion, stationary wave, group velocity and phase velocity, architectural acoustics, reverberation and Sabine's formula.

Heat and thermodynamics: principle of temperature measurements: platinum resistance thermometer, thermo-electric thermometer, pyrometer; kinetic theory of gases: Maxwell's distribution of molecular speeds, mean free path, equipartition of energy, Brownian motion, Vander Waal's equation of state, review of the first law of thermodynamics and its application, reversible and irreversible processes, second law of thermodynamics, Carnot cycle; efficiency of heat engines, Carnots theorem, entropy and disorder, thermodynamic functions, Maxwell relations, Clausius-Clapeyron equation, Gibbs phase rule, third law of thermodynamics.

Text and Ref Books:

1. Fundamentals of Physics" by - Haliday, Resnick and Walker
2. "Physics part-I by - Resnick and Halliday
3. "Physics part-II by - Resnick and Halliday
4. "A Text Book of Optics" by – Brijlal and Subramannyam
5. " Heat and Thermodynamics" by- Brijlal and Subramannyam
6. "A Text Book of Sound by - Brijlal and Subramannyam
7. "Waves and oscillation" by - Brijlal and Subramannyam

Phy 102: Physics Laboratory

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to explain the different phenomena regarding Waves and Oscillations, optics Mechanics, electricity and Heat
2. Students will be able to set up experiment, conducts experiment, collect data and manage time
3. Students will be able to produce lab report with proper appearance, format, grammar, introduction, objective and procedure. Ability to produce lab report with proper results, discussions and conclusion
4. Students will be able to 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 flywheel 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" by –Dr. Giasuddin
2. "Practical Physics" by –C.L Arora

Phy 105: Structure of Matter, Electricity and Magnetism and Modern Physics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

This course will be useful for developing basics in modern physics which will be helpful during project work in later semester, as well as professionally.

Course Outcomes:

1. Students will be able to define the different parameter such as crystal structure and crystal system, crystal defects, XRD, Coulomb's law, Gauss's law. Ampere's law, Faraday's law, photoelectric effect, Compton effect, matter wave, atomic model, radioactive decay, fusion and fission.
2. Students will be able to describe the crystal structure and crystal system of materials, crystal defects, Gauss's law, Ampere's law, Faraday's law, different theory regarding modern physics such as special theory of relativity and Compton theory
3. Students will be able to apply Bragg's law to evaluate crystal structure of materials, electric field, potential, resistance, capacitance, dielectric, current, inductance, magnetic field and estimating.
4. Students will be able to distinguish materials according to magnetic and electric properties of materials, nuclear transformation and nuclear reaction

Course Contents:

Structure of matter : crystalline and non-crystalline solids, single crystal and poly-crystal solids, unit cell, crystal systems, co-ordinations number, crystal planes and directions, NaCl and CsCl structure, packing factor, Miller indices, relation between inter-planar spacing and Miller indices, Bragg's law, methods of determination of inter-planar spacing from diffraction patterns; defects in solids: point defects, line defects, bonds in solids, inter-atomic distances, calculation of cohesive and bonding energy; introduction to band theory: distinction between metal, semiconductor and insulator.

Electricity and magnetism: Coulomb's law, electric field (E), Gauss's law and its application, electric potential (V), capacitors and capacitance, capacitors with dielectric, dielectric and atomic view, charging and discharging of a capacitor, Ohm's law, Kirchoff's law; magnetic field: magnetic induction, magnetic force on a current carrying conductor, torque on a current carrying loop, Hall effect, Faradays law of electromagnetic induction, Lenz's law, self-induction, mutual induction; magnetic properties of matter; hysteresis curve; electromagnetic oscillation: L-C oscillations and its analogy to simple harmonic motion.

Modern physics: Michelson-Morley's experiment, Galilean transformation, special theory of relativity and its consequences; quantum theory of radiation; photo-electric effect, Compton effect, wave particle duality, interpretation of Bohr's postulates, radioactive disintegration, properties of nucleus, nuclear reactions, fission, fusion, chain reaction, nuclear reactor.

Chem 103: Chemistry I

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

The purpose of this course will be to develop basic knowledge on introductory chemistry which will be useful in various civil engineering courses later on.

Course Outcomes:

1. Students will be able to define the different parameter and concepts regarding atomic structure, periodic table, chemical bonding, acids and bases.
2. Students will be able to define the different types of solutions.
3. Students will be able to apply different theory on chemical bonding and hybridization to evaluate structure of molecules.
4. Students will be able to classify and explain water pollution and chemistry of halogen, alkali metals, alkaline earth metals, non-metals and heavy metals.
5. Students will be able to explain chemical equilibrium, thermo-chemistry, chemical and ionic equilibria, electrochemical cells.
6. Students will be able to 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" by - M Mahbubul Haque
2. "A textbook of Engineering Chemistry" by – S.S. Dora
3. "Snatok Ajaibo Rosaion" by – Sayen Ahmed and Latif Hossain

Chem 105: Chemistry II

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

This course is the continuation of the previous chemistry course which will be useful in various civil engineering courses later on.

Course Outcomes:

1. Students will be able to apply the concept of rate of chemical reactions to determine the rate, order and molecularity of reactions.

2. Students will be able to identify different types of rate expressions, effect of temperature on reaction rate and energy of activation.
3. Students will be able to describe mechanism of chemical corrosion on metals and alloys in dry and wet environments.
4. Students will be able to identify atmospheric and soil corrosion including the preventive measures.
5. Students will be able to apply the concept of analytical techniques used in determination of pollutants to compute DO, BOD and COD
6. Students will be able to recognize the importance of environment and its characteristics, chemistry of metal and nonmetal pollutants.
7. Students will be able to describe the chemistry involved in water treatment plants and quality of industrial waste

Course Contents:

Reaction kinetics: rate of chemical reactions; order and molecularity of reactions, different types of rate expressions, methods of determining rate and order, effect of temperature on reaction rate and energy of activation.

Chemical corrosion: introduction to chemical corrosion, corrosion of metals and alloys in dry and wet environments, mechanism of corrosion, atmospheric and soil corrosion and their preventive measures.

Aquatic Chemistry: Water pollution, Importance of aquatic chemistry, Aquatic Ecosystem, environment and its characteristics, chemistry of metal and nonmetal pollutants, analytical techniques used in determination of pollutants, concepts of DO, BOD, COD and threshold odor number, chemistry involved in water treatment plants, quality of industrial waste water.

Polymers: chemistry of polymerization, different types of polymers and their properties, polymer degradation, elastomers and composite materials.

Text and Ref Books:

1. General Chemistry – by Ebbing, D.D. AITBS Publishers & Distributors, Delhi.
2. Chemistry and Chemical Reactivity, J.C. Kotz and Paul Treichel, (Sanders)

Chem 114: Inorganic Quantitative Analysis

1.50 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

The purpose of this course will be to develop basic knowledge on inorganic chemistry which will be useful in various civil engineering courses later on.

Course Outcomes:

1. Students will be able to 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. Students will be able to explain the different phenomena regarding iodimetric and iodometric method, complexometric titration etc.

3. Students will be able to estimate zinc, ferrous content in water sample by using various titrimetric methods.
4. Students will be able to summarize a report of any project work and apply in real life.
5. Students will be able to produce lab report with proper appearance, format, grammar, introduction, objective and procedure. Ability to produce lab report with proper results, discussions and conclusion
6. Students will be able to function as an effective team player with the capability to lead in the group project

Course Contents:

Volumetric analysis: acidimetry-alkalimetry; titrations involving redox reactions, determination of Cu, Fe and Ca volumetrically; determination of Ca and Mg in water.

EECE 165: Basic Electrical Technology

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

The purpose of this course will 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:

1. Students will be able to identify the electrical units and standards.
2. Students will be able to identify the measuring instruments like ammeters, voltmeters, watt meters and multi-meter.
3. Students will be able to apply the knowledge of series, parallel, node and mesh current analysis to measure current, voltage and resistance in electrical networks and circuits.
4. Students will be able to apply the concept of AC circuit analysis to find instantaneous current, voltage and power, effective current, voltage and average power.
5. Students will be able to recognize the electrical wiring for residential and commercial loads.
6. Students will be able to 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. Core and Specialized Courses Offered

CE 100: Civil Engineering Drawing

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Rationale:

It will be useful for designing and drawing schematics for simple blocks, orthographic and isometric representations, dimensioning, etc., which 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 drawing.

Course Outcomes:

1. Students will be able to learn basic concepts like how to project a point, line, solid objects in a plane and different types of projection etc.
2. Students will have the ability to analyze a drawing provided by a professional engineer.

Course Contents:

Lines and lettering; plane geometry: drawing of linear and curved geometric figures, e.g. pentagon, hexagon, octagon, ellipse, parabola, hyperbola; 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; plan, elevations and sections of one storied buildings and bridges.

Text and Ref Books:

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

CE 101: Analytic Mechanics

4.00 Contact Hour; 4.00 Credit Hours; Pre-requisite: None.

Rationale:

Purpose of this course is to provide the students with the basic knowledge in the 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:

1. Students should be able to apply equations of equilibrium to analyze statically determinate rigid bodies (with and without friction).
2. Apply equations to determine the forces in different types of Frames and Trusses.
3. Students will be able to the Friction forces that are developed between rough/non-smooth bodies.
4. Students will be able 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; internal forces and friction; flexible chords; centroids of lines, areas and volumes; moments of inertia of areas and masses; plane motion; impulse and momentum; principles of work and energy.

Text and Ref Books:

1. "Analytic Mechanics" by – Faires & Chambers (3rd Edition)

2. "Engineering Mechanics" by – 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

CE 102: Computer Aided Drawing

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Rationale:

It will be useful for designing and drawing of basic civil engineering components using AutoCAD which will be helpful during project work in later semesters, as well as professionally.

Course Objectives:

1. To know about basics engineering drawing formats
2. To gain knowledge about the basic functions of AutoCAD efficiently
3. To take data and transform it into graphic drawings

Course Outcomes:

1. Students will be able to draw orthographic projections and sections.
2. Students will be able to familiarize themselves with two dimensional CAD drawings.
3. Students will be able to draw and interpret detail architectural and structural drawing of residential building.

