MILITARY INSTITUTE OF SCIENCE AND TECHNOLOGY

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



COURSE CURRICULUM FOR UNDERGRADUATE PROGRAM

2024

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Committee of Courses EWCE Department, MIST

The under-graduation course curriculum for the department of Environmental, Water Resources, and Coastal Engineering (EWCE) of Military Institute of Science and Technology (MIST) has been reviewed by the committee as mentioned below.

President:

Colonel Md Shamim Iftakhar, NUP, PBGMS Head Department of Environmental, Water Resources, and Coastal Engineering (EWCE)

Members (Internal):

1. Colonel Nasir Uddin Ahmed Dean Faculty of Civil Engineering

 Brigadier General (Retired.) Md Gazi Ferooz Rahman Professor
 Department of Environmental, Water Resources, and Coastal Engineering (EWCE)

 3.
 Dr. Abul Fazal M. Saleh Professor
 Department of Environmental, Water Resources, and Coastal Engineering (EWCE) **Dr. G. M. Jahid Hasan** Professor Department of Civil Engineering

4.

5. **Dr. Md Tauhid-Ur-Rahman** Professor Department of Civil Engineering

 6. Lieutenant Colonel Khondaker Sakil Ahmed, PhD, Peng, Engrs
 Associate Professor
 Department of Civil Engineering

 7. Lieutenant Colonel Mohammed Russedul Islam, PhD Associate Professor Department of Civil Engineering MIST 8. Lieutenant Colonel Md Amirul Islam, PhD Associate Professor Department of Science and Humanities, MIST

9. Lieutenant Colonel Md Jafar Sharif, PhD, Sigs Associate Professor Department of Science and Humanities, MIST

 10. Lieutenant Colonel Mahabubar Rahman Shah, PhD, AEC Associate Professor Department of Science and Humanities, MIST

 11.
 Major Md. Soebur Rahman, PhD, PEng, Engrs Associate Professor
 Department of Civil Engineering 12.
 Major Mohammad Shafiul Azam, PhD, Engrs Associate Professor
 Department of Environmental, Water Resources, and Coastal Engineering (EWCE)

 13. Lieutenant Colonel Kazi Shamima Akter, PhD, Engrs Associate Professor
 Department of Environmental, Water Resources, and Coastal Engineering (EWCE)

14.

Masud Jahan Assistant Professor Department of Science and Humanities, MIST **External Member:**

1.

Brigadier General Md Mustafa Kamal, SGP

Dean, Faculty of Science and Technology Bangladesh University of Professionals (BUP)

2.

Brigadier General Md Mahbubur Rahman Siddiqui, ndc, afwc, psc, Mphil College of Inspector Bangladesh University of Professionals (BUP)

3.

Dr. Md Ashraf Ali

Professor Department of Civil Engineering Bangladesh University of Engineering & Technology (BUET)

4.

Dr. Md. Ataur Rahman Professor Department of Water Resources Engineering Bangladesh University of Engineering and Technology

5.

AKM Rafiqul Islam Deputy Director Department of Environment

6.

Dr. Robin Kumar Biswas Superintending Engineer Bangladesh Water Development Board

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 fouryear bachelor's degree on Civil Engineering. Bachelor degree in Computer Science Engineering course has been started on 2001. Bachelor courses in Electrical, Electronic & Communication Engineering and Mechanical Engineering started its journey from 2003. Bachelor of Science program in Aeronautical Engineering (AE) and Naval Architecture and Marine Engineering (NAME) program were started in 2008-2009 and 2012-2013 respectively. Besides, four new departments started their academic session in 2014-2015 i.e. Nuclear Science & Engineering (NSE), Biomedical Engineering (BME), Architecture (Arch) and Environmental, Water Resources & Coastal Engineering (EWCE).

1.2. Vision and Mission of MIST

1.2.1. <u>Vision</u>

To be a center 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. <u>Motto</u>

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. <u>Values</u>

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

1.4. Eligibility of Students for Admission in MIST

The students must fulfill the following requirements:

- a. **Bangladeshi Students.** Minimum qualifications/requirements to take part in the admission test are as follows:
 - The applicant must have passed SSC/equivalent examination in Science Group obtaining GPA 4.00 (without fourth subject) in the scale of 5.0 and in HSC/Equivalent examination from Board of Intermediate and Secondary Education/Madrasa Education Board/Technical Education Board in science group the applicant must have obtained minimum 'A+' (Plus) in any TWO (2) subjects out of FIVE (5) subjects including Mathematics, Physics, Chemistry, English, and Bengali and 'A' in rest THREE (3) subjects.
 - (2) The applicant must have qualified in minimum five subjects including Mathematics, Physics, Chemistry and English Language with minimum 'B' in average in GCE 'O' Level and in 'A' level he/she must have obtained minimum 'A' in ONE subject out of three subjects including Mathematics, Physics, and Chemistry with and minimum 'B' in rest TWO subjects.
 - (3) Applicants who have passed HSC or Equivalent examination in the current year or one year before the notification for admission can apply.
 - (4) Sex: Male and Female.
- b. **Foreign Students.** Maximum 3% of overall vacancies available will be kept reserved for the foreign students and will be offered to foreign countries through AFD of the Government of the People's Republic of Bangladesh. Applicants must fulfill the following requirements:
 - (1) Educational qualifications as applicable for Bangladeshi civil students or equivalent.

- (2) Must have security clearance from respective Embassy/High Commission in Bangladesh.
- (3) Sex: Male and Female.

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

1.5. Number of Seats

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

		Allocation of Seats	
Ser	Unit	Department	Seats
1		Civil Engineering (CE)	120
2		Computer Science and Engineering (CSE)	120
3		Electrical, Electronic and Communication Engineering (EECE)	120
4		Mechanical Engineering (ME)	120
5		Aeronautical Engineering (AE)	50
6	Α	Naval Architecture and Marine Engineering (NAME)	40
7		Biomedical Engineering (BME)	40
8		Nuclear Science and Engineering (NSE)	40
9		Environmental, Water Resources, and Coastal Engineering	60
10		Industrial and Production Engineering (IPE)	50
11		Petroleum and Mining Engineering (PME)	25
12	B	Architecture (Arch)	25
	Total		810

The total number is 810. 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, MOD, MIST	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

Ser.	Subjects	Marks
a.	Mathematics	90
b.	Physics	70
с.	Chemistry	30
d.	English	10
		Total = 200

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:

1.6.2. Final Selection

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

1.6.3. Medical Checkup

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

1.7. Students Withdrawal Policy

1.7.1. For Poor Academic Performance

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

- a. Students failing in any course/subject will have to clear/pass the said course/subject by appearing it in supplementary/self-study (for graduating student) examination as per examination policy.
- b. Students may also retake the failed subject/course in regular term/short term as per Examination policy.
- c. Maximum grading for supplementary/self-study examination etc of failed subjects will be B+ as per examination policy.
- d. One student can retake/reappear in a failed subject/course only twice. However, with the Permission of Academic Council of MIST, a student may be allowed for third time as last chance.
- e. In case of sickness, which leads to missing of more than 40% class or miss term final examination (supported by requisite medical documents), students may be allowed to withdraw temporarily from that term and repeat the whole level with the regular level in the next academic session, subject to the approval of Academic Council, MIST. However, he/she has to complete the whole undergraduate program within 06 (six)

academic years (for Architecture 07 academic years) from the date of his/her registration.

- f. Minimum credit requirement for the award of bachelor's degree in Engineering (B.Sc. Engg) and Architecture (B. Arch) will be decided by the respective Department, approved by the academic council, as per the existing rules. However the minimum CGPA requirement for obtaining a bachelor degree in engineering and Architecture is 2.20.
- g. Whatever may be the cases, students have to complete the whole undergraduate Program within 06 (six) academic years (for Architecture 07 academic years) from the date of registration.
- h. All other terms and condition of MIST Examination Policy remain valid.

1.7.2. Withdrawal on Disciplinary Ground

- a. <u>Unfair Means.</u> 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. <u>Influencing Grades.</u> 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. <u>Other Indiscipline Behaviors.</u> Academic Council may withdraw/expel any student on disciplinary ground if any form of indiscipline or unruly behavior is seen in him/her which may disrupt the academic environment/program or is considered detrimental to the image of MIST.
- d. <u>Immediate Action by the Disciplinary Committee of MIST.</u> The Disciplinary Committee, MIST may take immediate disciplinary action against any student of the Institution. In case of withdrawal/expulsion, the matter will be referred to the Academic Council, MIST for post-facto approval.

1.7.3. Withdrawal on Own Accord

a. Permanent Withdrawal

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

b. Temporary Withdrawal

A student, if he/she applies, may be allowed to withdraw temporarily from the program, subject to approval of Academic Council of MIST, but he/she has to

complete the whole program within 06 (six) academic years (for Architecture 07 academic years) from the date of his/her registration.

2. <u>RULES AND REGULATIONS FOR UNDERGRADUATE PROGRAM AT MIST</u>

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 Term (Jan – Jun) and Fall Term (Jul – Dec) in an academic year.

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

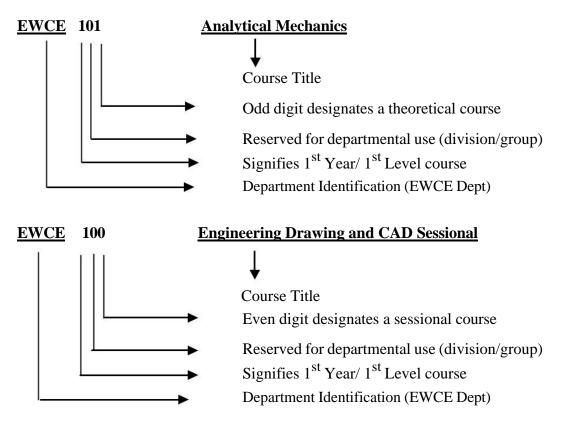
2.5. <u>Course Pattern and Credit Structure</u>

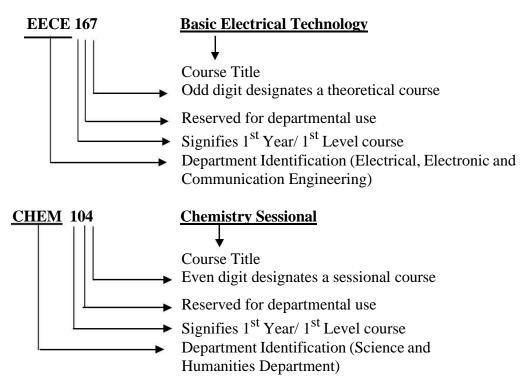
The undergraduate program is covered by a set of theoretical courses along with a set of laboratories (sessional) courses to support them.

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





2.7. <u>Assignment of Credits</u>

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. <u>Types of Courses</u>

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. <u>Course Offering and Instruction</u>

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. <u>Student Adviser</u>

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

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

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

2.12. Course Registration

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

2.12.1. <u>Registration Procedure</u>

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

2.12.2. <u>Pre-conditions for Registration</u>

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

2.12.3. <u>Registration Deadline</u>

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

2.12.4. Penalty for Late Registration

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

2.13. Limits on the Credit Hours to be taken

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

2.14. Course Add/Drop

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

first week of a short term. Dropping a course is permitted within the first four weeks of a regular term. Add/ Drop is not allowed after registration of courses for Supplementary-I and Supplementary-II Examination.

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

2.15. <u>Withdrawal from a Term</u>

If a student is unable to complete the Term Final Examination due to serious illness or serious accident, he/she may apply to the Head of the degree awarding department for total withdrawal from the term before commencement of term final examination. However, application may be considered during term final examination in special case. The application must be supported by a medical certificate from the Medical Officer of MIST. The concerned student may opt for retaining the sessional courses of the term. The Academic Council will take the final decision about such applications. However, the total duration for graduation will not exceed 6 academic years.

2.16. The Grading System

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

Numerical Markings	Grade	Grade Points
80% and above	A+	4.00
75% to below 80%	А	3.75
70% to below 75%	A-	3.50
65% to below 70%	B+	3.25
60% to below 65%	В	3.00
55% to below 60%	В-	2.75
50% to below 55%	C+	2.50

45% to below 50%	С	2.25
40% to below 45%	D	2.00
Below 40%	F*	0.00
Absent	AB	
Dis-collegiate	DC	
Voluntary Withdrawn	VW	
Project/ Thesis continuation	Х	-
Expelled	E	-
Satisfactory	S	-

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

2.17. Course Assessment Strategy

Theory

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

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

Total	100%
Final Examination	60%
Mid-Term Assessment	10%
Class Test/ Assignment/ Homework	20%
Class Performance	5%
Class Attendance	5%

Note:

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

Note:

a. In final exam, each section can be used for achieving not more than two course outcomes (COs). The remaining Cos should be attained from mid-term assessment or class tests. Course teacher has to inform the student at the beginning of the terms.

b. Course teacher of a particular course has to inform the department whether he/she wants to assess mid-term through exam or project within first two weeks of beginning of a term. The duration of mid-term examination should not be more than 50 minutes which has to be

conducted in between 6th and 9th week of a semester. If mid-term assessment is done through project, then there should be project report and presentation.

c. The weightage of class performance can be assessed through checking attentiveness during classes or arranging unnoticed pop quizzes.

d. The number of class tests shall be n for 3.0 or above credit courses and (n-1) shall be considered for grading, where n is the number of credits of the course. However, for courses having credits below 3.0, the considered class tests shall be 2 out of 3.

e. All class tests will carry 20 marks each. Exam software system will finally convert these achieved marks into total class test marks as per credit hour, i.e. for n=1 (20), n=2 (40), n=3 (60) and n=4 (80) etc.

f. Irrespective of the result of the continuous assessment (class performance, class test, midterm assessment), a student has to appear in the final examination (where applicable) for qualifying/passing the concerned course/subject.

Laboratory/Sessional/Practical Examinations

Laboratory/Sessional courses are designed and conducted by the concerned departments. Examination on laboratory/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 laboratory/sessional courses on the basis of the followings:

Total	100%
Viva Voce/ Presentation	10%
Final Evaluation (exam/project/assignment)	30%
Mid-Term Evaluation (exam/project/assignment)	20%
Report Writing/ Programming	15%
Conduct of Lab Test/ Class Performance	25%

Note: The above distribution of percentage can be rearranged to some extent if required by the department.

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

Class Performance/ observation	10%
Written Assignment	15%

Total	100%
Viva Voce	10%
Group Presentation	30%
Listening Skill	10%
Oral Performance	25%

2.18. Class Attendance

Class attendance may be considered as a part of continuous assessment. No mark will be allotted for attending classes.

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

Students having class attendance of 85% or above in individual subject will be treated as collegiate and less than 85% and up to 70% 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 70% 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 and CGPA

Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/completed by a student. For example, if a student passes/completes *n* courses

in a term having credits of C1, C2, \dots , Cn and his grade points in these courses are G1, G2,

 \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 , ..., TC_n and his GPA in these terms are GPA₁, GPA₂, GPA_n respectively then

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

2.21. <u>Numerical Example</u>

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

Course	Credits, Ci	Grade	Grade Gi	Points, Ci*Gi
EWCE 100	1.50	A-	3.50	5.250
EWCE 101	3.00	A+	4.00	12.000
CHEM 103	3.00	А	3.75	11.250
MATH 101	3.00	В	3.00	9.000
EECE 167	3.00	B-	2.75	8.250
EWCE 131	2.00	В	3.00	6.000
CHEM 102	1.50	A+	4.00	6.000
ME 142	1.50	А	3.75	5.625
Total	18.50			63.375

GPA = 63.375/18.50 = **3.43**

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

Level	Term	Credit Earned, TCi	Hours GPA Earned, GPA _i	GPAi*TCi
1	1	18.50	3.73	69.005
1	2	19.50	3.93	76.635
2	1	21.50	3.96	85.140
2	2	17.50	4.00	70.000
Total		77.00		300.78

CGPA = 300.78/77.00 = **3.91**

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. 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.

2.24. Classification of Students

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

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

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

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

Definition of Graduating Student

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

2.25. <u>Performance Evaluation</u>

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.

2.26. 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.

2.27. Time Limits for Completion of Bachelor's Degree

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

2.28. Attendance, Conduct and Discipline

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

Attendance

All students are expected to attend classes regularly. The university believes that attendance is necessary for effective learning. The first responsibility of a student is to attend classes regularly as per MIST rules.

Conduct and Discipline

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

2.29. <u>Absence during a Term</u>

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).

2.30. <u>Recognition of Performance</u>

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

2.31. 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 22 wk or so), Term Final Examination will be held. Students will appear in the Term Final Examination for all the theory courses they have taken in the Term.
- b. Supplementary Examination: It will take place twice in a year. Supplementary-I is defined as provision of giving exam in the first week of Spring Term (Jan-Jun)/ Fall Term (Jul Dec) end break and Supplementary-II in the first week of Fall Term (Jul Dec)/ Spring Term (Jan Jun) end break respectively. Students will be allowed to register for a maximum of two theory courses (Failed / Improvement) in Supplementary-I and maximum of one theory course (Failed / Improvement) in

Supplementary-II.

c. **Improvement Examination:** It will be taken during Supplementary-I and Supplementary-II examination. Questions will be same as the question of the regular examination of that Supplementary Examination (if any). Student can take maximum two subjects at a time (two subjects in Supplementary-I and one subject in Supplementary-II) 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.

2.32. <u>Rules of Different Examinations</u>

Term Final Examination

Following rules to be followed:

- i. 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.
- ii. Late registration will be allowed without penalty within first one week of the term.
- iii. 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.
- iv. Registrar office will finalize registration of all courses within 7 (seven) weeks, issue registration slips and that will be followed by issuing Admit Card.
- v. Term Final Examination to be conducted in the 18-20th week of the term as per approved Academic Calendar.

Supplementary Examination

Following rules to be followed:

- Supplementary-I is defined as provision of giving exam in the first week of Spring Term (Jan – Jun) / Fall Term (Jul – Dec) end break and Supplementary-II in the first week of Fall Term (Jul – Dec) / Spring Term (Jan – Jun) end break, respectively.
- ii. Students will be allowed to register for a maximum of two theory courses (Failed / Improvement) in Supplementary-I and maximum of one theory course (Failed / Improvement) in Supplementary-II.
- iii. No class will be conducted.
- iv. 40% marks will be considered from the previous exams.
- v. Maximum grading in Supplementary Exam will be 'B+'.
- vi. No sessional exam will be conducted.
- vii. Examination will be taken on 60% marks like Term Final Examination.
- viii. If a student fails in a course more than once in regular terms, then for calculating 40% marks, best one of all continuous assessment marks will be counted.

- ix. If anyone fails in the laboratory/sessional course, that course cannot be taken in the supplementary examination.
- x. If any student fails in a course, he/she can clear the course retaking it 2nd time, or he/she can clear the examination appearing at the supplementary examination as well. Any one fails twice in a course, can only retake it in the regular term for appearing third time. But anyone fails even after third time, he/she has to take approval of Academic Council of MIST for appearing 4th (last) time in a course and need to pay extra financial penalty. If any student fails even 4th time in a course, will not be allowed to appear anymore in this same course.
- xi. Registration of Supplementary-I Exam to be done within 5th wk after completion of Fall Term (July to Dec) and registration of Supplementary-II Exam to be done during the Mid-Term break of Spring Term (Jan –Jun), paying all the required fee.
- xii. There will be no provision for add/drop courses after registration.
- xiii. Question setting, Moderation and Result Publication to be done following the same rules of Spring (Jan –Jun) / Fall (Jul Dec) Term Final Exam as per existing MIST Policy.
- xiv. Moderation of the questions for Supplementary-I will be done in the 5th week after completion of Fall Term (Jul –Dec) Final Exam and Supplementary-II with the moderation of the questions of Spring Term (Jan Jun).
- xv. Separate Tabulation sheet to be made.

Project and Thesis and Capstone Project

If a student cannot complete project and thesis and Capstone project in two consecutive terms, with the recommendation of the supervisor, he/she may continue for next one/ two term for both within six academic years.

Improvement Examination

Following rules to be followed:

- i. Improvement examination is to be taken during the Supplementary-II examinations.
- ii. For Improvement examination, registration is to be done during the registration of Supplementary-I and Supplementary-II examinations by paying all the fees.
- iii. Question setting, Moderation and Result publication to be done with courses of Supplementary-I and Supplementary-II examinations.
- iv. Any student gets a grading below 'B+' and desires to improve that course, he/she will be allowed to appear the improvement examination for that particular course.
- v. Highest grade of improvement examination will be 'B+'.
- vi. One student is allowed to appear at improvement exam in 6 (six) courses in his/her whole graduation period taking maximum two courses at a time (two courses in Supplementary-I and one course in Supplementary-II).

2.33. <u>Irregular Graduation</u>

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.

3. <u>DEPARTMENT OF ENVIRONMENTAL, WATER RESOURCES, AND</u> <u>COASTAL ENGINEERING (EWCE)</u>

3.1. Introduction to EWCE

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

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

The proposed programs from EWCE department comprise a total of 160.0 credit hours and 202.00 contact hours and 08 weeks of field work and internship.

3.2. <u>Major Divisions of the Department</u>

Department of EWCE comprises of following divisions:

- 1. Division of Environmental Engineering.
- 2. Division of Water Resources Engineering.

3. Division of Coastal Engineering.

3.3. <u>Vision and Mission of the Department</u>

Vision:

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

Mission:

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

3.4. Laboratory Facilities of the Department

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

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

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

3.5. Awarded Degrees from EWCE Department

EWCE department will offer the following degrees in undergraduate program:

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

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

3.6. <u>Revision of Course Curriculum</u>

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

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

The third revision was recommended by 56th academic council meeting of BUP and approved by 69th syndicate meeting of BUP in 2021. As a part of continuous development of course curriculum, the department has revised the syllabus in 2024 incorporating more contemporary issues in the course contents to make the program more inclined to professional fields of the graduates. The revised course curriculum is presented in Chapter 4 and Chapter 5.

3.7. Program Educational Objectives (PEOs)

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

- a. Develop strong academic foundation for successful professional career.
- b. Acquire skills to excel in the area of civil engineering both in industries and academics.
- c. Possess awareness towards higher education, research & development and socioethical values.

3.8. <u>Learning Outcomes</u>

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

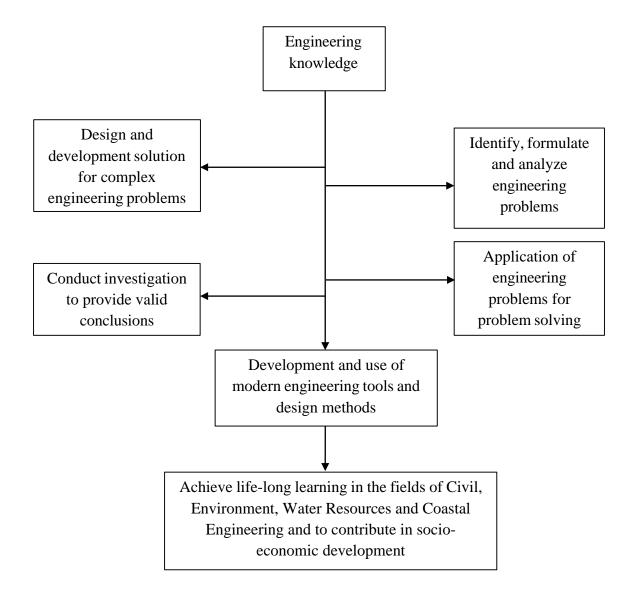
- i. **PO1 Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization (WK1, WK2, WK3, WK4) to the solution of complex Civil engineering problems.
- ii. **PO2 Problem analysis**: Able to identify, formulate, research literature and analyze complex Civil engineering problems and reach substantiated conclusions using the principles of mathematics, the natural sciences and the engineering sciences (WK1, WK2, WK3, WK4).

- iii. **PO3 Design/development of solutions**: Able to design solutions for complex Civil engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal and environmental concerns (WK5).
- iv. **PO4 Investigation**: Able to conduct investigations of complex Civil Engineering problems using research-based knowledge (WK8) considering experimental design, data analysis and interpretation of data and information synthesis to provide valid conclusions.
- v. **PO5 Modern tool usage**: Able to create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modeling, to complex Civil engineering problems with an understanding of their limitations (WK6).
- vi. **PO6 The engineer and society**: Able to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice (WK7).
- vii. **PO7 Environment and sustainability**: Able to understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development (WK7).
- viii. **PO8 Ethics**: Able to apply ethical principles and commit to the professional ethics, responsibilities and the norms of the engineering practice (WK7).
- ix. **PO9 Individual work and teamwork**: Able to function effectively as an individual, and as a member or leader of diverse teams and in multi-disciplinary settings.
- x. **PO10 Communication**: Able to communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.
- xi. **PO11 Project management and finance**: Able to demonstrate knowledge and understanding of engineering and management principles and apply these to one's work as a team member or a leader to manage projects in multidisciplinary environments.
- xii. **PO12 Life-long learning**: Able to recognize the need for, and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

3.9. <u>Generic Skills</u>

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

3.10. Curriculum/ Skill mapping



4. <u>COURSE CURRICULUM STRUCTURE AND SCHEDULE FOR</u> <u>EWCE DEPARTMENT</u>

Considering the program outcome mentioned in Chapter 3, the course schedule for the undergraduate students of the Department of Environmental, Water Resources, and Coastal Engineering (EWCE) is designed and described in this chapter. This curriculum will be effective from spring 2024 session.

4.1. Summary of Course Curriculum (Credit Hours)

				D .	Core Programs			Total
Level/ Term		Basic Science	Dept Courses	Other Engg	Technical Electives			
1-I	-	-	3.00	3.00+ 1.50	5.00 +1.50	3.00+1.50	-	18.50
1-II	1.50	2.00	3.00	3.00+ 1.50	6.00+1.50	-	-	18.50
2-I	1.50	4.00	3.00	-	9.00+1.50	1.50	-	20.50
2-II	-	2.00	3.00	-	9.00+4.50	-	-	18.50
3-I	-	-	-	-	13.00+4.50	3.00	-	20.50
3-II	-	3.00 + 2.00	-	-	10.00+2.50	3.00 + 1.50	-	22.00
4-I	-	2.00	-	-	12.00+7.00	-	-	21.00
4-II	-	-	-	-	3.00+4.50	-	10.00+3.00	20.50
Total Credit Hrs	3.00	18.00	12.00	9.00	94.50	10.50	13.00	160.0
% Of Total Course	1.88%	11.25%	7.5%	5.63%	59.06%	6.56%	8.12%	100%

SI	Level	Term	No. Theory Courses	Theory (Cr. Hr)	No. Lab Courses	Lab (Cr. Hr)	SIP (Cr. Hr)	Thesis and Capstone Project (Cr. Hr)	Credit
1	1st	Ι	5	14	3	4.5	-	-	18.50
2	151	II	5	14	3	4.5	-	-	18.50
3		Ι	6	16	3	4.5	-	-	20.50
4	2nd	II	5	14	4	4.5	-	-	18.50
5	2 1	Ι	5	16	3	4.5	-	-	20.50
6	3rd	II	5	17	2	4.0	1.0	-	22.00
7	4th	Ι	5	14	3	4.5	-	2.5	21.00
8	401	II	5	13	2	3	-	4.5	20.50
	Total						160.00		

4.2. Summary of Term wise Theory and Laboratory Courses

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

Level/Term	Theory Contact	Sessional Contact	Theory Credit	Sessional Credit	Total Contact	Total Credit
	Hours	Hours	Hours	Hours	Hours	Hours
1/I	14.00	9.00	14.00	4.50	23.00	18.50
1/II	14.00	9.00	14.00	4.50	23.00	18.50
2/I	16.00	9.00	16.00	4.50	25.00	20.50
2/II	14.00	9.00	14.00	4.50	23.00	18.50
3/I	16.00	9.00	16.00	4.50	25.00	20.50
3/II	17.00	10.00	17.00	5.00	27.00	22.00
4/I	14.00	14.00	14.00	7.00	28.00	21.00
4/II	13.00	15.00	13.00	7.50	28.00	20.50
Total	118.00	84.00	118.00	42.00	202.00	160.00

4.4. Thesis and Capstone Project

Thesis and Capstone Project will have to be undertaken by students under a supervisor in partial fulfillment of the requirement of his/her degree in the final year/ Level 4. Credit hours allotted to the thesis will be 4.00 and Capstone Project will be 3.00 corresponding to 14.00 contact hours.