Course Contents:

Introduction to computer usage; introduction to CAD packages and computer aided drafting: drawing editing and dimensioning of simple objects; isometric view and orthographic view of 3D object; plan, elevations and sections of multi-storied buildings; reinforcement details of beams, slabs, stairs etc; plan and section of septic tank; plans, elevations and sections of culverts, bridges and other hydraulic structures; drawings of building services.

CE 103: Surveying and Spatial Information Engineering

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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. Technical Adeptness - Graduates will be technically adept in Surveying Technology as well as supporting math and science disciplines, allowing these graduates to assist professional land surveyors in various surveying and mapping projects. Their

technical skills and knowledge will enable them to perform their work duties with a commitment to quality, timeliness, and continuous improvement.
2. Interpersonal Skills - Graduates will exhibit appropriate interpersonal skills as demonstrated by effectively working on teams and effectively communicating in the workplace.
3. Professionalism - Graduates will exhibit an interest in lifelong learning.
4. Awareness of Societal Impact - Graduates will be aware of their professional and ethical responsibilities, including a respect for diversity.

Course Outcomes:

1. Apply the knowledge, techniques, skills, and modern tools of surveying technology to narrowly defined surveying technology activities.
2. Apply a knowledge of mathematics, science, engineering, and technology to surveying technology problems that require limited application of principles but extensive practical knowledge.
3. Conduct standard tests and measurements, and conduct, analyze, and interpret experiments.
4. Function effectively as a member of a technical team.
5. Identify, analyze, and solve narrowly defined surveying technology problems.
6. Develop an ability to apply written, oral, and graphical communication in both technical and non-technical environments, as well as an ability to identify and use appropriate technical literature.
7. Understand the need for and engage in self-directed, continuing professional development.
8. Demonstrate an understanding of and a commitment to professional and ethical responsibilities, including a respect for diversity.
9. Exhibit a commitment to quality, timeliness, and continuous improvement.

Course Contents:

Introduction to surveying, orientation with survey equipment and instruments, reconnaissance survey/project survey, Linear measurements, Traverse survey, Triangulation, Leveling, Contouring, Calculation of area and volumes, Curve and curve ranging: transition curves, super-elevation and vertical curves, Principles and problems of tachometry.

Introduction to remote sensing, use and application of remote sensing, Introduction to photogrammetric survey, Acoustic measurements and investigations, hydrographic operations.

Text and Ref Books:

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

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CE 104: Practical Surveying

4 weeks; 1.50 Credit Hours; Pre-requisite: None.

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 (CE-103) into practical fields
3. To train the students to plan and execute survey work for any engineering project

Course Outcomes:

1. Students will be able to perform survey with instruments including chain, plane table, level, theodolite, total station aided by RTK GPS
2. Students will be able to present the survey data in a standard way
3. Students will be able 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.

Text and Ref Books:

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

Shop 132: Workshop Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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 Objectives:

1. Students will be able to recognize wood working tools, common bench tools, hand tools and machine tools.
2. Students will be able to identify the machines used in welding and machine shops and label them with their functions.
3. Students will be able to demonstrate a job with proper planning and estimating.

4. Students will be able to 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 planner, 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 polarity: 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, aluminum; 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 equipments; Gases and types of flame; welding of different types of materials; Gas welding defects; test of gas welding.

CE 200: Details of Constructions

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to acquire knowledge on components of a building, design loads, framed structure and load bearing wall structure.
2. Students will be able to understand practical difficulties faced in fields.

3. Students will be able 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, standard penetration test; 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, pointing, painting; distempering and white washing; cement concrete construction; sound insulation: acoustics; thermal insulation; house plumbing: water supply and wastewater drainage; thunder arrestor.

Text and Ref Books:

1. "Concrete and Formwork" by by T W Love
2. "Building Construction" by – W.B. McKay (Vol. 1)
3. "BDA Guide to Successful Brickwork" by the Brick Development Association.
4. "Concrete Construction", by Ken Nolan
5. "Building Construction" by – Sushil Kumar
6. "Formwork for Concrete" by 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" by Peter Hemp
9. 9. "Building Construction" by – Dr. B.C. Punmia
10. 10. "Building Construction Engineering" by – Gurcharan Singh
11. 11. "Construction Drawings and Details for Interiors: Basic Skills, 2nd Edition" by Rosemary Kilmer and W. Otie Kilmer
12. 12. "Sound Insulation" by Carl Hopkins
13. 13. "Popular Mechanics Complete Home How-to" by Albert Jackson, David Day
14. 14. PWD manual on house construction and plumbing

CE 201: Engineering Materials

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to analyze the suitability of engineering materials for different types of construction works.
2. Students will be able to select appropriate construction materials for different types of structures.

Course Contents:

Properties and uses of aggregates, brick, cement; sand, mortars; concrete; concrete mix design; admixtures; wood structures and properties; shrinkage and seasoning; treatment and durability; mechanical properties; wood products; basic property of FRP composites and available FRP composite products; steel; aluminum; introduction to geo-textiles; definition of stress and strain; plane stress and strain condition; identification of strain components of elastic, elasto-plastic and elasto-visco-plastic materials; time dependent strain response of these materials due to different types of loadings; mathematical and simple rheological modeling for prediction of creep behavior; ferro-cement: advantages and uses; corrosion and prevention of steel in RC structures; offshore structures; application of nano technology in cement and concrete; introduction to high performance material (ie., green building materials, ECC etc).

Text and Ref Books:

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

CE 203: Engineering Geology and Geomorphology

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to understand the typical formations and mineralogical compositions of soils and rocks.
2. Students will be able to learn the seismicity measurement scales and map of Bangladesh.

3. Students will be able to learn the general trends in geomorphological formations and its importance in riverine areas of Bangladesh.

Course Contents:

Geology and Civil Engineering; Formation of Earth Mass; Minerals and Rocks; Surface Processes

Igneous Rocks, Sedimentary Rocks & Metamorphic Rocks; Distribution of Rocks at and below the Surface; Geological Structures; Faults, Folds, Domes; Strikes and Dips

Geological Maps and Sections; Interpretation of Geological Maps; Weathering and Soils; Flood Plains and Alluvium; Glacial Deposits; Erosional Processes and Channel Formation

Landforms of Bangladesh; Plate Tectonics, Earthquake and Seismic Map of Bangladesh.

Text and Ref Books:

1. Geology for Civil Engineers: A.C. McLean & C.D. Gribble
2. Foundations of Engineering Geology: Tony Waltham

CE 204: Computer Programming Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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 to

1. Write clear, elementary C++ programs
2. Understand algorithmic thinking, problem-solving techniques and apply it to programming
3. Code with C++ arithmetic, increment, decrement, assignment, relational, equality and logical operators
4. 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 engineering.

Text and Ref Books:

1. "Teach Yourself C" by – Herbert Schildt
2. "Programming With C" by – Schaum's Outline Series

CE 205: Numerical Methods for Engineering

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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:

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

Course Contents:

Fundamental of numerical computing (e.g. numerical model, convergence, accuracy and stability) and error estimation; system of liner equations (Cramer's rule, Gaussian Elimination, LU factorization, Error analysis for liner systems, Iterative methods- Jacobi Method, Gauss-Seidel iteration, convergence of Iterative methods; Eigen Value Problems); Solving non-liner equations (root findings - Bi-section method, Newton-Raphson Method, Method of False Position); Interpolations (Polynomial interpolation, Piecewise/cubic spline interpolation Lagrange interpolation, and Chebyshev interpolation); Numerical differentiation and Integration (trapezoid, Romberg, Gauss, adaptive quadrature); Numerical solution of Ordinary Differential Equation (Initial Value Problem: Euler Method, Modified Euler Method, Range-Kutta Method); Numerical solution of Ordinary Differential Equation (Boundary Value Problem: Finite difference method and Shooting method, convergence and stability); Least square approximation (parameter estimation and curve fitting); Optimization Method; Numerical solution of Partial Differential Equations.

Text and Ref Books:

1. "Numerical Mathematical Analysis" by – James b. Scarborough
2. "Introductory Methods of Numerical Analysis" by – S.S. Sastry
3. "Numerical Methods For Scientific And Engineering Computation" by- Jain, Iyengar, Jain
4. "Numerical Methods using Matlab (4th Edi.) by John H Mathews and Kurtis K Fink

5. Fundamentals of Engineering Numerical Analysis by Parviz Moin (2010)

CE 206: Engineering Computations Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to perform numerical analysis of engineering problems.
2. Students will be able 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.

CE 207: Applied Mathematics for Engineers

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

In this course students will be introduced to various methods to solve various civil engineering problems dealing with probability and statistics. Students will also be able to evaluate uncertainty in civil 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 civil 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 civil engineering problems dealing with probability and statistics.
2. Develop and run simple probabilistic models to evaluate uncertainty in civil 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. 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 model selection; uncertainty and reliability analysis; project level decision making and quality control.

Text and Ref Books:

1. "Introduction to Probability and Statistics for Engineers and Scientists" – By Sheldon M. Ross

CE 208: Quantity Surveying

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Rationale:

This course is a hand on training for estimating quantity and cost for different components of various civil engineering infrastructures which will be helpful for the students in their professional field later on.

Course Objectives:

To gain knowledge on the basics of estimation of different types of structures.

Course Outcomes:

1. Students will be able to estimate the total quantity require for roadway excavation.
2. Students will be able to estimate the total cost required for residential building by calculating total volume require for every component of building including footing, column, beam, slab, wall.

Course Contents:

Earthwork excavation for roadway, earthwork computation from; estimation for residential building: estimation of slab, beam, column, footing; analysis of rates, specifications, costing of residential building; estimation and costing of septic tank; estimation and costing of underground water reservoir; estimation and costing of retaining wall; estimation and costing of slab culvert; computer aided quantity estimation; construction site survey and estimation.

Text and Ref Books:

1. "Estimating" by – Abul Faraz Khan
2. "Quantity Surveying: A Practical Guide for the Contractor's QS" by Donald Towey.
3. "Estimating & Costing in Civil Engineering" by – Dutta

CE 209: Professional Practices and Communication

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

This is a professional field oriented 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 contact 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:

1. Students will be able to ascertain the essential elements required at different phases of a project.
2. Students will be able to write engineering and business reports.
3. Students will learn code of ethics for engineers and will be able to take an ethical decision after critical analysis of the situation.
4. Students will be able to make procurement of goods, works and services according to PPR 2008
5. Students will be able to communicate effectively
6. Students will be able to formulate DPP

Course Contents:

Project: characteristic feature, types and life cycle; type of contracts and estimates; Project Proposal (DPP, TAPP), procurement regulations and law; documents for procurement of works, goods, services and their application; tender procedure with the light of PPR; specification and contract document preparation in the light of PPR, claims, disputes and arbitration procedure,

Communication: concepts, methods and strategies for effective speaking and inter-personal communication; business and engineering reports, proposals and messages; conducting meetings and writing minutes of the meeting, code of ethics for engineers; MOI (Method of Instruction).