4.5. Teaching Strategy

- a. Theory courses will be conducted by participatory lectures, presentation slides, demonstration videos, white board etc.
- b. Sessional courses will be conducted by lab demonstration, test, field sampling, field visit etc. based on the course contents

4.6. <u>Block Syllabus Effective from Spring 2024 Session and onwards (for Batch EWCE -10 and onwards)</u>

Total credit hours: 160.0

LEVEL-1, TERM-I

Course No	Course Name	Type of	Credit	Contact	
		Course	Hour	Hour	
CHEM 103	Fundamentals of Chemistry		3.0	3.0	
MATH 101	Differential and Integral Calculus	Theory	3.0	3.0	
EECE 167	Basic Electrical Technology		3.0	3.0	
EWCE 101	Analytical Mechanics		3.0	3.0	
EWCE 131	Environment, Ecology and Water Resources		2.0	2.0	
	Subto	tal (Theory)	14.00	14.00	
CHEM 104	Chemistry Sessional		1.5	3.0	
ME 142	Workshop Sessional	Sessional	1.5	3.0	
EWCE 100	Engineering Drawing and Computer Aided	Sessional	1.5	3.0	
EWCE 100	Design Sessional				
	Subtota	l (Sessional)	4.5	9.0	
	Total = Credits: 18.50 Contact hours: 23.00				

LEVEL-1, TERM- II

Course No	Course Name	Type of	Credit	Contact	
		Course	Hour	Hour	
PHY 129	Waves and Oscillations, Optics and Structure		3.0	3.0	
PHI 129	of Matter				
MATH 103	Differential Equations and Matrix	Theory	3.0	3.0	
GEBS 101	Bangladesh Studies		2.0	2.0	
EWCE 103	Surveying		3.0	3.0	
EWCE 105	Environmental Chemistry		3.0	3.0	
	Subto	otal (Theory)	14.00	14.00	
PHY 130	Physics Sessional	Sessional	1.5	3.0	
LANG 102	Communicative English-1	Sessional	1.5	3.0	
EWCE 104	Practical Surveying	Field Work	1.5	3.0*	
	Subtotal (Sessional &	Field Work)	4.5	9.0	
	Total = Credits: 18.50, Contact hours: 23.00				

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

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
GELM 275	Leadership and Management		2.0	2.0
MATH 201	Vector Analysis, Laplace Transform & Co- ordinate Geometry		3.0	3.0
EWCE 201	Construction Materials	Theory	3.0	3.0
GES 201	Fundamentals of Sociology	-	2.0	2.0
EWCE 205	Numerical Methods		2.0	2.0
EWCE 211	Mechanics of Solids		4.0	4.0
	Subto	otal (Theory)	16.00	16.00
CSE 278	Computer Programming and Computations Sessional		1.5	3.0
LANG 202	Communicative English-II	Sessional	1.5	3.0
EWCE 212	Structural Mechanics and Materials Sessional		1.5	3.0
	Subtot	al (Sessional)	4.5	9.0
	Total = Credits: 20.50, Contact hours: 25.00			

LEVEL-2, TERM-I

LEVEL-2, TERM-II

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
GEA 201/	Principles of Accounting/ Fundamentals of	Theory	2.0	2.0
GEE 201	Economics			
MATH 203	Applied Math for Engineering		3.0	3.0
EWCE 203	Geology and Geomorphology		3.0	3.0
EWCE 261	Fluid Mechanics		3.0	3.0
EWCE 213	Structural Analysis I		3.0	3.0
	Subto	otal (Theory)	14.00	14.00
EWCE 200	Details of Construction & Quantity Surveying		1.5	3.0
HW/CH 206	GIS in Environmental and Water Resources Engineering	Sessional	1.5	3.0
EWCE 262	Fluid Mechanics Sessional		1.5	3.0
	Subtota	al (Sessional)	4.5	9.0
	Total = Credits: 18.50, Contact hours: 23.00			

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
EWCE 363	Engineering Hydrology	Theory	3.0	3.0
CE 385	Design of Concrete Structures I		3.0	3.0
EWCE 331	Water Supply Engineering		3.0	3.0
	Geotechnical Engineering- I: Principle and Practices of Soil Mechanics		3.0	3.0
EWCE 351	Transportation Engineering		4.0	4.0
	Subte	otal (Theory)	16.00	16.00
EWCE 332	Environment Engineering Sessional		1.5	3.0
EWCE 342	Geotechnical Engineering Sessional	Sessional	1.5	3.0
EWCE 352	Transportation Engineering Sessional		1.5	3.0
	Subtot	al (Sessional)	4.5	9.0
	Total = Credits: 20.50, Contact hours: 25.00			

LEVEL-3, TERM-II

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
GEPM 375	Project Planning and Construction Management	Theory	3.0	3.0
CE 387	Design of Concrete Structure II		4.0	4.0
EWCE 333	Waste Water Engineering and Sanitation		4.0	4.0
EWCE 343	Geotechnical Engineering- II: Foundation Engineering		3.0	3.0
EWCE 361	Open Channel Hydraulics		3.0	3.0
	Subto	otal (Theory)	17.00	17.00
EWCE 300	Students' Internship Program (SIP)	Internship	1.0	2.0+
CE 386	Concrete Structure Design Sessional I		1.5	3.0
EWCE 362	Open Channel Hydraulics Sessional	Sessional	1.5	3.0
GERM 352	Fundamentals of Research Methodology		1.0	2.0
	Subtotal (Internship	& Sessional)	5.0	10.0
	Total = Credi	ts: 22.0, Con	tact hou	rs: 27.00

⁺ Equivalent Contact Hours [Duration – 4 Weeks, after Term Final Examination].

Course No	Course Name	Type of Course	Credit Hour	Contact Hour
GEEM 445	Engineering Ethics and Professional Practices	Theory	2.0	2.0
EWCE 411	Structural Analysis II		3.0	3.0
EWCE 431	Environment and Social Impact Assessment		3.0	3.0
EWCE 461	River Engineering and Flood Management		3.0	3.0
EWCE 471	Coastal Engineering		3.0	3.0
	Subt	otal (Theory)	14.00	14.00
EWCE 432	Environmental Engineering Design Sessional		1.5	3.0
EWCE 462	Computer Applications in Water and Environmental Engineering	Sessional	1.5	3.0
EWCE 464	Advanced Applications of GIS and RS		1.5	3.0
EWCE 400	Project and Thesis	Research	1.0	2.0
EWCE 402	Capstone Project	Design Project	1.5	3.0
	Subtotal (Session	7.0	14.0	
	Total = Credit	ts: 21.0; Cont	act hour	s: 28.00

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

Course No	Course Name	Type of Course	Credit Hour	Contact Hour	
EWCE 467	Integrated Water Resource Management (IWRM)	Compulsory Theory	3.0	3.0	
EWCE 433	Solid and Hazardous Waste Management	Major	3.0	3.0	
EWCE 435	Air Pollution and Control	Theory	2.0	2.0	
EWCE 437	Industrial Waste and Waste Water Treatment		3.0	3.0	
EWCE 469/ 473/ 475/ 477/ 479	Mathematical Modelling in Water Resources Engineering/ Waterway Engineering/ Urban Hydrology/Climatology/Groundwater Engineering	Minor Theory	2.0	2.0	
	Subt	total (Theory)	13.00	13.00	
EWCE 400	Project and Thesis	Research	3.0	6.0	
EWCE 402	Capstone Project	Design Project	1.5	3.0	
EWCE 434	Environmental Modelling Sessional	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	1.5	3.0	
EWCE 436/	Treatment Plant Design Sessional/	Sessional	1.5	3.0	
438	Building Service Sessional				
	Subtotal (Sessional & Project)			15.00	
	Total = Credits: 20.50, Contact hours: 28.00				

Course No	Course Name	Type of Course	Credit Hour	Contact Hour		
EWCE 467	Integrated Water Resource Management (IWRM)	Compulsory Theory	3.0	3.0		
EWCE 463	Irrigation and Drainage Engineering	Major	3.0 3.0 3.0 3.0 3.0 3.0 2.0 2.0 2.0 2.0			
EWCE 465	Design of Hydraulic Structures	Theory	3.0	3.0		
EWCE 477/ 479	Climatology / Groundwater Engineering		2.0	2.0		
EWCE 435/	Air Pollution and Control / Natural Resources	Minor	2.0	2.0		
439/481/	& Renewable Energy/ Climate Change &	Theory				
483/485	Disaster Management/ Building Services/ Environmental Management System					
	Subt	otal (Theory)	13.00	13.00		
EWCE 400	Project and Thesis	Research	3.0	6.0		
EWCE 402	Capstone Project	Design Project	1.5	3.0		
EWCE 466	Hydraulic Structure Design Sessional	C 1	1.5	3.0		
EWCE 468	Water Modelling Sessional	Sessional	1.5	3.0		
	7.5	15.00				
	Total = Credi	ts: 20.50, Con	tact hou	rs: 28.00		

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

CHAPTER 5

5. DETAILED CURRICULUM OF UNDERGRADUATE COURSE

5.1. <u>Courses Offered by EWCE Department</u>

COUR	COURSE INFORMATION												
Course	Code: EWCE 100							Cr	edit	Hou	ır: 1.	.5	
Course	Title: Engineering Drawing and C	Comp	uter A	Aide	ed D	esig	n	Co	ntac	t Ho	our:	3.0	
Session	nal	-				-							
PRE-R	EQUISITE												
None													
	ICULUM STRUCTURE												
	ne Based Education (OBE)												
	PSIS/ RATIONALE												
	e useful for designing and drawing	-					-				-	-	
isometric representations, dimensioning, etc. Designing and drawing of basic civil engineering													
components using AutoCAD will be helpful during project work in later semesters, as well as													
•	professionally. In this course students will be able to learn how to draw the plan, elevation and												
sectional view of one storied building both on paper and using AutoCAD as well as bridges,													
culvert, embankments.													
OBJEC													
	To get familiar with different draw	•											
2. '	To develop a deep understanding o	of diff	erent	geo	ome	tric 1	figu	es a	nd c	ortho	ograp	phic	
	views.												
3. '	To understand the concept of plan,	eleva	ation	and	sec	tion	al vi	ews	of c	ne s	storie	ed	
	building.					~							
	To gain knowledge about the basic					DCA	D ef	ficie	ently	· •			
	To take data and transform it into g	graph	ic dra	awir	igs.								
	SE CONTENT	•	C 1	,		1		1			C*		
	nd lettering, plane geometry: dra												
	n, hexagon, octagon, ellipse, solic eory of projections, drawing of isor												
	ments of cube; plan, elevations, an											ibe, j	prism,
uevelop	ments of cube, plan, elevations, an	u see	nona	1 VI		01 0			u ou	mun	ng.		
Introduc	tion to computer usage, introduct	ion to	o CA	Dn	ack	ages	and	l cor	npu	ter a	ided	l dra	afting:
	editing and dimensioning of sim												
	ied buildings, plans, elevations a												
	c and coastal structures.						,						
SKILL	MAPPING (CO - PO MAPPING)											
No	Course Outcome	PRO	OGR.	AM	OU	TCO	OME	ES (I	Os)				
110		1	2	3	4	5	6	7	8	9	10	11	12
	CO1: Ability to recognize various												
1	drawing instruments and												
1	understand basic techniques of	-											
	drawing												
	CO2: Ability to understand 2D												
2	and 3D views of different objects, shaped, buildings and hydraulic												
	structures	1											
3	CO3: Ability to draw different												
	views of structural elements.												
4	CO4: Ability to understand the					\checkmark		_					
	•												

	basic concept and features of AutoCAD software in engineerin applications							
5	CO5: Ability to apply th knowledge to draw deta architectural and structural drawin of buildings, embankments, an culverts.	il V g						
6	CO6: Ability to apply th knowledge to draw sectional view plan view and elevation of variou structures	∕, √						
COUR	SE OUTCOMES & GENERIC S	KILLS				<u>г</u>		
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods	
CO1	Ability to recognize various drawing instruments and understand basic techniques of drawing	1	C2	1	_	3	Class Assessment, Assignment, Mid quiz	
CO2	Ability to understand 2D and 3D views of different objects, shaped, buildings and hydraulic structures	1	C2	1	_	3	Class Assessment, Assignment, Mid quiz	
CO3	Ability to draw different views of structural elements.	1	C3	1	_	3, 5	Class Assessment, Assignment, Mid quiz	
CO4	Ability to understand the basic concept and features of AutoCAD software in engineering applications	5	C5	1	_	3,6	Class Assessment, Assignment, Final quiz	
CO5	Ability to apply the knowledge to draw detail architectural and structural drawing of buildings, embankments, and culverts.	1	C3	1	_	3,5	Class Assessment, Assignment, Final quiz	
CO6	Ability to apply the knowledge to draw sectional view, plan view and elevation of various structures	1	C3	1	_	3,5	Class Assessment, Assignment, Final quiz	

	WP= Wa EA=	shington Acco	ord Complex F	roblem Solv	ing/ CP= Com	plex Problem Solving;
	Engineer Knowled			x Activities;	WK= Washin	gton Accord
	Profile/ K	KP= Knowledg	e Profile			
	*Level of C1 –	f Bloom's Tax C2 –	onomy: C3-	C4 –	C5 -	C6 –
	Rememb		and Apply	-		Create
	Presentat	ion, R –Repor	t, F – Final Ex	am)	Exam, Asg – .	Assignment, Pr –
TEAC	CHING AN	ND LEARNIN				
			l Learning Ac	tivities		Engagement (Hours)
	o-face Lean					
•]	Lecture (3	hours/week ×	12 weeks)			36
Self- D	virected Le	arning				
•	Non-face	e-to-face learni	ng			2
•		of the previou	-	ome		4
•		on for final ex				4
Formal	Assessme					
Formar		ous Assessmen	+			12
		bus Assessmen	l			2
•	Quiz		TT (1			
			Total			60
		HODOLOGY				
Lecture a	and Discus	sion, Problem	Based Method			
	SE SCHEI					
Week	Lecture		Topics to	be Covered		Assessment
1	1				nts; Lettering	ç /
_	_		Lines / Dime		0	
2	2	Geometry: E	llipse, Parabo	la, Hyperbol		
3	3	Objects		-		3D Class Assessment, Home
4	4	Orthographic Objects	view of 3D	Objects Sect	ional View of	3D Assignment, Mid Quiz
5	5		to Different I One Storied F		uilding; Plan a	and
6	6		ws of One Sto		ıg	
7		Mid Quiz				
8	7	Introduction	to AutoCAD	and its featu	res	
9	8		, text writing g, object prop		making bloc	·ks,
10	9	One-storied sectional vie	building: foun w, detailing	dation, plan	, elevation,	Class Assessment,
11	10	One-storied sectional vie	Home Assignment, Final			
12	11				lator, aqueduc	t Quiz
13	12	Top view, the mbankment				
14		Final Quiz				
	MENT OF	-				
HOOEOO	DIVIENTS	TRATEGY				
		ients	Grading		CO	Bloom's

Continuous Assessment (Class assessments / Assignments / Active Class Participation)	40%	CO1, CO2, CO3, CO4, CO5, CO6	C2, C3, C5						
Quiz	60%	CO1, CO2, CO3, CO4, CO5, CO6	C2, C3, C5						
Total Marks	100%								
REFERENCE BOOKS									
1. Civil Engineering Dra	wing by - Gu	ırcharan Singh & Subash Chai	ndra						
	2. Prathomic Engineering Drawing by - Hamonto Kumar Bhottacharjo								
3. Engineering Drawing	by Basant A	grawal and C M Agrawal							

COURSE INFORMATION												
Course Code: EWCE 101						Cre	edit	Но	our:	3.0		
Course Title: Analytical Mechanics						Co	nta	ct H	Iour	:: 3.0		
PRE-REQUISITE												
None												
CURRICULUM STRUCTURE												
Outcome Based Education (OBE)												
SYNOPSIS/ RATIONALE												
Purpose of this course is to provide student	s th	e bas	ic co	once	pt a	nd ir	1-de	epth	n kno	owle	dge in	the
field of mechanics of rigid body which will	l be	helpt	ful f	or th	eir f	futur	e st	udy	y/ co	ourse	s	
OBJECTIVE												
1. Understanding different force systems	s and	d the	ir b	asic	mat	hem	natio	cs t	o so	olve	statica	ılly
determinate stationary rigid bodies, ex												
· · · · ·	beam, trusses and frames composed of pin connected members and forces developed in											
the cables and supports.												
2. To apprehend the problems involving	fric	ction	and	the	ir re	eal a	ppl	icat	tion	(in a	a limi	ted
scale).												
3. To determine geometric properties like												
Pappus and Guldinus, Centre of pressu												
Rectangular and Polar Moment of Inert												
areas, Transfer formula, Product of Iner							inc	line	ed az	x1s, n	naxim	um
and minimum moment of inertia, Mom							١ 4.					
4. Solve different problems with the conc	ept	of lin	ear .	Imp	uise	and	MC	ome	entui	<u>m.</u>		
COURSE CONTENT		anto	of fe	aa h	odu	dias			<u></u>	iona	forate	tio
Coplanar and non-coplanar force systems, c equilibrium, internal forces and moments,												
friction, impending moment, introduction												
volumes, moments of inertia of areas and n											iteas a	illu
SKILL MAPPING (CO – PO MAPPING)	11455	es, 11			lent		mu	<u> 1111</u>	puis	с.		
No Course Outcome	F	PROC	FR Δ	MO			ME	5 (1	POs)		
	1	2	3	4	5			8	9		11	12
1 CO1: Ability to understand free		4	5	т	5	0	/	0	/	10	11	12
body diagrams of different types of												
rigid bodies.	v											
2 CO2: Ability to apply equations of												
equilibrium to analyze statically												
determinate rigid bodies		•										
3 CO3: Ability to estimate the												
geometric properties like centroids,												

	moment of inertia etc. of differe	nt							
	objects. CO4: Ability to apply the								
		nd	v						
	momentum.								
	RSE OUTCOMES & GENERIC S	KILLS	1	-					
No	Course Outcome	ള							
		Corresponding POs	Bloom's Taxonomy*				ant		
		iods	l) s				Assessment Methods		
		rre: S	noc				Assessme Methods		
		Corr POs	Blo Ta	CP	CA	KP	As Me		
CO1	CO1: Ability to understand						Pop Quiz,		
	free body diagrams of	1	C2	1	—	1	Final Exa		
	different types of rigid bodies						~ -		
CO2	CO2: Ability to apply equations of equilibrium to						Class Test		
	analyze statically	2	C3	1	-	1	Mid-Term Final Exa		
	determinate rigid bodies							11	
CO3	CO3: Ability to estimate the						Mid Term		
	geometric properties like	1	C3	1	_	1	Final Exa	n	
	centroids, moment of inertia etc. of different objects.								
CO4	CO4: Ability to apply the						Class Test		
001	principles of impulse and	2	C3	1	_	1	Final Exa	-	
	momentum.								
	WP= Washington Accord Con	nplex P	roblem s	Solving/	CP = C	Comple	x Problem		
	Solving; EA=	a 1		• • • • • • • • • • • • • • • • • • • •		1.	A 1		
	Engineering Activities/ CA= Knowledge	Comple	x Activit	ties; WK	= was	hingtoi	n Accord		
	Profile/ KP= Knowledge Prof	ile							
	*Level of Bloom's Taxonomy								
		3-	C4 -	C5		C6 -			
	Remember Understand Ap	oply	Analyze	Evalu	ıate	Creat	e		
	(T – Test, PR – Project, Q – Q	miz M	– Mid T	erm Eva	m Asc	τ _ Δες	ionment Pr	_	
	Presentation, R $-$ Report, F $-$ I				111, 7 102	- 1100	igninent, i i		
TEA	CHING AND LEARNING STRA		, 						
Teac	ching and Learning Activities						gagement		
						(He	ours)		
	to-face Learning						42		
	Lecture (3 hours/week \times 14 weeks)						42		
Sell-	Directed Learning Non-face-to-face learning						09		
•	Revision of the previous lecture	at hom	e				18		
•			-				46		
	al Assessment								
•	Continuous Assessment						02		
•	Final Examination					03			
	Total						120		
	HING METHODOLOGY								
Lecture	e and Discussion, Problem Based M	Aethod							

COURS	SE SCHEDU	LE					
Week	Lecture	Topics to be Covered	Assessment				
	1	Resultant and Components of Forces					
1	2	Types of Forces and Introduction to Coplanar Concurrent Forces					
1	3	Centroids: Definitions of centroids, centre of mass and centre of gravity, Formulas of centroids for line, area and volume.	CT/				
	4	Concept of Equilibrium	Assignment/				
2	5	Free Body Diagrams	Final Exam				
Z	6	Principle of symmetry and centroid, centroid by summation method	T mar Exam				
	7	Introduction to Truss					
3	8	Analysis of Truss by joint Method					
5	9	Centroid by Integration, practice centroid of lines by integration					
	10	Analysis of Truss by Joint to Joint Method					
	11	Tutorial 1(on Forces, Resultant and Components)					
4	12	Centroid of Arc of a Circle, Centroid of plane triangle, Centroid of sector of a circle, Centroid of area without axis of symmetry.	CT/ Assignment/				
	13		Final Exam				
_	14						
5	15 Centroid of a volume (right circle cone, cylinder, hemisphere etc.) 16 Concept of Parallel Force System Determination of Reaction						
	16						
6	17						
	18						
	19	volume Tutorial on Determination of Reaction Forces, Forces on Members of Frames					
7	20	Tutorial on Determination of Reaction Forces, Forces on Members of Frames					
	21	Theorem of Pappus and Guldinus, Center of Pressure					
	22	Non-Concurrent, non-Parallel, Coplanar Forces					
0	23	Analysis of Truss by Method of Section					
8	24	Practice problem related to Theorem of Pappus and Guldinus, Center of Pressure	Mid Term/				
	25	Concept of Rectangular and Polar moment of Area and radius of gyration, Parallel axis, and perpendicular axis theorem (Transfer formula, rectangular to polar)	Assignment/ Final Exam				
9	26	Tutorial on Analysis of Truss by Method of Section					
	20	Practice problems of Rectangular Moment of Inertia					
	27	and radius of gyration with axis of symmetry (Rectangle, triangle etc)					
	28	Tutorial on non-concurrent, non – Parallel, Coplanar Forces					
10	29	Practice problems of Rectangular Moment of Inertia and radius of gyration with axis of symmetry (Rectangle, triangle etc)					
	30	Maximum and Minimum Moment of Inertia by					

		formula	and Mohr's	circle							
				ce problems (solid cylin	nder) for						
	31			Masses and radius of G							
11	32			and Belt Friction	<u></u>						
	33			about Inclined Axis, Pr	roduct of						
	34	Analysis	of Wedges			-					
12	35	Tutorial	on problems	associated with Friction	l						
	36	Moment	of Inertia of	Composite areas							
	37	Tutorial	on Friction a	and Belt Friction							
13	38		of inertia thin disk, co	of mass and practice pone) I	problems	CT/					
	39		of inertia thin disk, co	of mass and practice pone) II	problems	Assignment/ Final Exam					
	40	Problem	solving on V								
14	41	Moment	of Inerti	a of masses of c	omposite						
17	42	bodies Problem	s solving	on impulse and momen	tum						
ASSESS	MENT STR	ATEGY									
-	Component		Grading	СО	Bloom'	's Taxonomy					
(Class as	ous Assessmo signments/ (ctive Class tion)		40%	CO1, CO2, CO3, CO4	(C2, C3					
	Final Exam		60%	CO2, CO3		C3					
	Total Marks	5	100%								
	ENCE BOO										
	•		•	Chambers (3rd Edition)	•						
			s" by – Singe								
				3th Ed., Hibbeler.							
	4. "Engineering Mechanics: Dynamics", 13th Ed., Hibbeler.										
5. "	5. "Fundamentals of Physics:, 9th Ed., Halliday, Resnick and Walker.										

5.	"Fundamentals	of Physics: 9	h Ed., Hallid	ay, Resnick and Walker.
<i>.</i> .	1 will will will will will	01 1 11 1 01 0 0)		a, itesinen ana wanten.

COURSE INFORMATION	
Course Code: EWCE 103	Credit Hour: 3.0
Course Title: Surveying	Contact Hour: 3.0
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ RATIONALE	
The purpose of this course is to familiar with, to use various types o	f surveying technologies,
procedures and provide basic knowledge on different kinds of surv	eying in the professional
fields which will be helpful during project work in later stages as we	ll as professionally.
OBJECTIVE	
1. To become technically adept on surveying technologies	as well as procedures of
different types of surveying in their professional fields.	
2. To enable the graduates in assisting professional land surve	eyors in various surveying

and mapping projects.

3. To facilitate the graduates to perform their works, duties with a commitment to quality, timeliness, and continuous improvement in surveying in their respective carriers.

COURSE CONTENT

Fundamentals of surveying, linear measurement, chain surveying, plane table survey, traverse surveying, leveling, calculation of area and volume, topographic survey, trigonometrical survey, tachometric surveying, curves and curve setting, project survey. Special and modern survey equipment (Total station, EDM, RTK-GPS, ADCP, Echosounder, OBS etc.). Hydrographic survey (velocity profile, measurement of velocity and discharge, sounding, tide gages), photogrammetry, astronomical surveying, GIS, GPS, RS (remote sensing), drone survey.

SKIL	L MAPPING (CO – PO MAPPING)												
No	Course Outcome	PRO	OGR	AM	OU	TCO	ME	S (P	Os)				
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Able to understand basic survey												
	techniques and procedures as well as												
	use of survey equipment/instruments	-											
2	CO2: Able to use different												
	topographic survey methods i.e.												
	leveling, traversing, tachometry etc.			-									
3	CO3: Able to apply the concept of curve setting and route survey i.e.												
	contouring, calculation of area and												
	volume in civil engineering		v										
	application.												
4	CO4: Able to understand the basic												
	concept of map, hydrographic and												
	astronomical survey, and drone												
	survey, GIS, GPS and RS (remote												
GOV	sensing).	~											
COUL	RSE OUTCOMES & GENERIC SKILL	S					-			1			
		зg			~						<u>ب</u>		
		iibi		\mathbf{s}	'ny					Assessment Methods			
No	Course Outcome	Corresponding	CS	Ē	lor	Ð	<	CA	KP				
110		res	7	Bloom's Taxonomy*					ř.	Met			
		Con		щ	Та						Ā	4	
CO1	Able to understand basic survey		01.02							Clas	s Te	st.	
	techniques and procedures as well as	1		C1, C2		-	1	,3	1		Final Exan		
CO2	use of survey equipment/instruments					-					Clas	s Te	a t
02	Able to use different topographic survey methods i.e. leveling,	2	,	С3,	C5			1	1,			-terr	
	traversing, tachometry etc.	2	·	C5,	CJ	-		1	6			l Exa	
CO3	Able to apply the concept of curve										ma		4111
005	setting and route survey i.e.									A	Assig	gnme	ent.
	contouring, calculation of area and		2	C4,	C5	-		1	1,			s Te	
	volume in civil engineering							6		F	inal	Exa	m
	application.												
CO4	Able to understand the basic concept												
	of map, hydrographic and				~~			,	1,			gnme	
	astronomical survey, and drone			C2,	C3	-		1	3			s Te	
	survey, GIS, GPS and RS (remote sensing).										rma	l Exa	1111
	WP= Washington Accord Complex Pre	hlen	1.501	vina			mpl	ey I	Prob	ler	n So	lvin	σ.
	EA= Engineering Activities/ CA= Con	plex	Acti	vitie	es: V	VK = V	Was	hing	eton		cor	d l	5,
	Knowledge	-p.eA											
	Profile/ KP= Knowledge Profile												
	*Level of Bloom's Taxonomy:												
	Profile/ KP= Knowledge Profile												

	C1 –	C2 –	C3-	C4 –	С	5 -	C6 –					
	Remember	Understand	Apply	Analyze	E	valuate	Create					
		- Project, Q – Qu			am, Asg	g – Assign	iment, Pr –					
	Presentation, R – Report, F – Final Exam)											
	TEACHING AND LEARNING STRATEGY											
Teac	hing and Lear	ning Activities		Engagei	ment (Hours)							
Face-	to-face Learn	ing										
	Lecture (3 h	ours/week \times 14	weeks)				42					
	ed Learning											
Tutori	al/ Assignmen	ts (2 hours/weel	$x \times 6$ wee	ks)			12					
Self- I	Directed Learn	ing										
•	Non-face-to	-face learning				11						
•	Revision of	the previous lec	ure at ho	me			18					
•	Preparation	for the final example	nination				32					
Forma	al Assessment											
a)	Continuous A	Assessment					2					
b)	Final Examin	ation					3					
		Total					120					
TEACH	IING METHO	DOLOGY										
Lecture	and Discussion	n, Problem-Based	Method									

COUI	RSE SCHED	ЛПЕ	
Wee k	Lecture	Topics to be Covered	Assessment
	01	Introduction to surveying, definition. Classification. Importance of Surveying	
1	02	Useful Data and Formulae. Calculation of Areas	
	03	Useful Data and Formulae. Calculation of Volumes	
	04	Chain Surveying, Definition. Procedure. Errors in Chaining. Plotting of Details	
2	05	Advantages and disadvantages of Chain Survey. Linear Measurements	CT1
	06	Traverse Surveying, Definition. Prismatic Compass. Surveyor's Compass	
	07	Useful Definitions, Bearings. Local Attraction.	
3	08	Useful Definitions, Field Procedure, Plotting of Compass Traverse	
3	09	Closing Error and its Adjustment. Characteristics of Closed Traverses. Traverse Chart. Open Traverse	
	10	Plane Table Surveying, Definition. Instruments. Procedure. Orientation.	
4	11	Methods of Plane Tabling, Radiation. Intersection. Traversing. Resection	
	12	Levels and Levelling Definition. Dumpy Levels. Wye Levels. Levelling Staff Adjustment of Levels I	
	13	Levels and Levelling Definition. Dumpy Levels. Wye Levels. Levelling Staff Adjustment of Levels II	Mid Term Exam
5	14	Definitions of Various Terms. Purpose of Leveling. Procedure of Levelling Operation	
	15	Methods of Calculating Levels. Effect of Curvature and Refraction on Levelling. Errors in Levelling. Accuracy Required in Levelling Operation I	

		Mathada of C		anala Effect	of Compositions	
	16	Methods of C				
	16	and Refraction				ing.
6		Accuracy Req			tion II	
	17	Tacheometry				
	18	Definition- I Constants	instruments	. Theory. T	Cacheometric	
	19	Anallatic lens I	, field proce	edure, errors a	and accuracy	
7	20	Anallatic lens II	_			
	21	Curves and C for Circular C	urves	_	on Notations	
	22	Elements of C				CT 2
8	23	Methods of R		ves. Transition	n Curves	
	24	Vertical Curve				
	25	Astronomical				
9	26	Systems of Co				
,	27	Astronomical Equation of T		ons. Instrum	ents. Time.	
	28	Astronomical Equation of T		ons. Instrum	ents. Time.	
10	29	Azimuth and Meridian. Lat			Line: True	
	30	Photogramme			tion	
	31		Photogram	nety. Photo	o-Theodolite.	
11	32	Terrestrial Works in Terr	Photogramr estrial Phot		o-Theodolite. I	
-	33	Plotting Stere				
	34	Plotting Stere	ophcrogram	metry. Paralla	ax II	
12	35	Aerial Photog Compilation a		CT 3		
	36	Aerial Photog Compilation a	grammetry.	Scale of Ph	otographs.	
	37	Hydrographic Velocity Profi	Surveying	•	Soundings.	
13	38	Methods of Soundings. Th	locating	Soundings. scharge measu	Plotting of rement I	
	39	Methods of Soundings. Th	locating ne tides. Dis	Soundings. scharge measu	Plotting rement II	of
	40	GIS and Rem				
14	41	GIS and Remo				
	42	Review of Sur				
ASSES	SMENT ST	RATEGY				
	Compor	nents	Grading	C	0	Bloom's Taxonomy
C	ontinuous A	ssessment				
		CT/ Mid Term/	40%	CO1, CO2.	CO3, CO4	C1, C2, C3, C4, C5
	tive Class Pa		*	,	, -	, , , , , - 0
	Final E	-	60%	CO1 CO2	CO3, CO4	C2, C3
	Total M			C01, C02.	C03, C04	C_2, C_3
DEFE			100%			
	RENCE BO			Dunmia (CI	Unite)	
1.		- Volume I, II, ok of Surveying				
2.	A 16AL 00	ok of Surveying	- wi.A. AZ	iz & Shanjana	11	