Text and Ref Books:

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

CE 210: GIS and Remote Sensing

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Rationale:

This is a hand on training course for GIS and remote sensing. In this course students will be introduce to basic functions and analysis of GIS. Students will be also practice using GIST software for conducting spatial analysis.

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

Course Outcomes:

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

Course Contents:

GIS: basic concepts, location & spatial data, GIS data source (vector & raster data), use and application of GIS, features of Arc GIS, natural resource management by GIS, GIS in flood management, GIS in project management, GIS in urban planning and other civil engineering aspects;

Introduction, use and applications of Arc GIS, Google Earth Hands-on exercises using Arc GIS software, Google Earth and related software.

Text and Ref Books:

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

CE 211: Mechanics of Solids I

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: CE 101.

Rationale:

This is a basic mechanics course for civil engineering students. 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:

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

Course Contents:

Concepts of stress and strain, generalized Hooke's law; Constitutive relationships; Plane stress & strain, stresses and deformation, resisting force, axial and transverse load; 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; flexural and shear stresses in beams; shear Centre; Skew bending.

Text and Ref Books:

1. "Engineering Mechanics of Solids" by - Popov
2. "Theory and Problems of Strength of Materials" by -William A Nash
3. "Strength of Materials" by – Andrew Pytel, Ferdinand L. Singer (4th Edition)

CE 212: Structural Mechanics and Materials Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to perform analysis and design of reinforced concrete members and connections.
2. Students will be able to identify and interpret the appropriate relevant industry design codes.

Course Contents:

Normal consistency, initial setting time, and fineness test of cement, compressive strengths of cement mortar; gradation, specific gravity, absorption capacity and unit weight of fine and coarse aggregates; design and testing of a concrete mix and testing of bricks for compressive strength.

Tension, direct shear and impact tests of mild steel specimen; slender column test; static bending test; hardness test of metals; helical spring test.

Text and Ref Books:

1. "Engineering Mechanics of Solids" by – Popov
2. "Theory and Problems of Strength of Materials" by -William A Nash
3. Laboratory Manual
4. Bear and Johnson

CE 213: Mechanics of Solids II

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: CE 211.

Rationale:

This is a continuation of CE 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:

By the end of this course students should be able

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. Understand the concept of strain energy for axial stress, flexural stress and shear stress.
8. 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:

Stress transformation, Mohr's circle of stresses. Beam deflection by direct integration method, moment area method; virtual work method, Elastic strain energy and external work, Buckling of columns; Concept of Euler's buckling of columns, Elastic analysis of circular shafts, solid non-circular and thin walled tubular members subjected to torsion, Cable and cable supported structures, cable theorem; closely coiled helical springs.

Text and Ref Books:

1. Engineering Mechanics of Solids" by – Popov
2. Advanced Strength and Applied Elasticity, 5th Edition, by A C Ugural and S K Fenster
3. "Theory and Problems of Strength of Materials" by -William A Nash
4. "Strength of Materials" by – Andrew Pytel, Ferdinand L. Singer (4th Edition)
5. "Mechanics of Materials" by – Laurson & Cox
6. "Strength of Materials" by – R.S. Khurmi

CE 214: Architechtural, Engineering and Planning Appreciation

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

This is a hand on training course for civil engineers where students will gain perspective of basic design and functional flow of structures from the point of view architectural and planning consideration.

Course Objectives:

1. To understand Architecture and its relation to Civil Engineering
2. To understand the Basic Design and Functional Flow
3. To perceive the spaces and forms in Architecture
4. To realize the relation between Architecture & Urban Planning

Course Outcomes:

1. Students will be able to analyze the preliminary design elements and appreciate the qualities of a basic design
2. Students will be able to read the architectural design

3. Students will be able to design a very limited and small scale projects.

Course Contents:

Basic Design, Understanding Architecture and its relation to Civil Engineering, Plan arrangement with special consideration in functional flow, lighting, ventilation and climatic aspects, Spaces & Forms in Architecture & Urban Design, Spatial Structures of Cities; Study with relevant examples from Composition, Architecture and Urban Planning, Evolution of Architecture (Old to modern age).

CE 261: Fluid Mechanics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

This is a basic fluid mechanics course for civil engineering students. 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:

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, branching pipes, pipe networks.

Text and Ref Books:

1. "Fluid Mechanics with Engineering Application" by – Franzini
2. "Fluid Mechanics" by – Streeter & Wylie
3. "Fluid Mechanics" by – Frank M.White

CE 262: Fluid Mechanics Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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:

By the end of this course students should be able to understand the basic principles and analysis of 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" by – Franzini
2. "Fluid Mechanics" by – Streeter & Wylie
3. Laboratory Manual

CE 301: Project Planning & Construction Management

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to lead an engineering project.

2. Students will be able to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety
3. Students will be able to function on multidisciplinary teams.

Course Contents:

Project planning and evaluation; feasibility reports; cash flows, pay back period, internal rate of return; benefit-cost ratio; cost-benefit analysis case studies;

Planning and scheduling, PERT, CPM; resource scheduling; MS Project, linear programming and application.

Principles of management; construction management: principles, project organization, methods and practices, technology, management of materials and equipment, site management, contracts and specifications, inspection and quality control, safety, economy.

Conflict management; psychology in administration: human factors in management; human resource management. Supply chain management.

Demand forecasting; inventory control; stores management; procurement; legal issues in construction; environmental regulations. Construction safety.

Text and Ref Books:

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

CE 311: Structural Analysis and Design I

4.00 Contact Hour; 4.00 Credit Hours; Pre-requisite: CE 211 & CE 213.

Rationale:

It is the first course on structural analysis. 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:

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:

Stability and determinacy of structures; Analysis of statically determinate frames, trusses and arches; Influence lines;

Moving loads on beams, frames and trusses; Wind and earthquake loads, code provisions. Approximate analysis of statically indeterminate structures: Mill bents, braced trusses; Portal method, cantilever method and vertical load analysis of multi storied building frames; building drift, Deflection of trusses and frames by virtual work method; Approximate analysis of suspension bridges.

Text and Ref Books:

1. "Theory of Simple Structures" by – T.C. Shedd and J.Vawter (2nd Edition)
2. "Elementary Structural Analysis" by – 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)

CE 315: Design of Concrete Structures I

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to understand basic performance of concrete and steel as structural material in reinforced concrete structure.
2. Students will be able to design component of building structures safely, economically and efficiently.
3. Students will be able to understand practical design consideration using different safety provisions.

Course Contents:

Fundamental behavior of reinforced concrete and loads on structure; 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 of reinforcement and its detailing. Design of one way slabs; Design of two-way edge supported slabs: using strip and alternate methods. Introduction to floor systems; structural forms;

Text and Ref Books:

1. Reinforced Concrete: Mechanics and Design (6th Edi) by James Wight and James MacGregor
2. "Design of Concrete Structures" by – Nilson (12th Edition)
3. "Design of Concrete Structures" by – Nilson, David & Dolan (14th Edition)

CE 316: Concrete Structures Design Sessional I

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to design a reinforced concrete low rise building
2. Students will be able to design slab bridge and balanced cantilever bridge in real time project.
3. Students will be able to analyze the behavior of RCC beam

Course Contents:

Design and detailing of a low-rise masonry building. Design and detailing of a slab bridge. Design and detailing of a balanced cantilever bridge.

Text and Ref Books:

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

CE 317: Design of Concrete Structures II

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

It is the second design course for reinforced concrete structures after CE 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:

1. Students will be able to understand basic performance of concrete and steel as structural material in reinforced concrete structure.
2. Students will be able to design component of building structures safely, economically and efficiently.
3. Students will be able to understand practical design consideration using different safety provisions.

Course Contents:

Design of columns under uniaxial and biaxial loading, introduction to slender column; structural design of footings, pile caps; retaining wall, seismic detailing; shear wall subjected to axial load and flexure; Design of column supported slabs; Prestressed Concrete: concepts of prestressing; materials; anchorage systems; analysis and preliminary design of prestressed beam.

Text and Ref Books:

1. "Design of Concrete Structures" by – Nilson (12th Edition)
2. "Design of Concrete Structures" by – Nilson, David & Dolan (15th Edition)
3. Reinforced Concrete: Mechanics and Design (6th Edi) by James Wight and James MacGregor
4. "Fundamentals of Reinforced Concrete" by – Ferguson & Philip
5. Bangladesh National Building Code (BNBC)'2012
6. "Design of Prestressed Concrete Structure" by – T.Y. Lin, Ned H. Burns (3rd Edition)
7. Prestressed Concrete Structures by Michael P Collins

CE 319: Design of Steel Structures

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

It is the design course for steel structures, especially designing of tension and compression members, bolt and weld connections. In this course students will also be introduced with the

concept of buckling, flexural and shear strength, non-sway frame, etc which will be useful in the various projects in the later semesters.

Course Objectives:

Prepare students to analyze and design of steel system and components (including connection) according to ANSI/AISC 360-05 code using loads from ASCE 7-10 standard and material codes such as AISC Steel Construction Manual (13th Edition)

1. To develop a deep understanding of behavioural principles of structural steel
2. To gain familiarity with limit state design philosophy
3. Determine critical loading patterns for design
4. Design steel components to resist applied loads and satisfy performance objectives
5. To gain detailed knowledge pertaining to the requirements of American Institute of Steel Construction (ANSI/AISC) Standards 360-05.

Course Outcomes:

1. Students will be able to apply knowledge of engineering mechanics and strength of materials
2. Students will be able to solve regular and irregular steel structural components
3. Students will be able to design a steel structural system and components (including connection) to meet desired needs
4. Students will be able to produce steel structural drawings with proper detailing for construction
5. Students will be able to write a technical report through term-project

Course Contents:

Behavioral principles and design of structural steel; design of tension members, residual stress. bolted and welded connections; compression members; local buckling, effective length; flexural members; lateral torsional buckling, flexure and shear strength, point loads on beam, design for deflection. Introduction to beam-columns; non-sway frames. Connection design: simple connection, moment connection, column bases; Introduction floor systems for steel buildings.