3. Schaum's Outline of Introductory Surveying - Roy Wirshing and James Wirshing

4. Construction Surveying and Layout: A Step-By-Step Field Engineering Methods - Wesley G. Crawford

5. Basic Surveying - Raymond Paul and Walter Whyte, 4th Ed.

COUI	RSE INFORMATION													
	e Code: EWCE 104									Cre	dit H	Hour:	1.5	
	e Title: Practical Surveying											Hour		
	REQUISITE									001		11001		
EWCE 103 (Surveying)														
CURRICULUM STRUCTURE														
Outcome Based Education (OBE)														
SYNC	SYNOPSIS/ RATIONALE													
	urpose of this course is to introd												olyin	g
those	those in the field. This training will be useful for the students in professional field.													
OBJE	OBJECTIVE													
	1. To orient the students wit	h th	e use	e of va	ario	ous i	nstr	um	ent	s of s	surv	eying	and	
	applying those in the field	l of	surv	ey.										
	2. To utilize the students '	theo	oretic	al kn	ow	ledg	ge o	on s	surv	veyin	g (I	EWCE	2-103	3)
	into practical fields.					C				-	· ·			
	3. To train the students to pl	an a	ind e	xecute	e si	irve	y w	ork	for	any	eng	ineerii	ng pi	oject.
COUI	RSE CONTENT												01	2
Linea	r and angular measurement tech	niqu	ies, ti	ravers	e s	urve	eyin	g, 1	eve	ling	and	conto	uring	5 ,
curve	setting, tachometry, project su	irve	ying,	mod	err	ı suı	rvey	/ing	g ec	uipr	nent	and	their	
	ations, hydrographic surveying.									•••				
	SKILL MAPPING (CO – PO MAPPING)													
No	Course Outcome PROGRAM OUTCOMES (POs)													
		1	2	3	4	5		6	7	8	9	10	11	12
	CO1: Able to use appropriate													
	survey instruments i.e. chain,													
1	plane table, level, theodolite,													
	total station etc. in survey	v												
	field works				-									
	CO2: Able to analyze survey													
	data in preparing longitudinal													
2	and transverse profiles of a													
	route and contour map of an		v											
	area.													
	CO3: Able to work effectively													
3	as an individual and as a													
	member of a team in survey													
COLU	field works	I CIZ	пт											
000	RSE OUTCOMES & GENERIC	, DK)	1									
				പ്പ			,							
				dir		s,	ny ⁴						440	ls l
No	Course Outcome)son		Ъ,	lon	٩		CA		KP	5	hoc
INO	Course Outcome			esp PC		Bloom'	KOL	C)	Ú		K	1.00000000	Methods
				Corresponding POs		B	1 axonomy*						V 0.0	βŽ
				Ũ		Ľ								,

CO1	A11 /	• .	1	<u> </u>	т			D.:'I		
CO1		use appropriate survey						Daily Quiz,		
		ts i.e. chain, plane table,		~			-	Report,		
	survey fie	bodolite, total station etc. in	1	C3	1,2		6	Final		
	survey ne	iu works						Quiz,		
000				-				Viva		
CO2		analyze survey data in						Daily		
		longitudinal and transverse a route and contour map of	2	C4	22		5,6	Quiz,		
	an area	a route and contour map of	2	C4	2,3		5,0	Report, Final Quiz,		
	un urcu							Viva		
CO3	Able to	work effectively as an						Daily		
	individual	and also as a member of a						Quiz,		
	team in su	rvey field works	9	C3	1		6	Report,		
								Final Quiz,		
	WD W.	L'actor Accord Consultat Da	1.1	1			D	Viva		
		hington Accord Complex Pro neering Activities/ CA= Com								
	Knowledg		piez Ac	uvines,	•• IX— ••	asining		Joiu		
		P= Knowledge Profile								
		Bloom's Taxonomy:								
	C1 –	C2 - C3 -	C4 -		C5 -	a.t.a	C6			
	Remembe	r Understand Apply	Analy	ze	Evalu	ate	Cre	ate		
	(T-Test. P	R – Project, Q – Quiz, M – M	fid Tern	n Exam.	Asg - A	Assignr	nent. Pr	·_		
	Presentatio	on, R – Report, F – Final Exa	m)	,	8	0	,			
		ND LEARNING STRATEG	Y							
		earning Activities			E	Ingage	ment (H	lours)		
	o-face Lea					6				
•		2hours/week \times 3 weeks)	``			6 45				
• Salf T		rk (15 hours/week \times 3 week	(S)			43				
Sell-L	Directed Le	reparation (2hours/week \times 3	wooks)			6				
		on for quiz and viva	weeks)			2				
Forma	1 Assessme									
	z and viva						1			
		Total				60				
TEACH	ING MET	HODOLOGY								
Lecture	and Discu	ssion, Problem Based Metho	d							
COLIE										
Week	SE SCHE	Topics to be Covered			A 6	coccm	ont			
WEEK						sessm	ent			
	01	Linear and angular measure		-	5					
	02	Route survey; Calculation ovolume	of cut ar	nd fill						
1	03	Traverse surveying								
	04	Trigonometric surveying			Ľ		uiz, Re Quiz, V	port, Final iva		
	05	Tacheometric surveying					- / /			
	06	Contouring								
2	07	Curve setting: Simple Circu	ular Cur	ve						
1										

	09	Plane Table Survey					
	10	Project surveying					
	11	Hydrographic survey					
	12	Application of moder like GPS, Total statio		-			
3 Application of modern surveying equipment's like GPS, Total station, RTK GPS etc.							
	14	Final Quiz					
	15	Field Test and Viva					
ASSES	SMENT S	TRATEGY					
	Con	nponents	Grading	С	0	Bloom's Taxonomy	
Continuous Assessment (Daily Quiz, Field performance/ works /attendance, Observations, Final reports and assignments, Practical exam)			X7%	CO1, CO2, CO3		C3, C4	

15%

100%

CO1, CO2, CO3

C3, C4

Total Marks REFERENCE BOOKS

Final Exam

1. 1. Surveying- Volume I, II, III - Dr. B.C. Punmia (SI Units).

2. A Text book of Surveying - M.A. Aziz & Shahjahan.

3. Practical Surveyor - Samuel Wyld and David Manthey.

COURSE INFORMATION	
Course Code: EWCE 105 Credit Hour: 3.0	
Course Title: Environmental Chemistry Contact Hour: 3.0	
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ RATIONALE	
The course is concerned with the interactions of chemicals (natural or artificial) in air, w	ater,
soils and sediments which help to understand the elements of pollution and their sou	rces.
Students will develop a firm knowledge of analytical chemistry to environmental proc	esses
which will be used in later semesters and also in professional fields.	
OBJECTIVE	
1. To understand the importance of 3R (Reuse, Reduce and Recycle) principle.	
2. To understand the details of pollutant chemistry in atmosphere, water, soil and	food
as well as their adverse effects on environment and human health.	
3. To describe the process chemistry involved in water and waste water treat	ment
plants.	
4. To understand the chemical mobilization from anthropogenic sources,	like
industrialization, agriculture, drug and food additives.	
COURSE CONTENT	

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

Atmospheric chemistry: Atmospheric cycles, air pollution and pollutants - criteria and critical

pollutants, ozone hole and stratospheric ozone depletion, chemical and photochemical reactions in atmosphere, hydrocarbons and photochemical smog.

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

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

	MAPPING (CO – PO MAPPING)		10 10	ou pi	CSCI	vativ	CS.							
		DD4							(\mathbf{n})					
No	Course Outcome	1 1	$\frac{\mathbf{GR}}{2}$	$\frac{RAM}{3}$	4	5		<u>5 (P</u> 7	Us) 8		10	11	10	
1	CO1: Ability to understand the concept of 3R principle and relate with their day-to-day work environment.			3	4	3	6	/	8	9	10	11	12	
2	CO2: Ability to explain the chemical and biochemical principles of fundamental environmental processes in air, water, and soil.													
3	CO3: Ability to identify the pollution sources as well as understand the principals of pollutant removal and environmental fate of contaminants.		V	-										
COUR	SE OUTCOMES & GENERIC SKIL	LS				<u> </u>								
No	Course Outcome	Corresponding	POs	Bloom's Taxonomv*		CP	CA		KP		Assessment Methods			
CO1	Ability to understand the concept of 3R principle and relate with their day-to-day work environment.		L	C2		-					1	Assignment, Class Test, Final Exam		st,
CO2	Ability to explain the chemical and biochemical principles of fundamental environmental processes in air, water, and soil.	1	L	C2, C	23	-	-		1	Class Test, Mid-term, Final Exam				
CO3	Ability to identify the pollution sources as well as understand the principals of pollutant removal and environmental fate of contaminants.	(4	2 C2 3] H	Assignment, Class Test, Mid Term, Final Exam						
	WP= Washington Accord Complex F EA= Engineering Activities/ CA= Complex Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 – C2 – C3- Remember Understand Appl (T-Test, PR – Project, Q – Quiz, M – Presentation, R –Report, F – Final Ex	x Ac C y A Mid	tiviti 4 – .naly	ies; W vze	√K=	Was C5 Eva	hing - lluat	gton	Ac		rd C6 — Creat	e	ng;	

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

TEAC	CHING AN	ND LEARNING STRATEGY						
		earning Activities	Engagement (Hour	rs)				
	o-face Lea	<u> </u>						
	Lecture	0		42				
•	Practical/	Futorial/ Studio						
		Centered Learning						
-	virected Le	<u> </u>						
		e-to-face learning	09					
		-	18					
•		of the previous lecture at		46				
	home			40				
•	.	on for the final examination						
	Assessme			2				
		is Assessment		2				
b)	Final Exar	nination		3				
		Total		120				
ТЕАСИ	ING MET	HODOLOGY		120				
		sion, Problem-Based Method						
	SE SCHE							
		Topics to be Covered		Assessment				
,, cer	01	Introduction to basic environ	mental chemistry	1 1000001110110				
		Scopes and history of						
1	02	environmental chemistry	de veroprinente or					
	03	Introduction on aquatic chem	nistrv	CT1				
	04	Green synthetic chemistry						
2	05	Concept of 3R (reuse, reduce	e and recycle)					
	06	Physical properties of water	<u> </u>					
	07	Composition, structure a	and evolution of					
3	00	atmosphere						
	08	Carbon cycle and nitrogen cy						
	09	Chemical properties of water						
4	<u>10</u> 11	Introduction to chemistry of						
4	11	Sources and effects of air pol						
	12	Non-aqueous phases in water CFCs						
5	13	Ozone hole and stratospheric	ozona danlation					
5	14	Complex reactions in aqueou		Mid Term Exam				
		Complex reactions in aqueou Chemical and photochem						
	16	atmosphere I						
6	17		nical reactions in					
	18	atmosphere II	I					
	18	Equilibrium problem solving Hydrocarbons and photocher						
7	20	Introduction to effects of air						
	20	Equilibrium problem solving						
	21	Greenhouse gas effects	11					
	22	Aqueous carbonate system I						
8		Aqueous carbonate system	II, Alkalinity and					
	24	acidity	·					
	25	Climate change and its conse		CT2				
9	26	Water pollution and pollutan	ts	012				
	27	Redox equilibria						
10	28	Basic introduction to monito	ring of air quality					
10	29	Organic pollutants in water	·. · ·					
	30	Chemistry of water quality n	nonitoring and water					

		quality standar	ds.					
	31		nts and critical polluta	nts				
11	32		composition of soil					
	33		ollutants in soil					
	34		hods for monitoring air					
12	35	Chemical fates	of pollutants					
	36	Metal dissoluti	ons and precipitations					
	37	Air quality star						
13	38	Adsorption of 1	netals I					
	39		CT3					
	40		ir pollution incidents/					
	41	Biochemical pr	operties and impacts of	f pesticides,				
14	41	insecticides		_				
	42		operties and impacts of	f anti-biotic				
	42	and food preser	rvatives					
ASSESS	SMENT S	TRATEGY						
Compo	nents	Grading	СО	B	Bloom's Taxonomy			
Continu	ous Assess	sment						
(Class as	ssignment	s/ CT/						
Mid Ter	m/Active	Class 40%	5 CO1, CO2,	, CO3	C2, C3			
Participa	ation)				,			
1	,							
F	inal Exam	60%	5 CO1, CO2	, CO3	C2, C3			
Te	otal Marks	1009			·			
REFER	ENCE B							
			In aire a arin a Clair N	C D.	my I. McContry and Cana			

1. Chemistry for Environmental Engineering – Clair N. Sawyer, Perry L. McCarty and Gene F. Parkin, 4th ed., McGraw Hill Inc.

2. Environmental Chemistry – Stanley E. Manahan., 8th ed., CRC Press.

3. Aquatic Chemistry: Chemical Equilibria and Rates in Natural Waters – Werner Stumm and James J Morgan, 3rd ed., Hoboken: Wiley, 2012.

4. Environmental Engineering – Howard S. Peavy, Donald R. Rowe and George

Tchobanoglous, McGraw Hill International Edition.

COURSE INFORMATION	
Course Code: EWCE 131	Credit Hour: 2.0
Course Title: Environment, Ecology and Water Resources	Contact Hour: 2.0
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ RATIONALE	
The purpose of this course is to introduce ecological levels of an orga	nization, biogeochemical
cycles, biodiversity loss, environmental and anthropogenic pollut	ants, their sources, and
impacts on the environment and human health. Understanding ecolo	ogical processes and loss
will help to identify the areas of intervention for conservation in th	e practical field. A basic
understanding of environmental pollutants and existing standards	will help understand the
importance of pollution abatement in later semesters as well as in pro-	fessional fields
OBJECTIVE	

1. To understand the basic concept of material transport and energy dissipation in various trophic levels, human induced alteration of biogeochemical and hydrologic cycles, biodiversity loss and its impacts on environment.

2. To understand the basics of pollutant from atmosphere, water and soil as well as their adverse effects on environment and human health.