Text and Ref Books:

1. Steel Structures: Design and Behavior by Salmon, Johnson and Malhas (5th Edi)
2. "Design of Steel Structures" by – Gaylord, Gaylord
3. Limit States Design in Structural Steel by G L Kulak and G Y Grondin
4. AISC Manuals for Steel Constructions (13th Edition-2005)

CE 320: Steel Structures Design Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Rationale:

This is the class room design sessional where students will be guided to design and detail of different components, such as tension member, compression member, connections, column base, of a low rise steel structure as well as a roof truss.

Course Objectives:

1. To provide the students the tools necessary for designing steel structures.
2. To familiarize the students with international design codes.
3. To provide an understanding of Load from Allowable Stress Design (ASD).

Course Outcomes:

1. The students will be able to understand design process.
2. The students will understand the sizing of structural steel members.
3. The students will be able to design a realistic steel structure.

Course Contents:

Analysis and design of low rise moment frame building for gravity and wind loads; design of members, connections and columns bases; roof truss.

Text and Ref Books:

1. Steel Structures: Design and Behavior by Salmon, Johnson and Malhas (5th Edi)
2. Limit States Design in Structural Steel by G L Kulak and G Y Grondin
3. AASHTO LRFD Bridge: Design Specifications 2012

CE 331: Environmental Engineering I

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

This is the introductory course on environmental engineering where 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:

1. Students will be skilled enough to predict the fresh water demand and provide required water supply in urban as well as rural areas.
2. Students will be able to design and construct advanced surface/ground water treatment plant, groundwater well and water supply pump.
3. Students will be able to design and construct water distribution networks.
4. Students will be capable enough to compute the water loss and solve the unaccounted water issue

Course Contents:

Introduction to Environmental Engineering: water, sanitation, ecology and environment; climate change; biodiversity; contemporary environmental issues.

Water Supply Engineering: Water requirement in urban (water demand, population prediction, water demand for street fire hydrant and interior fire protection) and rural communities; the hydrologic cycle and water availability; water supply sources; ground water exploration: aquifer properties and ground water flow, well hydraulics, water well design, drilling, construction and maintenance; shallow hand tubewells, deep tubewells, deep set pumps, pond sand filter, rain water harvesting system and alternative water supplies for problem areas.

Surface water collection and transportation; pumps and pumping machineries; water distribution systems; fire hydrants; water meters; water loss control (auditing, unaccounted for water, leak detection and water conservation).

Water quality requirements; water treatment: plain sedimentation, coagulation, flocculation, filtration, disinfection; miscellaneous treatment methods; low cost treatment methods (arsenic/iron removal plants etc.) for rural communities; water safety plans.

Text and Ref Books:

1. "A Textbook of Water Supply Engineering" by – M.A. Aziz
2. "Environmental Engineering" by – Peavy, Rowe & Tchobanoglous
3. "Water Supply and Sanitation" by – Ahmed and Rahman

CE 332: Environmental Engineering Laboratory

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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 chlorination, alum coagulation, sampling and laboratory analysis of air, sampling and laboratory analysis of soil and solid waste.

Text and Ref Books:

1. "A Textbook of Water Supply Engineering" by – M.A. Aziz
2. "Water Supply and Sanitation" by – Ahmed and Rahman
3. Laboratory Manual

CE 333: Environmental Engineering II

4.00 Contact Hour; 4.00 Credit Hours; Pre-requisite: None.

Rationale:

This is the second course on environmental engineering where students will be presented with basic knowledge on waste water technology and sanitation, design and construction of treatment plant and sanitation system. Students will also learn about the environmental impact assessment. 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:

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

Course Contents:

Wastewater Engineering: introduction; estimation of wastewater; wastewater collection systems; hydraulics of sewer; design, construction and maintenance of sanitary sewer and storm drainage system; sewer appurtenances; plumbing system.

Microbiology of wastewater; wastewater characteristics; wastewater treatment and disposal; treatment and disposal of industrial effluents; sludge treatment and disposal; economical sanitation technologies / system for urban and rural communities (conventional system, pit

latrine, pour-flush latrine, small bore sewerage system, septic tank system and ecological sanitation).

Sustainability of water and sanitation services; participatory development approach in water and sanitation sector; community management of water and sanitation services.

Environmental impact assessment: risk analysis in environmental assessment; socioeconomic impact assessment; introduction to environmental pollution (water pollution, air pollution, noise pollution). Introduction of EIA. Sustainable Development Goals in Water supply and Sanitation, Clean Development Mechanisms.

Text and Ref Books:

1. "Environmental Engineering" by – Peavy, Rowe & Tchobanoglous
2. "Water Supply and Sanitation" by – Ahmed and Rahman
3. "Wastewater Engineering" by – Metcalf & Eddy (4th Edition)
4. "Water supply & Sewerage" by - McGhee

CE 341: Principles of Soil Mechanics

4.00 Contact Hour; 4.00 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to 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. Students will be able to apply the consolidation and stress distribution theory to predict the consolidation behavior in presence of clay layer beneath the foundations.
3. Students will be able to 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:

Geotechnical Engineering & Soil Mechanics; Formation, Type and Identification of Soils; Soil Structure and Fabric; Weight-Volume Relationships; Index Properties of Soil; Engineering Classifications of Soil; Soil Compaction; Total and Effective Stresses within Soil Mass due to Overburden; Stresses within the Soil Mass due to External Loading;

Permeability and Seepage; Stress-Strain-Strength Characteristics of Soil; Compressibility and Settlement of Soil; Lateral Earth Pressure; Use of Software in Soil Mechanics.

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

CE 342: Geotechnical Engineering Sessional I

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Rationale:

In this geotechnical engineering laboratory 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:

1. Students will be able to analyze the soil for different types of foundation and will also be able to perform the bearing capacity and settlement calculation of soil.
2. Students will be able to design and construct footings, rafts and piles in clay.
3. Students will be able to design and construct footings, rafts and piles in sand.

Course Contents:

Field Identification of Soil; Test for Specific Gravity of Soil Particles; Grain Size Analyses of Soil by Sieve and Hydrometer; Atterberg's Limits Tests; Compaction Test; Maximum and Minimum Densities of Sandy Soils; Field Density Test of Soil; Permeability Test of Soil by Constant and Falling Head Methods; Unconfined Compression Test; Direct Shear Test; Computation of Triaxial Test Data Consolidation Test.

Text and Ref Books:

1. Geotechnical Engineering Laboratory Handout: MIST
2. Soil Mechanics Laboratory Manual – B.M. Das
3. ASTM Standards for Geotechnical Engineering

CE 351: Fundamentals of Transportation Engineering

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

Rationale:

This is the fundamental course on transportation engineering where 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:

1. Students will be able to explore the problems related to different geometric features of the highways including finding solutions to common challenges encountered.
2. Students will be able to forecast travel demands using contemporary methods for effective transportation planning.
3. Students will be able to 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. Students will be able to investigate road traffic accident.
5. Students will have clear idea about different tools and functioning of ITS. They will also know the procedures for conducting TIA.

Course Contents:

Transportation engineering, transportation functions; transportation systems, functional components, factors in transportation development, transportation modes, public transportation, emerging modes; transport planning: concepts, scope and hierarchy, process, goals and objectives, inventories, socio-economic activities, land use-transport interaction, travel demand forecasting; transportation in Bangladesh: transportation modes and networks, constraints and challenges, transport demand and modal share, road classification and design standards.

Geometric design of highways: design controls and criteria, cross sectional elements, alignment, sight distance, intersection and interchange layouts, planning and design of bicycle and pedestrian facilities; Introduction to road safety issues.

Traffic engineering: fundamentals of traffic engineering, vehicle and traffic characteristics, traffic control devices and systems, traffic studies, planning and design of parking facilities, roadway lighting; Introduction to Intelligent Transportation System (ITS); Fundamentals of transport economics.

Text and Ref Books:

1. "Highway Engineering" by – Paul H. Wright (6th Edition)
2. "Transportation Engineering and Transport Planning" by – L.R. Kadiyali
3. "Transportation Planning and Traffic Engineering" by – O'Flaherty

CE 361: Open Channel Hydraulics

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to analyze open channel flows and its measurement techniques
2. Students will be able to estimate energy dissipation due to hydraulic jump
3. Students will be able to 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; 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" by – Chow
2. "Open Channel Hydraulics" by – French
3. "Flow Through Open channels" by – Rang Raju
4. "Flow in Open channel" by - Subramanya

CE 362: Open Channel Hydraulics Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to analyze open channel flows and its measurement techniques
2. Students will be able to estimate energy dissipation due to hydraulic jump

Course Contents:

Broad-crested weir; sluice gate; venturi flume; parshall flume; cutthroat flume; hydraulic jump; velocity distribution profile; Manning's roughness coefficient; specific force and specific energy.

Text and Ref Books:

1. "Open Channel Hydraulics" by – Chow
2. Laboratory Manual

CE 400: Thesis

9.00 Contact Hour; 4.50 Credit Hours; Pre-requisite: None.

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:

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

Course Contents:

Experimental and theoretical investigation of various topics in structural engineering, environmental engineering, transportation engineering, geotechnical engineering and water resource 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 report at the end of the work and present his/her work in front of a board consists of faculty member(s).

CE 402: Civil Engineering Students' Internship Program (CESIP)

4 weeks; 1.00 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to apply theoretical knowledge in solving engineering problems.
2. Students will be able to illustrate the current practices in construction project management.
3. Students will be able to explain corporate culture and its contribution for the society.
4. Students will be able to produce project report with proper appearance, format, grammar, introduction, objective and procedure.

Course Contents:

4 weeks of internship in a civil engineering related job at an organization/firm 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.

CE 403: Socio-economic Aspects of Development Projects

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Objectives:

1. To gain knowledge on the socio-economic aspects and trends in human developments.
2. To understand the common forms of sustainable developments.

Course Outcomes:

1. Students will be able to learn about the various indicators of socio-economic developments.
2. Students will be able to learn about the causes of deforestations, land use and losses for sustainable developments.
3. Students will be able to learn about the sanitation, health and nutritional issues.

Course Contents:

Economics and social structure; development and economic growth; socio-economic indicators; concept of human development, human development index; gender related human development index; human poverty and human poverty index; poverty reduction strategies in Bangladesh; concepts of sustainable development; MDGs.

Characteristics of development projects; human interest related aspects; population displacement; resettlement and rehabilitation strategy;

Productivity; land loss, land use 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 impact assessment approach; socio-economic survey; case studies.

Text and Ref Books:

1. "Project Planning and Control" by - Lester
2. " Project Management Techniques" by – A.O. Awani

CE 405: Business and Career Development

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Objectives:

To provide the students with practical instruments, concepts, and skills that will enhance their understanding of self and the professional paths which best match their personal and professional aspirations.

Course Outcomes:

1. Gain an understanding of students' personality, interests, skills, values, and how these relate to occupational options
2. Become familiar with key career development theories
3. Enhance students' knowledge of the world of work. Occupational alternatives will be generated through utilization of occupational resources and information interviews
4. Develop lifelong skills associated with career decision making and career management. Students will learn how to make self-appropriate occupational choices and set realistic occupational/educational goals
5. See themselves as an active agent in your career/life planning process

Course Contents:

Human resource management: source of manpower, methods of selection and recruitment, development and motivating the workforce, appraisal procedures, employee compensation and benefits; basic marketing management, segmentation and market analysis, marketing strategies and use of marketing tools; branding, choosing brand elements, brand extension and its advantages and disadvantages; introduction to operations management, basic production decisions of an organization, quality control within operations process.

CE 410: Concrete Structures Design Sessional II

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Course Objectives:

1. To equip the students with a thorough understanding of the behaviour and design of bridges.
2. To understand the load flow mechanism and identify loads on bridges and buildings.
3. To design a realistic high-rise building considering different types of loads.

Course Objectives:

1. Students will understand the general mechanical behavior of prestressed concrete.
2. Students will be able to analyze and design prestressed concrete flexural members.
3. Students will be able to analyze and design for vertical and horizontal shear in prestressed concrete
4. Students will design a full realistic high-rise building considering all static and dynamic loads.

Course Contents:

Analysis and design of low rise RC moment frame buildings for wind and seismic application; multistoried RC buildings with shear wall and mat foundation for wind and seismic application; reinforcement design and detailing at joints.

Text and Ref Books:

1. Prathomic Engineering Drawing – HamontoKumar Bhottacharjo
2. Civil Engineering Drawing-Gurcharan Singh & Subash Chandra
3. Engineering Drawing-Basant Agrawal and C M Agrawal
4. Design of Concrete Structures – Winter & Nilson (10th Edition)
5. Design of Concrete Structures – Nilson (12th and 14th Edition)
6. AASHTO LRFD Bridge: Design Specifications 2012
7. Bangladesh National Building Code (BNBC)-2012

CE 411: Structural Analysis & Design II

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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 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.

Course Outcomes:

1. Students will be able to analyze and design statically indeterminate beams and frames by aforementioned methods.
2. Students will be able to generate algorithms by using direct stiffness method.
3. Students will be able to develop influence lines of statically indeterminate beams and frames.

Text and Ref Books:

1. Structural Analysis-R. C. Hibbeler, Prentice Hall, 8th Edition
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 Edition
4. Elementary Structural Analysis-Charles Head Norris, John Benson Wilbur and Senol Utku, McGraw Hill, 4th Edition
5. Structural Analysis-Aslam Kassimali, CENGAGE Learning, 3rd Edition

CE 412: Computer Aided Analysis and Design of Structures Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Course Objectives:

1. To gain knowledge on the basics of Design of reinforced concrete building.
2. To become skilled at the design and construction Steel structures
3. To devise the theories for stability of slopes.

Course Outcomes:

1. Students will be able to understand the practical analysis and design consideration for high rise building.
2. Students will be able to check and design RCC structures using software.
3. Students will be able to design and construct footings, rafts and piles in sand.

Course Contents:

Structural idealization, computer modeling of frame structures, computer aided analysis and design of various reinforced concrete and steel structures, e.g. high-rise building, modular bridge, water tower etc.

Text and Ref Books:

1. Bangladesh National Building Code (BNBC)-2012
2. AASHTO LRFD Bridge: Design Specifications 2012

CE 413: Design of Steel-Concrete Composite Structure

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Objectives:

1. To gain knowledge on steel concrete composite structures.

2. To become skilled at the design and construction of different types of composite columns, beam and slab.
3. To learn about the behavior of different types of composite columns.

Course Outcomes:

1. Students will be able to compare among various construction materials (RC, steel and steel concrete composite) and determine the suitable solution for the construction of different categories of building (low, medium and high rise) using appropriate method.
2. Students will be able to design and construct various types of composite columns.
3. Students will be able to design and construct composite beam and floor systems.

Course Contents:

Introduction to composite structures, Advantages of composite construction; Behavior of different types of composite columns, Axial load capacity and interaction diagram for composite columns;

Composite floor system: details of composite deck and shear connectors, Elastic and plastic analysis of composite beams, Design of composite beams for serviceability and strength limit states.

Text and Ref Books:

1. Steel Structures: Design and Behavior by Salmon, Johnson and Malhas (5th Edi)
2. Limit States Design in Structural Steel by G L Kulak and G Y Grondin
3. AISC design guide

CE 415: Prestressed Concrete

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Objectives:

1. Be able to perform analysis and design of prestressed concrete members and connections.

Course Outcomes:

1. Students will understand the general mechanical behavior of prestressed concrete.
2. Students will be able to analyze and design prestressed concrete flexural members.
3. Students will be able to analyze transfer and development length as well as prestress losses.
4. Students will be able to analyze and design for deflection and crack control of prestressed concrete members.
5. Students will be able to analyze and design simple connections of prestressed concrete members.

Course Contents:

Prestressed Concrete: concepts of prestressing; materials; anchorage systems; loss of prestress; analysis of sections for flexure, shear, bond and bearing; analysis of end block and composite sections; beam deflections; cable layout; partial prestress.

Design of prestressed concrete beams for simple and continuous spans; ideas about use of AASHTO – PCI sections for standard spans; design considerations for prestressed concrete pipes, piles, poles and railway sleepers.

CE 417: Design of Concrete Structures III

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Objectives:

1. To gain knowledge on the advance topic of reinforced concrete structure.
2. To become skilled at the design of slab and torsion for beam.
3. To become aware of the lateral load resisting design and detailing of concrete structures.

Course Outcomes:

1. Students will be able to solve complex design problems of a concrete structure more economically and efficiently.
2. Students will be able to gain advance level understand of various practical design considerations.

Course Contents:

Analysis and design for torsion; design of one way and two way joist slabs with or without beam on the column line; slender columns; strut-and-tie models (design of deep beam), design of reinforcement at joints; design and detailing of lateral load resisting components. lift cores, diaphragm etc.

Text and Ref Books:

1. Design of Concrete Structures by Nilson (15th Edition)
2. Reinforced Concrete: Mechanics and Design (6th Edi) by James Wight and James MacGregor
3. Prestressed Concrete Structures by Michael P Collins

CE 419: Introduction to Finite Element Method

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Objectives:

1. The objective of this module is to equip students with fundamentals of finite element principles so as to enable them to understand the behavior of various finite element and to be able to select appropriate elements to solve physical and engineering problems with emphasis on structural and geotechnical engineering applications.

Course Outcomes:

Upon completion of this course student will be able to

1. Analysis linear, axisymmetric and or field problem in structural and geotechnical disciplines using appropriate FE formulation.

2. Engage in future studies on advanced finite element procedures

Course Contents:

Introduction to finite element method as applied to stress analysis problems; basic equations in elasticity, matrix displacement formulation, element shapes, nodes, nodal unknowns and coordinate system, shape functions, strain displacement matrix, methods for assembling stiffness equations e.g. direct approach, Galerkin's method, virtual work method, principle of minimum potential energy; introduction to isoparametric formulation; discritization of a structure and mesh refinement, one dimensional stress-deformation and two dimensional plane stress and plane strain analysis of stress-deformation problems; numerical integration and computer application.

Text and Ref Books:

1. Bathe, K.J., "Finite Element Procedures", 1996.
2. Zienkiewicz, O.C. and Morgan, K., "Finite Elements and Approximation", John Wiley and Sons, 1983.
3. Cook, R.D., "Finite Element Modelling for Stress Analysis", John Wiley and Sons, 1995.
4. D.L. Logan, "A First Course in the Finite Element Method", Third Edition, Thomson Learning, 2001.
5. J.N. Reddy, "An Introduction to the Finite Element Method", Second Edition, McGraw-Hill International Editions, Singapore.
6. Grandin, H., "Fundamentals of the Finite Element Method", Macmillan Publishing Company, 1986.
7. Weaver, W. And Johnston, P.R., "Finite Elements for Structural Analysis", Prentice-Hall, 1984.

CE 421: Dynamics of Structures

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Objectives:

1. Learn how to model single-degree and vibratory systems and calculate the free and forced response of these systems.
2. Ability to apply the structural dynamics theory to real-world problems like seismic analysis and design of structures.

Course Outcomes:

At the conclusion of this course, the students will be able to:

1. Apply knowledge of mathematics, science, and engineering by developing the equations of motion for vibratory systems and solving for the free and forced response.
2. Create simple computer models for engineering structures using knowledge of structural dynamics
3. Interpret dynamic analysis results for design, analysis and research purposes
4. Apply structural dynamics theory to earthquake analysis, response, and design of structures

Course Contents:

Single degree of freedom system, free vibration response; response to harmonic, impulse and general dynamic loading; numerical evaluation of dynamic response; earthquake response of linear system; two degrees of freedom system; response spectrum analysis.

Text and Ref Books:

1. Dynamics of Structures by Anil K. Chopra (4th Edition)
2. Dynamics of Structures by Ray W. Clougs and J. Penzien

CE 423: Structural Safety

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Structural Safety is a course to integrate risk assessment for a wide range of constructed facilities such as buildings, bridges, earth structures, offshore facilities, dams, lifelines and nuclear structural systems, especially RCC and steel structures. Its purpose is to gain in-depth knowledge about risk and reliability among technical disciplines involved in design and construction, and to enhance the use of risk management in the constructed environment. All aspects of quantitative safety assessment and to addresses the protection of structures and infrastructure such as buildings and bridges both RCC and Steel structures exposed to multiple hazards, including earthquakes, cyclones, fire hazards, hurricane, surge or corrosion.