3. To give basic idea about environmental rules and water quality standards.

4.	То	apprehend	preliminary	concept	of	environmental	pollution	and	water
resourc	es is	sues and ma	inagement						

COURSE CONTENT

Background of ecology, ecosystem and bio-diversity, biogeochemical cycles, hydrologic cycle, human influence on biogeochemical cycles. Environmental Pollution, Environment and water resources standards, Environment and water Pollution Management, Water Resources Problems and Management.

	LL MAPPING (CO – PO MAPPIN	<u>G)</u>											
No	Course Outcome	PROGRAM OUTCOMES (POs)											
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: To understand the basic	\checkmark											
	concept of material transport and												
	energy dissipation in various												
	trophic levels, human induced												
	alteration of biogeochemical and												
	hydrologic cycles, biodiversity												
	loss and its impacts on												
_	environment.												
2	CO2: To understand the basics of	1											
	pollutant from atmosphere, water												
	and soil as well as their adverse												
	effects on environment and												
2	human health.			ļ									
3	CO3: To give basic idea about	\checkmark											
	environmental rules and water												
4	quality standards.												
4	CO4: To apprehend preliminary												
	concept of environmental		v										
	pollution and water resources												
COI	issues and management JRSE OUTCOMES & GENERIC S		C										
	SKSE OUTCOMES & GENERIC S	DNILI							Т	-			
				ing 11		s.	*_	_		_			nt .
			-	bnd °		, г	ŚЩ	Ϋ́	<	Ś	VK		ods
No	Course Outcome			g C		nou	onc	CP (WP)			KP (WK)		eth
				Corresponding		Blc	Taxonomy*	CE	Č	5	KF		Assessment Methods
			C	5			Ξ						ł
CO1	To understand the basic concer	nt of										1	
	-	nergy										1	
	dissipation in various trophic le												ass Test,
	human induced alteration	of		1		С	2	-		_	1		id-term,
	biogeochemical and hydrologic cy												Final
	biodiversity loss and its impact												Exam
	environment.											1	
CO2	D2 To understand the basics of pollutant from atmosphere, water, and soil as											Cla	ass Test,
				1		С	'n				1		id-term,
	well as their adverse effects			1		U		-		_	1		Final
	environment and human health.												Exam
CO3	To give basic idea about environr	nenta	1										ass Test,
	rules and water quality standards.			2		С	2	-		-	2		id-term,
												Fina	al Exam

er re H H H H (((C (C (C (C))	NVIRONMENT SOURCES ISS WP= Wash EA= Engineering Profile/ KP *Level of E C1 – Reme Create T – Test, F Presentation CHING AN	nd preliminary concept of tal pollution and water 1 C1, C2 sues and management 1 C1, C2 ington Accord Complex Problem Solving/ CP= g Activities/ CA= Complex Activities; WK= W = Knowledge Profile Bloom's Taxonomy: mber C2 – Understand C3- Apply C4 – Ana PR – Project, Q – Quiz, M – Mid Term Exam, A n, R – Report, F – Final Exam) ND LEARNING STRATEGY	Final Exam = Complex Problem Solving; /ashington Accord Knowledge llyze C5 - Evaluate C6 – Asg – Assignment, Pr –					
	o-face Lear	earning Activities	Engagement (Hours)					
		2 hours/week \times 14 weeks)	28					
Self- D	Directed Le	-						
•		e-to-face learning	5					
•		of the previous lecture at home	12 30					
• Formal	-	on for final examination	30					
Forma	Formal Assessment2							
	Final Exa	3						
		Total	80					
		HODOLOGY						
Lecture	and Discus	sion, Problem Based Method						
0.01								
	SE SCHEI Lecture		Assessment					
WEEK	Lecture	Basic concept on ecology, Scope and importa						
1	1	of ecology, Ecological levels of organizat hierarchy						
	2	Elementary knowledge on ecological						
	<u></u>	factors, Basic characteristics of ecosystem						
2	3	Ecosystem structure and components, Ecosys footprint						
	4	Basics on biological diversity, Benefit from						
	5	biodiversity, Threat to biodiversity	—					
	5	Hydrologic cycle, Water Pollution Biological evaluation, nature selection	ion					
3	6	symbiosis, Influence of geography and geol						
		on biological diversity						
	7	Ecological communities and food chain, T	ypes Class Test					
4		of food chains						
	8	Source of Pollution, Quality of Water						
	9	Energy partitioning in food chains and food webs, Ecological pyramids						
5		General aspects of biogeochemical cycles						
5		Carbon cycle						
	10							
	10	Nitrogen cycle, Phosphorus cycle	Mid-Term Exam					
6	$ \begin{array}{r} 10\\ 11\\ 12 \end{array} $							

_	13	Water Pollutar	nts								
7	14	Causes of Soil									
		Sources of wa									
8	15	Adverse		er pollution							
	16	Soil Pollution	Control strategy	<u> </u>							
9	17	Source of Nuc									
9	18	Control of Nu	ntrol of Nuclear Pollution								
	19	Pollution from	m Agricultural acti	vities							
1020Control of pollution from agricultural activitiesClass Test											
1.1	21	Pollution due	to Detergent and dye								
11	22		Pollution from dete								
10	23	mers									
12	24	Water pollutio		Class Test							
	25	Heavy meta	l pollution in aqu	atic	Class Test						
13	25										
	26	ecosystem I Environmenta	l Laws and Regulatio	ns I							
1.4	27	Environmenta	ns II								
14	28		ollution in aquatic ec								
ASSES	SMENT S	TRATEGY	^								
	Compo	nents	Grading	СО	Bloom's Taxonomy						
Continu	ious Assess	sment									
(Class a	ssignment	s/ CT/ Mid	40%	CO1, CO3, CO4	C1, C2						
Term/ A	Active Clas	s Participation)		, ,	- , -						
Final Exam			60%	CO1, CO2, CO3, CO4	C1, C2						
	Total M	larks	100%								
REFE	RENCE B	OOKS			•						
			arth as Living Plane	t - Daniel B. Botki	n, Edward A.						
		d., John Wiley a	6								
2. Environmental Science – A Global Concern - William P. Cunningham, Mary Ann											
\angle . EII	Cunningham, 12th ed., McGraw Hill Companies										
	nningham.	12th ed., McGi	raw Hill Companies								

3. Fundamentals of Ecology - Eugene P. Odum, Gray W. Barrett, 5 th ed., Thomson Learning Inc.

4. Environmental Engineering – Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, McGraw Hill International Edition

COURSE INFORMATION								
Course Code: EWCE 200	Credit Hour: 1.5							
Course Title: Details of Construction and Quantity Surveying Contact Hour: 3.0								
PRE-REQUISITE								
None								
CURRICULUM STRUCTURE								
Outcome Based Education (OBE)								
SYNOPSIS/ RATIONALE								
In this course students will be introduced with components of	of different civil							
engineering. This hand on training will be useful for the students in l	ater projects.							
OBJECTIVE								
1. To impart knowledge on the basics of different type	s of components of a							
building, design loads, framed structure and load bearing wall structure.								

- 2. To impart knowledge on the basics of different structures like culvert, septic tank, water reservoir and retaining wall.
- 3. To make the students efficient in practical field through site visits and technical sessions.

COURSE CONTENT

Types of building, components of a building, design loads, framed structure and load bearing wall structure foundations: shallow and deep foundation, site exploration, bearing capacity of soil, brick masonry: types of brick, bonds in brickwork, supervision of brickwork, defects and strength on brick masonry, typical structures in brickwork, load bearing and non-load bearing walls, cavity walls, partition walls, lintels and arches: different types of lintels and arches, loading on lintels, construction of arches, stairs: different types of stairs, floors: ground floors and upper floors, roofs and roof coverings, shoring, underpinning, scaffolding and formwork, plastering, cement concrete construction, house plumbing: water supply and wastewater drainage, estimating and cost analysis of a building, bridge, shore structures etc.

	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome												
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Able to understand the components of substructure and superstructure of a building, properties of construction materials, design loads, framed structure and load bearing wall structure	\checkmark											
2	CO2: Able to recognize different aspects of construction through field visit and team work												
3	CO3: Able to estimate the total material and cost required for different components of a residential building	\checkmark											
4	CO4: Able to determine the material required for different civil engineering structures such as culvert, septic tank, water reservoir and retaining wall	CO4: Able to determine the naterial required for different civil engineering structures such as $\sqrt{10}$ ulvert, septic tank, water											
COU	IRSE OUTCOMES & GENERIC SK	KILI	LS										
N		my*		CP	CA		KP	Assessment	Methods				
CO1	Able to understand the compone substructure and superstructure building, properties of constru- materials, design loads, fr structure and load bearing structure	of	a on od	1		C2				3,4		Test, Quiz, Report	
CO2	of construction through field and team work	vis	it	9	C1					3		Test, Quiz, Report	
CO3	Able to estimate the total ma and cost required for diff components of a residential bui	ferei	nt	1 C2			-	_		6	Tes Qui Repo	z,	

CO4		determine the material						Test		
	culvert,	ing structures such as septic tank, water reservoir	1	C2	-	_	6	Test, Quiz, Report		
	and retaining wall									
	Solving; EA=									
	Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge									
		KP= Knowledge Profile								
		f Bloom's Taxonomy:	G (a -			94		
	C1 – Rememb	C2 – C3- ber Understand Apply	C4 –	70	C5 - Eval	luate		C6 – Create		
	Kentenit	en onderstand Appr	y Anary		Lva	iuaic		Cicale		
		PR – Project, Q – Quiz, M –		m Exam, A	Asg –	Assig	nment	, Pr –		
TEACL		tion, R –Report, F – Final Ex D LEARNING STRATEGY								
		arning Activities			1	Engage	ement	(Hours)		
	face Lear					Jiigugy	lineint	(Hours)		
		.5 hours/week \times 12 weeks)					30			
	Learning									
		ents (1 hours/week \times 12 wee	ks)				12			
	ected Lean	-					2			
	Non-face-		3 3							
	Revision of		4							
Preparation for the final examination 4 Formal Assessment										
c) Continuous Assessment 3										
d) Quiz and viva 5										
		Total					60			
		ODOLOGY								
Lecture ar	nd Discuss	sion, Problem Based Method								
COURSI	E SCHED	ШЕ								
Week		Topics to be Covered				Asses	sment	ţ		
1	01	Introduction, Parts of buildi foundation	ng, types	s of buildi	ng,	As	signmo	ent/Test		
2	02	Brick and Concrete					U			
3	03	Estimation of brickworks, F Concrete	A, CA, a	and Ceme	nt in					
4	04	Stairs, Slabs, Lintel, and Ar	ches							
5	05	Plastering, Paints, Varnishe	s			Ass	signmo	ent/Test		
6	06	House plumbing system, De	-							
7	07	Calculation of volume road embankment	of ear	rthwork	for					
8	08	Mid Quiz					Qu	iz		
9	09	Estimating and cost analysis	s of a bui	lding 1		Ac	signm	ent/Test		
		Estimating and cost analysis of a building 2 Assignment/Test								
10	10	Estimating and cost analysis	s of a bui	lding 2						

12	12	Estimating and	d cost analysis of	a culvert						
13	13	Estimating and	d cost analysis of	a septic tank						
14	14	Final Quiz, Vi	va			Quiz				
ASSESSN	ASSESSMENT STRATEGY									
	Compon	ents	Grading	СО	СО					
Continuous Assessment (Assignment/Test/ Mid Term/ Active Class Participation)			45%	CO1, CO2, CO3	, CO4	C1.C2				
Quiz			50%	CO1, CO2, CO3, CO4		C1.C2				
Viva			5%	CO1, CO4		C2				
	Total Ma	urks	100%							
DEFEDE	NCE DO	OVC								

REFERENCE BOOKS

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

COURSE INFORMATION								
Course Code: EWCE 201	Credit Hour: 3.0							
Course Title: Construction Materials Contact Hour: 3.0								
PRE-REQUISITE								
None								
CURRICULUM STRUCTURE								
Outcome Based Education (OBE)								
SYNOPSIS/ 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	d to brick, cement, sand,							
coarse aggregate, mortar, concrete, wood, steel, aluminum, geo-tex	tiles, composites, FRP,							
etc. Students will be also familiarizing with behavior and character	istics of these materials.							
Studying of these materials will be useful for the students in later pro-	ojects.							
OBJECTIVE								
1. To gain knowledge on the basics of engineering material	s.							
2. To be able to identify the suitability of engineering mat	erials in the construction							
of different civil engineering structures.								
3. To be able to design concrete mix by appropriate method	ds.							

COURSE CONTENT

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

	LL MAPPING (CO – PO MAPPIN	VG)											
No	Course Outcome PROGRAM OUTCOMES (POs)												
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Able to identify the suitability of engineering materials for different types of construction works and the properties of construction materials.	\checkmark											
2	CO2: Able to understand the production process of major engineering materials (bricks, cement etc) and their uses.												
3	CO3: Able to know the basics of modern, green and high-performance civil engineering material.												
4	CO4: Able to use appropriate method to undertake basic design calculations for concrete mix.		\checkmark										
COU No	IRSE OUTCOMES & GENERIC Course Outcome	SKI	LLS				0				-		
			Corresponding POs		Bloom's Taxonomy*		CP	CA		KP	Assessment	Methods	
CO1	Able to identify the suitabilit engineering materials for diffe types of construction works the properties of construc materials.	rent and	1		C	2	_		_	4,5		Mid- Fi	s Test, -term, nal am
CO2	Able to understand production process of m engineering materials (bri cement etc) and their uses.	cks,	1		C	2	_		—	4,5		Mid- Fi	s Test, -term, nal am
CO3	modern, green and h performance civil enginee material.	igh- ring	1		C	2			_	3,4	4 [] F	Class Test, Mid-term, Final Exam	
CO4	undertake basic de calculations for concrete mix.	sign	2		C:				-	4	F	Mid- inal	s Test, -term, Exam
	WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy:												