Text and Ref Books:

1. AISC Seismic Provisions for Structural Steel Buildings, ANSI/AISC 341-10
2. Structural Seismic Design Optimization and Earthquake Engineering: Formulation and Applications by Vagelis Plevris, Chara Ch. Mitropoulou, Nikos D Lagaros, 2012
3. Computational Methods in Earthquake Engineering by Papadrakakis, Fragiadakis and Lagaros, 2011
4. Journal of Structural Safety by Elsevier (for case studies)

CE 425: Seismic Design of Structures

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

At the completion of this subject the student is expected to be able to –

1. Use the knowledge of nonlinear dynamic response of structures to interpret the design code provisions and apply them in seismic design structural systems.
2. Explain the seismic behavior of moment frame, braced frame and shear wall structural systems and successfully design such systems to achieve the performance objectives stipulated by the design codes.
3. Determine the performance of structures under earthquake loading using modern performance assessment methods and analysis tools.

Course Contents:

Seismic design philosophy; ductility concepts; lateral force resisting systems; mechanisms of nonlinear deformation; methods of analysis: push-over analysis, incremental dynamic analysis, time-history analysis; introduction to elastic and inelastic response spectra; code procedures for earthquake resistant structures; detailing of structural steel and reinforced concrete elements; lessons learned from past earthquakes.

Text and Ref Books:

1. Design of Concrete Structures by Nilson (14th Edition, Chapter 20)
2. AISC Seismic Provisions for Structural Steel Buildings, ANSI/AISC 341-10
3. Structural Seismic Design Optimization and Earthquake Engineering: Formulation and Applications by Vagelis Plevris, Chara Ch. Mitropoulou, Nikos D Lagaros, 2012
4. Computational Methods in Earthquake Engineering by Papadrakakis, Fragiadakis and Lagaros, 2011

CE 427: Advanced Solid Mechanics

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Objectives:

1. To expand on the basic principles established previously in Solid Mechanics.
2. To consolidate the solid mechanics principles presented in the student's Engineering degree, and the equip students with skills required to solve a range of engineering problems they have not seen before.

Course Outcomes:

At the completion of this subject the student is expected to be able to –

1. Understand advanced stress/strain correlations
2. Obtain simple mathematical and physical relationships between mechanics and materials
3. Model an engineering structure without detailed instruction
4. Expand their analytical and cognitive skills through learning experiences in a diverse range of solid mechanics topics

Course Contents:

Stress, strain and displacements in two and three dimensions. Constitutive equations. Governing equations of elasticity and simple solutions, Formulation of basic equations of elasticity in solid mechanics, Strain energy. Theories of failure.

Text and Ref Books:

1. Introduction to Solid Mechanics and Finite Element Analysis by Samer Adeeb
2. Advanced Strength and Applied Elasticity, 5th Edition, by A C Ugural and S K Fenster
3. The geometrical Language of Continuum Mechanics by Marcelo Epstein

CE 431: Natural Resources and Renewable Energy

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Classification, 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.

CE 432: Design of Water Supply, Sanitation and Sewerage Systems

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

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:

1. Students will be 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. Students will be able to design and construct water wells, sanitary sewer, storm sewer, septic tanks.
3. Students will be able to design and construct waste water treatment plants and sewage treatment options.
4. Students will be 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 tubewell and water distribution network; estimation of industrial, domestic and commercial wastewater generation, wastewater network design; household plumbing system design; design of water and wastewater treatment plant; computer application in environmental engineering; field visits and reporting. Design of ETP.

CE 433: Solid and Hazardous Waste Management

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Students will be able to explore the characterization of different kinds of solid and hazardous wastes and their treatment.
2. Students will be able to analyze health and environmental issues related to solid waste management.
3. Students will be able to 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. Students will be able to ensure waste management for health safety.

Course Contents:

Solid Waste Management: sources and types of solid wastes; physical and chemical properties of solid wastes; solid waste generation (Separation at source); on-site handling, storage and processing; collection of solid wastes; transfer stations and transport; resources and energy recovery and recycling (Reduction, Re-used & Recycling- 3R concept); decomposition of solid waste: anaerobic treatment/biogasification, aerobic treatment/composting; thermal treatment, land disposal.

Hazardous Waste Management: identification, sources and characteristics of hazardous wastes; different types of hazardous waste, hazardous waste management plant; methods of treatment (physical, chemical, biological and thermal treatment; fixation/stabilization) and disposal(landfill and ocean dumping) of hazardous waste.

Healthcare waste management, categories of healthcare waste, treatment methods of healthcare waste.

Integrated solid waste management and live cycle inventory analysis.

CE 435: Environmental Pollution Management

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Students will be able to analyze the root cause of water, air and land pollution and also to control such pollution.
2. Students will be able to design air quality monitoring system.
3. Students will be able to design a smart, green and pollution free urban community.
4. Students will be able to ensure pollution management for health safety.

Course Contents:

Environmental pollution and its Control; water pollution - sources and types of pollutants; waste assimilation capacity of streams; dissolved oxygen modeling; ecological balance of streams; industrial pollution; heavy metal contamination; detergent pollution and eutrophication; groundwater pollution; marine pollution; pollution control measures: water quality monitoring and management. Concepts of wetlands.

Air pollution: sources and types of pollutants; effects of various pollutants on human health, materials and plants; air pollution meteorology; global warming, climate change and ozone layer depletion; air pollution monitoring and control measures; introduction to air quality models.

CE 437: Climate Change and Disaster Management

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

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.

CE 439: Environmental Impact Assessment and Sustainability

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Important terms, aims, objectives, roles and methodology of environmental impact assessment; 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. Sustainability, SDG, Methods of Sustainable management.

CE 441: Foundation Engineering

3.00 Contact Hour; 3.00 Credit Hours; Pre-requisite: None.

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:

1. Students will be able to 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. Students will be able to 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. Students will be able to 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. Students will be able to analyze the performance of existing foundation and construct new footing, raft and pile foundation in various subsoil conditions.
5. Students will be able to analyze the stability of any soil slopes in order to determining proper and stable slopes on various subsoil and groundwater conditions.

Course Contents:

Subsoil Investigations; Various Types of Shallow and Deep Foundations; Bearing Capacity Equations and Factors for Shallow Foundations; Settlement of Shallow Foundations; Axial Load Carrying Capacity of Pile Foundations; Settlement of Pile Foundations; Construction of Footings, Rafts and Piles

Slope Stability Analyses; Ground Improvement for Foundations.

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

CE 442: Geotechnical Engineering Sessional II

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Students will be able to explore types of foundation used for structures based on bearing capacity of soil
2. Students will be able to evaluate the bearing capacity and settlement for the purpose of designing footing, raft and pile foundations for a structure on various subsoil and loading conditions.
3. Students will be able to analyze the performance of existing foundation and construct new footing, raft and pile foundation in various subsoil conditions
4. Students will be able to produce lab report with proper results, discussions and conclusion

Course Contents:

Examination and Interpretation of Subsoil Investigation Report; Geotechnical Design of Footing, Raft and Piles; Structural Design of Reinforced Concrete Footing, Raft and Piles; Design of Earth Retaining Structures for Deep Excavations; Design of Reinforced Soil; Use of Foundation Engineering Software.

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

CE 443: Earth Retaining Structures

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Students will be able to familiarize with the various types of earth retaining structures and their specific usages.
2. Students will be able to analyze and design both rigid flexible types of earth retaining structures for deep and shallow difference in elevations.
3. Students will be able to analyze and design bracing systems for deep excavation.
4. Students will be able to design dewatering system for deep and shallow excavations.
5. Students will be able to comprehend construction details of structures like slurry wall, cofferdam and caissons.

Course Contents:

Foundations of Structures Subjected to Lateral Loads; Rigid and Flexible Earth Retaining Structures; Deep Excavation and Dewatering Methods; Braced Excavation; Sheet Piles, Contiguous Wall, Cofferdams, Caissons and Slurry Walls; Construction Problems in Excavation and Earth Retaining Structures. Use of Plaxis/ Abaqus/ FLAC/GeoStudio/Geo5 to solve basic and complex boundary problems

Text and Ref Books:

1. Foundation Engineering: Peck, Hansan and Thornburn
2. Foundations and Earth Retaining Structures: SI Edition –Muni Budhu

CE 445: Elementary Soil Dynamics

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Students will be able to comprehend the fundamental knowledge on vibration theory for different free and forced vibration system
2. Students will be able to apply the knowledge of site amplification for assimilating the wave propagation effect
3. Students will be able to comprehend the fundamental concept of properties of soil dynamics
4. Students will be able to analyze a machine foundation system for its different characterizing factors

Course Contents:

Elementary Vibrations; Dynamic Properties of Soil; Seismic Response of Soil; Seismic Site Characterization and Site Amplification; Soil Liquefaction; Earthquake Hazards and Remedial Measures, Dynamic Bearing Capacity Analyses, Principles of Machine Foundations. Use of Plaxis/ Abaqus/ FLAC/GeoStudio/Geo5 to solve basic and complex boundary problems

Text and Ref Books:

1. An Introduction to Soil Dynamics – S Prakash

2. Principles of Soil Dynamics - B.M. Das & G.V. Ramana

CE 447: Soil-water Interaction

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Students will be able to explore nature of soil when embedded in water in order to design foundation.
2. Students will be able to discern permeability and seepage, capillary action, soil suction for proper design
3. Students will be able to analyze slope stability subjected to wave current, lateral load in order to make river side embankment
4. Students will be able to design geotechnical landfill for slope stability

Course Contents:

Water in Soil: Occurrence and Effects; Soil Water Interaction Problems; Vertical and Horizontal Permeability for homogeneous and stratified soil; Seepage, Capillary and Soil Suction; One Dimensional Flow in Layered Soil; Flow through Earth Dams; Slopes Subjected to Seepage, Water Current, Wave Action etc; Filters and Revetments; Leachate due to Sanitary Landfill. Use of Plaxis/ Abaqus/ FLAC/GeoStudio/Geo5 to solve basic and complex boundary problems

Text and Ref Books:

1. Basic Soil Mechanics - R. Whitlow
2. Seepage, Drainage and Flownets – H.R. Cedergren

CE 449: Numerical Methods in Geotechnics

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Introduction to Tensor Analyses, Stresses, Strains, Equation of Continuum Mechanics, Isotropic Elasticity, Anisotropy, Stress Dependency, Nonlinearity, Failure and Palstic Flow, Dilatancy, Yielding and Hardening, Preconsolidation, Material Models, Critical State, Rate Dependency, Finite Elements, Finite Difference . Use of Plaxis/ Abaqus/ FLAC/GeoStudio/Geo5 to solve basic and complex boundary problems.

Text and Ref Books:

1. Constitutive Modelling in Geomechanics -A Puzrin
2. Applied Soil Mechanics with Abaqus applications – S Halwany
3. Plasticity and Geotechnics- Hai Sui Yu
4. Soil Consitutive Models- Evaluation, Selection & Calibration by J A Yammuro & V N Kaliakin

CE 450: Integrated Design Project

10.00 Contact Hours (2.00+3.00 Credit hours per semester); Pre-requisite: None.

Rationale:

The course aims to synergies all the basic engineering knowledge gained previously to solve real civil engineering problems in an integrated and comprehensive manner. Students will be first exposed to the importance of good design concepts that considers important characteristics including public health and safety, society and culture, environment and sustainability, authorities' requirements, as well as project cost effectiveness.

Course Outcomes:

1. Students will be able to describe the concepts of sustainability and the need for sustainable development.
2. Students will be able to appraise already completed Project for public health and safety, society and culture, project management, cost effectiveness, plus environment and sustainability.
3. Students will be able to develop preliminary design concepts of integrated complex Civil Engineering project that makes appropriate consideration of public health and safety, society and culture, project management, cost effectiveness, environment and sustainability, and authorities' requirements.
4. Students will be able to describe project's authorities' conditions and other relevant needs related to "Engineers and Society'.
5. Students will be able to produce report and present preliminary design concept for integrated project.
6. Students will be able to assume responsibility and commitment towards given tasks either as an individual, member or leader of the team.
7. Students will be able to examine, identify and describe existing proposed project site conditions and constraints that includes existing topography and terrain, sub-soil, Civil Engineering infrastructure facilities (road, drainage, water supply, and sewerage systems, and elements important to environment and sustainable development.
8. Students will be able to critically assess and evaluate the project site with respect to environment and sustainability, public health and safety, culture and society, and economics and cost effectiveness, etc.
9. Students will be able to develop integrated project design solutions that considers environment and sustainability, public health and safety, culture and society, and economics and cost effectiveness, etc. (includes choice of site, construction techniques and materials such as the use of Industrialized Building System (IBS).
10. Students will be able to judge and manually perform detailed design of infrastructure elements (earthworks, road, drainage, water supply, sewerage, etc.), foundation and building structures by applying relevant codes of practice and guidelines
11. Students will be able to run computer softwares in the design process, preparation of drawings, reports and presentations (Excel, AutoCad and other design softwares)
12. Students will be able to produce presentable capstone project report containing executive summary, introduction, tasks distribution, concepts, design calculations, drawings for tender documentation, conclusions, etc

13. Students will be able to verbally present capstone project in presentation session or interview
14. Students will be able to perform tasks individually and be an effective group member
15. Students will be able to apply strategies to achieve cost effectiveness, and estimating cost (bill of quantities) of selected components
16. Students will be able to produce infrastructural and structural elements design that considers the effect on environment and demonstrate knowledge and sensitivity towards sustainable development
17. Students will be able to implement authorities' requirements in project

Course Contents:

Students are tasked to work in groups to develop the design of integrated infrastructural and structural elements for a development project from inception of the concepts until the production of detailed design and drawings, and bills of quantities (BOQ). Aspects of environment and sustainability, public health and safety, culture and society, and economy and cost effectiveness are to be considered in the process. The project includes various infrastructural elements such as earthworks, erosion sediment control plan (ESCP), slope stability/retaining, roads, drainage, detention pond, water supply, sewerage systems, and structural and foundation systems, including any other required elements. The design must comply with criteria set by the relevant Codes of Practice, and guidelines and conditions set by local authorities, technical departments and professional bodies, as well as other requirements related to the public and society.

Students are required to produce group design report and perform presentation. The successful implementation of the design project requires close cooperation between all team members. Hence, it is important for students to assume full responsibility in executing individual assignments and at the same time possess good team spirit to ensure the success of the project.

Text and Ref Books:

1. Bangladesh National Building Code (BNBC)
2. American Association of State Highway and Transportation Officials (AASHTO)
3. American Society for Testing and Materials (ASTM) International
4. British Standard (BS)
5. European Standard (EN)
6. Canadian Standards Association (CSA) Standards and Codes
7. National Building Code of Canada
8. Standard Specification for Road Works (JKR/SPJ/2017)
9. Guidelines on Slope Maintenance in Malaysia (JKR 21503-0001-06).
10. Gould F. E. and Joyce N. E. 2003. Construction Project Management. 2nd Ed. Prentice Hall.
11. Colin Harding, Chartered Institute of Building, 2015. Integrated Design and Construction. Wiley Blackwell
12. Brad Hardin & Dave McCool, 2014. BIM and Construction Management: Proven Tools, Methods, and Workflows, 2nd Edition.
13. Saleh A. Mubarak, 2015. Construction Project Scheduling and Control, 3rd Edition.
14. Malaysian Water Association 1994. MWA Design Guidelines for Water Supply Systems.
15. American Water Works Association / American Society of Civil Engineer, 2012. Water Treatment Plant Design. 5th Edition. McGraw Hill.

16. Shun Dar Lin, 2007. Water and Wastewater Calculations Manual. 2nd Edition. McGraw Hill.
17. Metcalf and Eddy, Wastewater Engineering 2016: Treatment Disposal and Reuse. 4th Edition. McGraw Hill.
18. Malaysian Water Association 1998. Guideline for Developers: Vol 1: Sewerage Policy for New Development. Vol 2: Sewerage Works Procedure. Vol 3: Sewer Networks and Pumping Stations. Vol 4: Sewage Treatment Plants. Vol 5: Septic Tanks.

Building Information Modeling (BIM) Aspects:

1. Karen, K. and Douglas, N., "Building Information Modelling: BIM in Current and Future Practice", 1st edition, John Wiley & Sons, Inc., Hoboken, New Jersey, USA, 2014.
2. Robert, S.W., "BIM Content Development: Standards, Strategies, and Best Practices", John Wiley & Sons, Inc., Hoboken, New Jersey, USA, 2011.
3. Darren, R., "Computer Modelling for Sustainable Urban Design", Earthscan, Abingdon, Oxon, UK, 2011.
4. Nawari, O.N., "Building Information Modelling: Framework for Structural Design", Apple Academic Press Inc., Waretown, New Jersey, USA, 2015.
5. Eddy, K. and James, V., "Mastering Autodesk Revit Architecture 2015: Autodesk Official Press", John Wiley & Sons, Inc., Indianapolis, Indiana, USA, 2015.

Structural (RC and Steel Design) Aspects:

1. American Concrete Institute (ACI) Codes
2. American Institute of Steel Construction (AISC) Codes
3. American Society of Civil Engineers (ASCE) Codes
4. Mosley, W.H., Bungey, J.H., and Hulse, R., "Reinforced Concrete Design to Eurocode 2", 7th edition, Palgrave Macmillan, London, UK, 2012.
5. Bhatt, P., MacGinley, T.J., and Choo, B.S., "Reinforced Concrete Design to Eurocodes: Design Theory and Examples", 4th edition, CRC, New York, USA, 2014.
6. Lam, D., Ang, T.C. and Chiew, S.P., "Structural Steelwork: Design to Limit State Theory", 4th edition, CRC Press, Taylor & Francis Group, London, UK, 2014.
7. Gardner, L. and Nethercot, D.A., "Designers' Guide to Eurocode 3: Design of Steel Structures – Designers' Guide to EN 1993-1-1 Eurocode 3: Design of Steel Structures General Rules and Rules for Buildings", Thomas Telford, London, UK, 2005.
8. Draycott, T. and Bullman, P., "Structural Elements Design Manual: Working with Eurocodes", 2nd edition, Butterworth-Heinemann, Oxford, UK, 2009.

Construction Aspects:

1. Gould, F.E. "Managing the Construction Process", Prentice Hall, 4th edition 2011.
2. Hinze, J.W. "Construction Planning and Scheduling", Prentice Hall, 2011.
3. Callahan, M.T. "Construction Project Scheduling", McGraw-Hill, 1992.
4. A Guide to the Project Management Body of Knowledge (Pmbok Guide) - 5th edition, Project Management Institute Inc., 2013.

Geotechnical Aspects:

1. Coduto, D.P., "Foundation Design – Principles and Practices", 2nd edition, Prentice Hall, 2001.
2. Craig, R.F. and Knappett, J.A., "Craig's Soil Mechanics", 8th edition, Spon Press, 2012.
3. Das, B.M., "Principles of Foundation Engineering", 8th edition, Cengage Learning, 2016.

CE 451: Highway Materials, Pavement Design and Railway Engineering

4.00 Contact Hour; 4.00 Credit Hours; Pre-requisite: None.

Course Objectives:

1. To familiarize with the properties, test procedures , specifications and uses of various types of pavement materials including mix design methods.
2. To acquire knowledge on characteristics, functions and types of pavement including latest development.
3. To acquaint with the different design methods of rigid and flexible pavement.
4. To have clear idea about road maintenance and construction equipment.
5. To familiarize with low cost road.
6. Learning the basic knowledge on railway engineering, rolling stocks and tracks, signaling, stations and yards

Course Outcomes:

1. Students will be able to select the right type of materials for specific pavement projects basing on test, specifications, and design method.
2. Students will be able to recommend the need for a particular type of pavement from a given set of conditions, after analyzing its relative advantages and disadvantages with other types of pavement.
3. Students will be able to estimate the thickness of rigid and flexible pavement using AASHTO, Asphalt Institute, PCA, Road Note 31and RHD design methods.
4. Students will be able to identify different pavement distresses and recommend appropriate remedial measures.
5. Students will be able to employ appropriate construction equipment for different phases of road construction work.
6. Students will be able to specify requirements for various elements of railway tracks, signals, stations and yards

Course Contents:

Pavement materials: bituminous binders, cement, aggregates, embankment material, soil stabilization; mix design methods; low cost roads; flexible and rigid pavement: pavement components and functions, pavement design and construction, road maintenance; railway engineering: general requirements, rolling stock and tracks, stations and yards, points and crossings, signaling, maintenance operations, pavement construction equipment and uses.