	C1 – Rememb	C2 – C3- C4 – C5 - ber Understand Apply Analyze Evalu	c6 – ate Create
		PR – Project, Q – Quiz, M – Mid Term Exam, Asg – A tion, R –Report, F – Final Exam)	Assignment, Pr –
TEAC		ND LEARNING STRATEGY	
		earning Activities	Engagement (Hours)
	o-face Lea		
	Lecture ($(3 \text{ hours/week} \times 14 \text{ weeks})$	42
Guide	d Learnin	σ	
		ments (2 hours/week \times 6 weeks)	12
	irected Le		12
•		e-to-face learning	32
•		of the previous lecture at home	11
•		ion for the final examination	18
Formal	Assessme		
a)	Continuou	us Assessment	2
b)	Final Exa	mination	3
,		Total	120
TEACH	ING MET	HODOLOGY	
Lecture a	and Discus	ssion, Problem-Based Method	
	SE SCHE		
Week	Lecture	Topics to be Covered	Assessment
	01	Introduction to CE materials	
1	02	Brick: Definition, Characteristics, Classification, Manufacturing	
	03	Brick: Brick burning, Tests for bricks, Brick specifications	
	04	Sand: Sources, Classification, Properties, Functions,	
		Substitute	
2	05	Sand: Functions, Uses, Tests, Bulking	
	06	Metals & Alloys: Definition, Effect of Impurities,	
		Comparison	CT/Mid Term/Final
	07	Lime: Definition, Properties, Sources, Types, Hydraulicity	Exam
3	08	Lime: Classification, Slaking methods,	
5	00	Artificial hydraulic lime	
	09	Mortar & Plaster: Types, Uses, Characteristics, Functions	
	10	Cement: Manufacture, Cement chemistry, Functions, Hydration	
4	11	Cement: Major types, Other types, Testing of Cement	
	12	Ferro cement: Components, Uses	
	13	Introduction to Concrete, Concrete Properties	
5	14	Shrinkage and Creep of Concrete	
	14	Manufacturing of concrete	
	15	CT/Mid Term/Final	
6	10	Exam	
Ĭ	18		
	10	ACI Mix design of concrete British method of mix design	
7	20	Concrete production in Bangladesh	
	21	Concrete in hydraulic structures	
0	22	Stress-Strain Behavior: Definition, Figures	Einal E-are
8	23	Stress-Strain Behavior: Load-Strain Behavior of	Final Exam

		materials							
	24	Rubber: Types,	Properties	lises					
		Glass: Funct		ties					
	25	Classification,		uirements, Propert					
		,		Constituents, Ba	uses,				
9	26	Characteristics,	,	Constituents, Da	1505,				
	27	Varnish: Func Types, Process	tions, Cons	tituents, Characterist	tics,				
	28		s and propert	ies mechanical proper	rties				
10	29		A A	treatment and durab					
	30	Mechanical pro							
	31	Insulating Mat Types		ents,					
11	32								
	33	Corrosion & Pr Causes & Preve		rosion					
	24								
10	34	Advanced fiber composites, rein		• • · ·					
12	35	Glass fiber, nan							
	36	Geotextiles and							
	37		Introduction to Coastal Structures						
13	38	Materials used							
	39	Marine Concret			CT/Final Exam				
	40	Riprap, Gabio hydraulic struct		and Geotubes used	l for				
14	41	Materials us protection	sed for	river/sea bank					
	42	Review of desig	gn problems						
ASSESS	SMENT S	STRATEGY							
Compo			Grading	СО	Bloom's Taxonomy				
Co	ntinuous A	Assessment							
(Class	s assignme	ents/ CT/ Mid	40%	CO1, CO2, CO3, C	C2, C3				
Term/ A	ctive Cla	ss Participation)							
	Final E	Exam	60%	CO1, CO2, CO3, C	C2, C3				
	Total N								
	ENCE B								
		aterials – Gurcha							
	e e								
Jar	nes A. Jao	cobs and Thoma	s Kilduff, 5t	h Ed.					

COURSE INFORMATION	
Course Code: EWCE 203	Credit Hour: 3.0
Course Title: Geology and Geomorphology	Contact Hour: 3.0
PRE-REQUISITE	
CHEM 103, PHY 129	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ RATIONALE	
In this course students will be given basic knowledge on how the	earth formed, its typical

structures, mineralogical composition of rocks, types of minerals and the processes acting on the earth. Students will be familiarized with geomorphological study of landforms and the processes that shape them. Students will also have the preliminary knowledge on seismological, geological, and geomorphological study of Bangladesh.

OBJECTIVE

- 1. To gain knowledge on the composition, structural formation of several types of rocks, minerals, and the seismicity in Bangladesh.
- 2. To attain insight on the common geomorphological formations emphasizing on the perspective of Bangladesh.

COURSE CONTENT

Formations of earth crusts and changes that occur on the earth's surface. Rocks and minerals: identification of rocks and minerals, common rock forming minerals, physical properties of minerals, mineralogist rocks, types of rocks, cycle of rock change, earthquake and seismicity of Bangladesh, geology of Bangladesh. Structural geology: faults, types of faults, fold and fold type, domes, basins, erosional process, quantitative analysis of erosional land forms. Fluvial processes in Geomorphology: channel development, channel widening, valley shape, stream terraces, alluvial flood plains, deltas and alluvial fans, fluvial deposits, coastal deposits, glacial deposits, lacustrine deposits, Aeolian deposit, river basin, channel morphology, channel patterns and the river basin, geology and geomorphology of rivers of Bangladesh.

SKILL	L MAPPING (CO – PO MAPPING	i)											
No	Course Outcome		PROGRAM OUTCOMES (POs)										
		1	2	3	4	5	6	7	8	9	10	11	1
1													2
1	CO1: Able to understand the												
	typical formations and mineralogical compositions of	-											
	rocks and the earth crust.	v											1
2	CO2: Able to gain knowledge on												
2	earthquake, seismic hazards, and		,										1
	vulnerability in Bangladesh.												1
3	CO3: Able to understand and												
	synthesize the general trends in		, I										1
	geomorphological study of land												1
	forms and its importance in												1
COUD	riverine areas of Bangladesh.	711 1	C										_
COUR	COURSE OUTCOMES & GENERIC SKILLS												
			50								Ļ		
			ding		s "v	2					ien	ds	
No	Course Outcome		ond		Bloom's Γaxonomy*		CP	CA	KP		Assessment Methods		
			Corresponding POs		loc		$\overline{}$	0	Ţ		sse	Mei	
			Os Os		д _В						Å		
CO1	Able to understand the typ										Class	Tes	st
	formations and mineralog		1		C1, C	2	_	1	1			nal	<i>,</i>
	compositions of rocks and the e	arth	1		<i></i> , <i>.</i>	-		•				am	
CO2	crust. Able to gain knowledge	or									Class		
02	8 8	on and									Mid-		
	vulnerability in Bangladesh.	anu	2		C2, C	4	-	1	1,3			nal	1,
	sumeraonity in Dangiadosii.											am	
CO3	Able to understand and synthe	size									Assi		e
	the general trends	in									nt, C		
	geomorphological study of l		1,2	2	C3, C4	4	-	1	1,4			est,	
	forms and its importance in rive	rine									Mid Term,		
	areas of Bangladesh.		1.1	~	1 .		~				inal]		
	WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving;												

	Knowled Profile/ K	ing Activities/ CA= Complex Activities; WK= W ge IP= Knowledge Profile f Bloom's Taxonomy:	ashington Accord
	C1 –	C2 – C3- C4 – C	C5 - C6 – Evaluate Create
		PR – Project, Q – Quiz, M – Mid Term Exam, As ion, R –Report, F – Final Exam)	g – Assignment, Pr –
		ND LEARNING STRATEGY	
-		earning Activities	Engagement (Hours)
	o-face Lea		
race-u		3 hours/week \times 14 weeks)	42
Cuida	d Learnin	· · · · · · · · · · · · · · · · · · ·	42
		g nents (2 hours/week \times 6 weeks)	12
	-		12
	Directed Le		11
•		e-to-face learning	11
		of the previous lecture at home	18
	*	on for the final examination	32
	Assessme		_
,		as Assessment	2
d)	Final Exar	nination	3
		Total	120
TEACH	ING MET	HODOLOGY	
		sion, Problem-Based Method	
	SE SCHEI		
		Topics to be Covered	Assessment
1	01	Introduction to Minerals	
1	02	Introduction to Minerals	
1		Introduction to Minerals Quantitative analysis of erosional land forms	
1	02	Introduction to Minerals	 CT1
1	02 03	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming	CT1
	02 03 04	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals	CT1
	02 03 04 05	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals	CT1
	02 03 04 05 06	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development	CT1
2	02 03 04 05 06 07	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening	CT1
2	02 03 04 05 06 07 08	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals	CT1
2	$ \begin{array}{r} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ \end{array} $	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks	CT1
2	02 03 04 05 06 07 08 09 10 11 12	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape	CT1
2 3 4	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks	
2	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Mineraloids rocks	CT1
2 3 4	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ \hline 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Stream terraces	
2 3 4 5	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Stream terraces Types and cycle of rock change	
2 3 4	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Stream terraces Types and cycle of rock change	
2 3 4 5	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Stream terraces Types and cycle of rock change Alluvial flood plains	
2 3 4 5 6	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Stream terraces Types and cycle of rock change Types and cycle of rock change Alluvial flood plains Earthquake and seismic map of Bangladesh	
2 3 4 5	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Mineraloids rocks Stream terraces Types and cycle of rock change Types and cycle of rock change Alluvial flood plains Earthquake and seismic map of Bangladesh Earthquake and seismic map of Bangladesh	
2 3 4 5 6	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Stream terraces Types and cycle of rock change Types and cycle of rock change Alluvial flood plains Earthquake and seismic map of Bangladesh Earthquake and seismic map of Bangladesh Deltas and alluvial fans	
2 3 4 5 6 7	$\begin{array}{c} 02\\ 03\\ 04\\ 05\\ 06\\ 07\\ 08\\ 09\\ 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ \end{array}$	Introduction to Minerals Quantitative analysis of erosional land forms Identification and common rock forming minerals Identification and common rock forming minerals Channel development Physical properties of minerals Physical properties of minerals Channel widening Physical properties of minerals Mineraloids rocks Valley shape Mineraloids rocks Stream terraces Types and cycle of rock change Types and cycle of rock change Alluvial flood plains Earthquake and seismic map of Bangladesh Deltas and alluvial fans Earthquake and seismic map of Bangladesh	
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COURSE INFORMATION								
Course Code: EWCE 205	Credit Hour: 2.0							
Course Title: Numerical Methods Contact Hour: 2.0								
PRE-REQUISITE								
None								
CURRICULUM STRUCTURE								
Outcome Based Education (OBE)								
SYNOPSIS/ RATIONALE								
In this course students will be given basic knowledge of 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.								
OBJECTIVE								
1. To gain knowledge of the basic computations of numerical prob	lems.							
2. To become skilled in using numerical solution techniques.								
3. To learn the schemes of reducing the numerical errors in basic c	omputations.							
	-							
COURSE CONTENT								

Basics of Numerical Methods, Numerical solution of non-linear algebraic and transcendental equations, Systems of linear algebraic equations, interpolation and curve fitting, roots of equations, numerical differentiation, numerical integration, initial value problems, two-point

bound	ary value problems, and finite dif	fere	nces										
SKILL MAPPING (CO – PO MAPPING)													
No	Course Outcome	PROGRAM OUTCOMES (POs) 1 2 3 4 5 6 7 8 9 10 11 1										12	
1	CO1: Ability to understand the fundamental concepts of various numerical techniques and to distinguish the difference between numerical and analytical solution methods.	$\sqrt{1}$	2		4	5			0	7	10	11	12
2	CO2: Ability to analyze the distinctive characteristics of various numerical techniques and the associated error measures.												
3	CO3: Ability to apply the principles of various numerical techniques to solve distinctive mathematical and engineering problems.												
COUR	SE OUTCOMES & GENERIC S	SKII	LS	T		-							
No	Course Outcome	Corresponding	POs		Bloom´s Taxonomy*		CP	CA		KP		Assessment Methods	
CO1	Ability to understand the fundamental concepts of various numerical techniques and to distinguish the difference between numerical and analytical solution methods.	1		C	2		-	_		3	Mic	ss Tes l- tern al Exa	n,
CO2	Ability to analyze the distinctive characteristics of various numerical techniques and the associated error measures.	2		C4, C5		5	-	_		3	Assignment, Class Test, Mid-term, Final Exam		
CO3	Ability to apply the principles of various numerical techniques to solve distinctive mathematical and engineering problems	2			C3 -		-	- 3,4		Final Exam			
	WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: <u>C1-</u> <u>C2-</u> <u>Remember</u> <u>Understand</u> <u>Apply</u> <u>Analyze</u> Evaluate <u>Create</u>											ing;	
(T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R –Report, F – Final Exam) TEACHING AND LEARNING STRATEGY													

Teach	ing and L	earning Activities	Engagement (Hours)
	-face Lea		
	Lecture	6	28
•		Tutorial/ Studio	
•		Centered Learning	
	irected Le		
		-	5
•		-to-face learning	12
•		of the previous lecture at home	12 30
•		on for tests and examination	50
Formal	Assessme		
•	Continuo	us Assessment	2
•	Final Terr	m Examination	3
		Total	80
TEACH	ING MET	HODOLOGY	
Lecture a	and Discus	sion, Problem-Based Method	
COUP	SE SCHE		
		Topics to be Covered	Assessment
	1	Introduction to Numerical Methods	
1	2	Basics of Numerical Methods	_
		Numerical solution of non-linear	CT, Assignment, Mid Term,
•	3	algebraic equations: Concept	Final Exam
2		Numerical solution of non-linear	
	4	algebraic equations: Problem	
	~	Numerical solution of transcendental	
2	5	equations: Concept	
3	6	Numerical solution of transcendental	_
	6	equations: Problem	
	7	Systems of linear algebraic equations :	
4	1	Concept	
	8	Systems of linear algebraic equations :	Assignment, Mid Term, Final
	-	Problem	Exam
5	9	Interpolation: Concept	
_	10	Interpolation: Problem	
6	11	Curve fitting: Concept	_
	12	Curve fitting: Problem	_
7	13	Roots of equations: Concept	
	14	Roots of equations: Problem	
8	15	Numerical differentiation: Concept	
	16 17	Numerical differentiation: Problem	CT, Assignment, Final Exam
9	17	Numerical differentiation: Problem	
	18	Numerical integration: Concept Numerical integration: Problem	
10	20		
	20	Numerical integration: Problem Initial value problems: Concept	
11	21	Initial value problems: Problem	CT, Assignment, Final Exam
		Two-point boundary value problems:	
	23	Concept	
12		Two-point boundary value problems:	
	24	Problem	
10	25	Finite differences: Concept	
13	26	Finite differences: Problem	
	27	Finite differences: Problem	Assignment, Final Exam
14	28	Finite differences: Problem	7
ASSESS	-	TRATEGY	
			CO Bloom's Taxonomy
	mpc	Graving C	

Continuous Assessment (Class assignments/ CT/ Mid Term/ Active Class Participation)	40%	CO1, CO2, CO3	C2, C3, C4, C5
Final Exam	60%	CO1, CO2, CO3	C2, C3, C4, C5
Total Marks	100%		
REFERENCE BOOKS			

REFERENCE BOOKS

1. Numerical Mathematical Analysis – James b. Scarborough.

2. Introductory Methods of Numerical Analysis– S.S. Sastry.

3. Numerical Methods for Scientific And Engineering Computation - Jain, Iyengar, Jain.

4. Numerical Methods using Matlab (-John H Mathews and Kurtis K Fink, 4th Ed.

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

Course Code: EWCE 206 Credit Hour: 1.5 Course Title: GIS in Environmental and Water Resources Contact Hour: 3.0 PRE-REQUISITE EWCE - 103 (Surveying), EWCE - 104 (Practical Surveying) CURRICULUM STRUCTURE Outcome Based Education (OBE) SYNOPSIS/ RATIONALE This is a hand on training course for GIS in both environmental and water resources perspective. In this course students will be introduced to basic functions and analysis of GIS. Students will be also practice using GIS for conducting spatial analysis. OBJECTIVE I. To understand basic functions of GIS A produce maps for basic GIS analysis COURSE CONTENT Introduction, use and applications of GIS software, map projection system, features of ArcGIS, hands-on exercises using basic GIS tools. SKILL MAPPING (CO – PO MAPPING) No Course Outcome PROGRAM OUTCOMES (POs) I 1 Ability to define the fundamental concepts and practices of V I I I I I I I I I I I I I I I I I I I <	COU	RSE INFORMATION												
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3 3 Map Design	2	2 Infoduction to basics of GIS and AlcOIS 10.8 Interface							
	3	3	Map Design						

4	4	GIS Outputs	
5	5	Table Operation	
6	6	Geoprocessing	
7	7	Quiz	Quiz
8	8	File Geodatabase	
9	9	File Geodatabase (continued)	
10	10	Spatial Analysis	
11	11	Quiz	Quiz
12	12	Introduction to Maps, Map Projection, and coordinate Systems: Georeferencing	A
13	13	Digitizing and Editing	Assignment
14	14	Quiz	Quiz
ASSESS	SMENT S	TRATEGY	•

ASSESSIVIENT STRATEOT	L		
Components	Grading	СО	Bloom's Taxonomy
Continuous Assessment (Class assessment / Quiz / Active Class Participation)	40%	CO1, CO2, CO3, CO4	C2, C3, C4
Quiz	60%	CO1, CO2, CO3, CO4	C2, C3, C4
Total Marks	100%		
DEFEDENCE DOOLC			

REFERENCE 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

COURSE INFORMATION							
Course Code: EWCE 211	Credit Hour: 4.0						
Course Title: Mechanics of Solids	Contact Hour: 4.0						
PRE-REQUISITE							
EWCE 101 (Analytical Mechanics)							
CURRICULUM STRUCTURE							
Outcome Based Education (OBE)							
SYNOPSIS/ RATIONALE							
This is a basic mechanics course. In this course, students will be introduced to basic solid							
mechanics including stress, strain, deformation, different loads, and behavior of structures							

mechanics including stress, strain, deformation, different loads, and behavior of structures under loading. Students will be able to design structural members considering different criteria and factors of safety.