Text and Ref Books:

1. "Highway Engineering" by – Paul H. Wright (6th Edition)
2. "Transportation Engineering and Transport Planning" by – L.R. Kadiyali
3. "Principles of Pavement design" by – E.J. Yoder
4. "Railway Engineering" by - S. C. Rangwala

CE 452: Highway Materials and Transportation Engineering Design Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Course Objectives:

1. To learn test method for aggregate, bitumen and mixes according to ASTM/BS/STP
2. To learn Mix Design Method for dense graded bituminous mix
3. To gain knowledge on capacity analysis
4. To become skilled at determining saturation flow

Course Outcomes:

1. Students will be able to conduct and assess quality control tests for aggregates, bitumen
2. Students will be able to find design bitumen content by Marshall Mix Design Method
3. Students will be able to determine capacity and saturation flow of a road way.

Course Contents:

Laboratory tests of highway materials: tests on aggregates, tests on bitumen, California Bearing Ratio (CBR); Bituminous mix design: Marshall Method; Los Angeles Abrasion Value test on aggregates (ASTM test);

Traffic Engineering: Roadway Capacity, Saturation Flow.

Text and Ref Books:

1. "Highway Engineering" by – Paul H. Wright (6^{th} Edition)
2. Laboratory Manual

CE 453: Traffic Engineering Design and Management

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Ability to relate various transportation problems, issues and challenges in context of Bangladesh.
2. Ability to assess various mitigation techniques of transportation crisis.
3. Ability to recommend various solutions to urban traffic problems in context of Bangladesh.
4. Ability to justify the importance of road safety and be able to explore various road safety measures.
5. Ability to explore advanced concepts of traffic management, management strategies.

Course Contents:

Analysis of traffic flow characteristics; road traffic assignment, network equilibrium, system optimality; traffic flow theory, shockwaves, deterministic and stochastic queuing analysis; Traffic Impact Assessment (TIA); Introduction to signal optimization tools, Intersection control and design; grade separation and interchanges; computer application in traffic system analysis; introduction to micro simulation and ITS: Components and Applications;

Transportation demand, supply and equilibrium; Advanced concepts of traffic management, management strategies; NMT issues and road safety.

Text and Ref Books:

1. "Traffic Flow Fundamentals" by – Adlof D May
2. "Traffic Engineering and Transport Planning" by – L.R. Kadiyali
3. "Highways – The Location, Design, Construction" by – Flaherty
4. "Principles of Transportation Engineering " by – Das
5. "Transportation Engineering Handbook" by – Geulias
6. "Traffic and Highway Engineering" by – Garber
7. "Introduction to Transportation Engineering" – by James H. Bank

CE 454: Traffic Studies and Pavement Design Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Ability to design highway and airfield pavement
2. Ability to design highway and airfield pavement by using software
3. Ability to analyze various traffic flow parameters.
4. Ability to design and analyze intersection by computer simulation.
5. Ability to produce lab report with proper results, discussions and conclusion

Course Contents:

Design of flexible and rigid pavement and air field pavements; geometric design; road intersection design and interchanges; traffic studies; computer models and application packages.

Text and Ref Books:

1. "Highway Engineering" by - Paul H Wright
2. "Principles of Pavement Design" by – E.J. Yoder
3. "Traffic Engineering and Transport Planning" by – L.R. Kadiyali
4. Laboratory Handbook

CE 455: Pavement Management, Drainage and Airport Engineering

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Students will be able to discuss on advanced concepts of pavement management system and management strategies.
2. Students will be able to apply the concept of surface and sub-surface drainage system and cross-drainage structures to reduce the water related damage to highway
3. Students will be able to apply the concepts of aircraft characteristics, airport configuration, geometric design criteria, standards of airport lighting, marking, drainage in planning of airports

4. Students will be able to apply the concept of FAA circulars and knowledge of airport design software in designing airport pavements.

Course Contents:

Pavement management systems; evaluation and strengthening of pavements, non-destructive evaluation of pavement structural condition; drainage: highway drainage and drainage structures; airports: importance, advantages and trends in air transportation, planning and design of airports, aircraft characteristics related to airport design, types and elements of airport planning studies, airport configuration, geometric design of the landing area, terminal area, heliports, design of airport pavements, lighting, marking and signing, airport drainage, introduction to airside planning, design and operations software.

Text and Ref Books:

1. "Principles of Pavement Design" by – E.J. Yoder
2. "Traffic Engineering and Transport Planning" by – L.R. Kadiyali
3. "Highways – The Location, Design, Construction" by – Flaherty
4. "Planning and design of airports" by – Robert Horonjeff

CE 457: Urban Transportation Planning and Management

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

The urban transport problems and trends; road network planning; characteristics and operation of different transit and paratransit modes, planning transit network; estimating system costs and benefits, pricing and financing, evaluation, transit users attitude, policies and strategies for transit development in metropolitan cities; freight traffic planning and management; selected transport case studies, congestion management; safety management; environmental issues and sustainable transport.

Text and Ref Books:

1. "Traffic Engineering and Transport Planning" by – L.R. Kadiyali
2. "Transportation Engineering Handbook" by – Geulias
3. "Traffic and Highway Engineering" by – Garber

CE 459: Intelligent Transportation System

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

History of ITS, ITS standards and architecture; Environmental aspects of ITS; Enabling technologies for ITS; Introduction to mobile application for ITS; Introduction to traffic flow modeling and control; Application of ITS for advanced traffic management, advanced traveler information system, public transport, commercial vehicle operation, freeway incident detection and control, electronic toll collection; Connected vehicle technology and applications; ITS benefits, evaluation and costs.

Text and Ref Books:

1. Fundamentals of Intelligent Transportation Systems Planning by - Mashrur A. Chowdhury
2. Intelligent Transportation Systems: Technologies and Applications by - Samuel Morgan

CE 461: Railway Engineering

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Railway engineering: general requirements, geometric design of railway, super elevation, high speed tracks, track fitting and fastening, rolling stock and tracks, stations and yards, points and crossings, advanced signal system, maintenance and operations.

Text and Ref Books:

1. "Railway Engineering " by – Rangwala
2. "Railway Engineering " by – Agarwal (Student Edition)

CE 463: Hydrology and Irrigation Engineering

4.00 Contact Hour; 4.00 Credit Hours; Pre-requisite: None.

Course Objectives:

By the end of this course students should be able

1. To gain basic understanding on hydrological processes in water balance studies
2. To understand and develop rainfall runoff models for flood estimation
3. To understand the fundamental information on irrigation and flood management
4. To perform design calculations of irrigation projects

Course Outcomes:

1. Measure water flow in various phases of hydrologic cycle
2. Understand hydrologic data and apply a range of common techniques, such as flood frequency analysis, regression analysis etc.
3. Design an irrigation project which include water requirements, canal design and hydraulic structures required for irrigation projects etc.
4. Plan proper water management for flood protection

Course Contents:

Hydrologic cycle; Weather and hydrology; Precipitation, evaporation and transpiration; Infiltration; Stream flow; Application of telemetry and remote sensing in hydrologic data acquisition; Rainfall-runoff relations; Hydrographs, unit hydrographs; Hydrologic routing; Statistical methods in hydrology.

Plant-soil-water relationship; Consumptive use and estimation of irrigation water requirements; Design of irrigation canal system; Methods of irrigation; quality of irrigation water; problems of irrigated land.

Text and Ref Books:

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

CE 465: Groundwater Engineering

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Groundwater in hydrologic cycle and its occurrence. Physical properties and principles of groundwater movement. Groundwater and well hydraulics. Groundwater resource evaluation. Groundwater levels and environmental influences. Water mining and land subsidence. Groundwater pollution and contaminant transport. Recharge of groundwater. Saline water intrusion in aquifers. Groundwater management.

Text and Ref Books:

1. "Groundwater Hydrology" by – Rushton
2. "Groundwater Engineering" by – Toad

CE 467: Flood Mitigation and Management

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Flood and its causes; 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.

Economic aspects of flood management: flood risk and vulnerability analysis, direct and indirect losses of flood, flood damage assessment, flood damage in urban and rural areas.

CE 469: River Engineering

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Outcomes:

1. Students will be able to demonstrate the understanding of the basic of river engineering and the morphological processes related to river.
2. Students will be able to distinguish different types of bank erosion and choose the necessary river training works to control those.
3. Students will be able to categorize the basics of scouring process and its effects on the hydraulic structures.

4. Students will be able to 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; sediment movement in river channels, bed form and flow regimes; Application of mathematical models for river problems.

Text and Ref Books:

1. "Principles of River Engineering" by – Chang
2. "Principles of River Engineering" by – Garg
3. "River Engineering" by – Peterson
4. "Sediment Transport Technology (Water & Sediment Dynamics)" by – Daryl B. Simons & Fuat Sentirk

CE 471: Hydraulic Structures

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Hydraulic structures – characteristics and types: Diversion head works; Principles of design hydraulic structures; Design of dams, barrages, weirs, spillways, energy dissipators and spillway gates; Cross drainage works.

Course Outcomes:

1. Students will be able to demonstrate the hydraulics and water resources background in water structures design applications
2. Students will be able to develop understanding of the basic principles and concepts of analysis and design of different hydraulic structures
3. Students will be able to apply basic design calculations of different hydraulic structures

Text and Ref Books:

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

CE 472: Hydraulic Structures Design Sessional

3.00 Contact Hour; 1.50 Credit Hours; Pre-requisite: None.

Course Contents:

Design of hydraulic structures: hydrologic, hydraulic, structural and foundation design of a drainage regulator

Course Outcomes:

1. Students will be able to estimate design storm, runoff volume and other hydrologic parameters for a catchment area
2. Students will be able to design and construct small hydraulic structure with stilling basin, cutoff wall and loose protections.
3. Students will be able to compute design loads, pressures and analyze stability of a hydraulic structure.
4. Students will be able to produce lab report with proper results, discussions and conclusion

Text and Ref Books:

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

CE 473: Coastal Engineering

2.00 Contact Hour; 2.00 Credit Hours; Pre-requisite: None.

Course Contents:

Coast and coastal features; deltas and estuaries; tide; wave; storm surge; tsunami; port, dock and harbor; wave forces on coastal structures; coastal sedimentation processes; shore protection works; design of shore protection structure.