OBJECTIVE

- 1. Grasp the internal force systems in frame members and compute the internal forces at various locations.
- 2. To obtain fundamental concepts of stress and strain and their relationships for structural materials (constitutive relations), various stresses due to load in structural

members such as bending, shear, and torsion.

COURSE CONTENT

- 3. To analyze the effect (state of stress) on the beam due to combined loading and transformation stresses (construction of Mohr's circles of stress).
- 4. To obtain fundamental concepts of Euler's buckling theory, the concept of strain energy for axial stress, flexural stress and shear stress and establish failure criteria by maximum distortion energy theory.

Concepts of stress and strain, stress transformation, Deformations due to tension, compression and temperature change, Thin walled pressure vessels, Elastic analysis of circular shafts subjected to torsion, 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, Symmetric and unsymmetric bending of beams, Beam deflection by direct integration method, Buckling of columns, Elastic strain energy and external work and Castigliano's theorem, Cable theorem, Cable supported structures. SKILL MAPPING (CO - PO MAPPING) PROGRAM OUTCOMES (POs) No Course Outcome 1 2 3 4 5 6 7 8 9 10 11 12 1 CO1: Be able to investigate the state of $\sqrt{}$ stress due to combined loading at beam and column and find neutral axis and deformation. 2 CO2: Be able to $\sqrt{}$ calculate the deflection and rotation at any point of the beam under transverse loading using the direct integration method. CO3: Be able to design 3 $\sqrt{}$ structural members considering strength, buckling, thermal stress and factors of safety. 4 CO4: Be able to apply $\sqrt{}$ the concept of elastic strain energy to determine various deformation components in simple structural elements. **COURSE OUTCOMES & GENERIC SKILLS** No Corresponding POs **Taxonomy*** <u>Bloom's</u> Assessment Methods G CA R **Course Outcome** CO1 Be able to investigate the state of stress due Assignment, Pop quiz, C2 to combined loading 1 5.6 1 Final Exam at beam and column and find a neutral axis. CO₂ Be able to calculate 1 C3 5,6 Class Test, 1

	4	Statically member			axial loa	ded					
1	3	Problem s Stress, Sh			Strain, S	Shear					
2 Problem solving: Stress, Strain, Shear Stress, Shear strain								CT1			
	1	Concept of Problem of					-				
	Lecture	Topics t					Asses	sment			
COUR	SE SCHEI	DULE									
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•	Final Exa	mination				1.00		3			
•		us Assessn	nent					5 3			
Forma	l Assessme							_			
c)	Preparati	on for final	examina	tion				20			
b)	Revision	-			home			20			
a)		-	arning					40			
Self- I	Directed Lea	arning						10			
Tutoria	al/ Assignn	nents (2 ho	urs/week	$\times 8$ w	veeks)			16			
•		4 hours/we	$ek \times 14 v$	veeks)			56			
Face-te	o-face Lear	÷.		,							
		aching and					F	Engagement (Hours)			
	resentation, CHING AN										
						rm Exam,	Asg – A	ssignment, Pr –			
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_	emember	Underst			Analy		Evaluate				
	Level of Bl	oom's Tax C2 –		73-	C4 –		C5 -	C6 –			
	rofile/ KP=						-	-			
E	ngineering			nplex	Activiti	es; WK= V	Washing	ton Accord Knowledge			
	A = WashiiA = A	ngton Acco	ord Comp	lex Pr	oblem S	olving/ CF	∕= Comp	lex Problem Solving;			
6	elements.				.1.1 C	-1-: / CT					
		structural						Fillal Exalli			
	deformation components							Pop quiz, Final Exam			
	determine	various	2	C4	1	_	4	Mid-term,			
5	strain en	ergy to						Class Test,			
	Be able a concept o										
	safety.										
5	stress and	factor of						Final Exam			
	ouckling,	thermal	2	C4	1	—	3	Pop quiz,			
	structural considering	member strength						Class Test, Mid-term,			
	Be able t	•						Class Tast			
i	ntegration r	nethod.									
	using	direct									
-	the beam transverse	under loading						Final Exam			
	otation at a	• •						Pop quiz, Final Exam			
	he deflec							Mid-term,			

	5	Statically Indeterminate axial loaded	
		member	
2	6	Thermal Stress	
	7	Thin-walled pressure vessel	
	8	Thin-walled pressure vessel	
	9	Change of length and diameter of pressure	
	9	vessel using generalized Hook's law	CTO
		Basic assumptions for circular members in	CT2
	10	torsion, Torsion Formula, Torsion stress	
3	10	diagram for circular solid, hollow bar and	
5		bar with different materials.	
-	11	Angle of twist of circular member	
-		Design of circular members in torsion for	
	12	strength, Stress Concentrations	
		Design of circular members in torsion for	
	13	strength, Stress Concentrations	
-			
	14	Basic concept of transformation of stress.	
4		Transformation of stresses in 2D problems.	
·	15	Principal stresses 2D problems. Maximum	
Ļ	-	shear stresses in 2D problems	
	16	Practice Problem-Transformation of stress	
	10	by derived formula.	
	17	Derive the equation for Mohr's circle of	
	1 /	stress for 2D problems.	
Ī		Practice problems with the help of Mohr's	
	10	circle of stress transform the stress at	
	18	principal stress and maximum normal	
		stress.	
5		Practice problems with the help of Mohr's	
	10	circle of stress transform the stress at	
	19	principal stress and maximum normal	
		stress.	
-		Practice problems with the help of Mohr's	
	20	circle of stress find the value of normal and	
	20	shear stress at an angle of stress	
		Free body diagram and equations of statics	
	21	for beam. Internal force at a particular	
	<i>L</i> 1	section.	
ŀ		Inclined force on Beam and equilibrium,	
	22	Sign convention for drawing shear force	
6	LL		
ŀ		and bending moment diagram.	
	23	Practice Shear Force and Bending Moment	
ŀ		Diagram of Beam	CT3
	24	Practice Shear Force and Bending Moment	
		Diagram of Beam	
	25	Practice Shear Force and Bending Moment	
_	20	Diagram of Beam	
	26	Practice Shear Force and Bending Moment	
7	20	Diagram of Beam	
	27	Practice Shear Force and Bending Moment	
	<i>∠1</i>	Diagram of Beam	
	28	Free body diagram of Frame	
	20	Practice Axial force, Shear Force and	
	29	Bending Moment Diagram of Frame	
	20	Practice Axial force, Shear Force and	۲ <i>.</i> ۲. ۱ m
8	30	Bending Moment Diagram of Frame	Mid Term
ŀ	0.1	Introduction to flexure stress and Flexure	
	31	formula, flexure stress	

	32	Member	ormation of a s	-		
	33	different cross		_		
9	34	different cros				
	35	Shear stress i	n Straight Mer	nbers.		
	36	Shear stress of beam.	distribution alo	ng depth of a		
	37	Components formula over	of skew bendin view.	ng and related		
10	38		a of skew bend rincipal axes.	ing. Bending		
	39	Problem on s	kew bending			
	40	Problem on s	kew bending			
	41		f 2 nd and 4 th ord leflection of be nethod)			
	42	beams: simpl	f equation of el ly supported wi bad, uniformly	th (uniformly		
11	43	integration m	beam using di bethod: Fixed s istributed load,		CT4	
-	44	Deflection of integration m	beam using di nethod: Simply pading, discont			
	45	Indeterminat	e beam (calcula FD, BMD) solv			
12	46		to Cable Theor	y and Cable		
	47		Cable Theorem	1		
	48		Cable Theorem			
	49	Introduction	to Buckling of tions and conc	column,		
	50	Derivation of with pin ends with differen	f Euler's Load s. Euler Load fo t end restraints	for columns or columns		
13	51	restraint usin	load/stress/cros g Euler Formu ing AISC ASD	la, Analysis of		
	52		section for giv RFD formula.	en load using		
	53	Elastic Strain	Energy: basic ty, Total strain	concept (stain energy)		
14	54	Structure wit	h axial loading energy)-proble			
	55	Elastic Strain stress and str	ture with Shear			
	56	Castigliano's	theorem			
ASSES	SMENT ST	TRATEGY				
Compor	nents		Grading	СО		Bloom's Taxonomy
Continuo	ous Assess	ment	40%	CO1, CO2, 0	CO3, CO4	C2, C3, C4

(Class assignments/ CT/ Mid							
Term/ Active Class Participation)							
Final Exam	60%	CO1, CO2, CO3, CO4	C2, C3, C4				
Total Marks	100%						
DEEEDENCE BOOKS							

REFERENCE BOOKS

- Engineering Mechanics of Solids Egor P. Popov (2nd Ed.).
 Mechanics of Materials (6th Edition) Ferdinand P. Beer,E. R.Johnston,John T. Dewolf and David F. Mazurek.
- 3. Mechanics of Materials (10th Edition) R. C. Hibbeler.
- Theory and Problems of Strength of Materials William A Nash.
 Advanced Strength and Applied Elasticity, (5th Edition) A C Ugural and S K Fenster.
- 6. Mechanics of Materials by Laurson & Cox.
- 7. Strength of Materials by R.Khurmi.

COURSE INFORMATION												
Course Code: EWCE 212									it Ho			
Course Title: Structural Mechar	nics a	nd M	lateri	als S	essio	nal		Cont	act H	Hour: 3.0)	
PRE-REQUISITE												
EWCE-201 (Construction Materials), EWCE-211 (Mechanics of Solids)												
CURRICULUM STRUCTURE												
Outcome Based Education (OB	E)											
SYNOPSIS/ RATIONALE	SYNOPSIS/ RATIONALE											
This is a hand on training con	urse	for e	ngin	eerin	g ma	nteria	ls an	d m	echai	nics. In	this of	course
students will introduce to basi	ic tes	sting	proc	edur	e for	bric	k, ce	emen	t, sa	nd, stone	e, coi	icrete,
and steel. Students will be also l	learni	ng te	sting	of d	iffere	ent st	ructu	res.				
OBJECTIVE				,								
1. To gain knowledge o	n the	basic	pro	pertie	es of	engii	neerin	ng ma	ateria	ıls.		
2. Identify the strength												
3. Identify the strength a												
4. To recognize the app												
COURSE CONTENT	- I				0			0	<u> </u>			
Tension, direct shear and impact	tests	of mi	ld st	eel sr	becin	ien, s	lende	er col	lumn	test, sta	tic be	ending
test, hardness test of metals, helic												
of concrete, FM of aggregates, n												
test of cement, compressive stren			ment	mort	tar, d	esigr	and	testii	ng of	a concre	ete m	ix and
testing of bricks for compressive	stren	gth.				-			-			
SKILL MAPPING (CO - PO M												
No Course Outcome	PR	OGR.					· · ·					-
	1	2	3	4	5	6	7	8	9	10	11	12
1 CO1: Be able to identify												
the engineering properties												
of cement, aggregate,	,											
steel and brick.												
2 CO2: Be expert in												
describing the strength												
and deflection of different												
structural members.												
3 CO3: Be able to												
recognize the appropriate												
relevant design codes				v								
through experiments.												
COURSE OUTCOMES & GEN	VERI	C SK	ILLS	5								

No	Co	ourse Outcome	Corresponding POs	Bloom's Taxonomy*	Taxonomy* CP CA		KP	Assessment Methods	
CO1	Be able engineerin cement, a brick.	•	1	C1	-	_	3	Test, Quiz, Report, Assignment	
	strength different	in describing the and deflection of structural members.	1	C2	-	_	5,6	Test, Quiz, Report, Assignment	
a	hrough exp	relevant design codes eriments.		C1	-	-	5,6	Test, Quiz, Report, Assignment	
WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: $C1 - C2 - C3 - C4 - C5 - C6 -$ Remember Understand Apply Analyze Evaluate Create									
		– Project, Q – Quiz, M R –Report, F – Final I		Term Ex	am, As	g – 1	Assignmen	l, PT –	
TEACHING AND LEARNING STRATEGY									
	Teaching	g and Learning Activit			Eng	gagement (Hours)		
Face-t	to-face Lea Lecture (3	rning 3 hours/week × 12 wee	eks)				36		
	•	g nents (1 hours/week \times	12		12				
Self- D	Directed Lea	arning							
•	Non-face-	-to-face learning			1				
•	Revision	of the previous lecture	at hor	ne	2				
•	Preparatio	on for the final examin	ation		3				
	1 Assessmen								
		s Assessment					2		
b)	Quiz and v	iva					4		
		Total			60				
		HODOLOGY	Math.	1					
Lecture	and Discus	sion, Problem Based I	viethoc	1					
COUP	SE SCHEF	DII F							
Week	COURSE SCHEDULE Veek Lecture Topics to be Covered Assessment								
1	01	Normal consistency time of cement wi	and			·			
2	02	Sieve Analysis of fine							
		Specific gravity and a			-		Assessm	ent/Assignment	

-	,								
4	04	Direct	compressive streng	gth of cement mortar.	Assessment/Assignment				
5		Comp specin		cylindrical concrete					
6			nination of compresention capacity of bri						
7	07	Mid Q	uiz		Quiz				
8	08	Tensio	on tests of mild stee	l specimen.					
9	119	Direct specin	ests of mild steel	Assessment/Assignment					
10	10	Hardn	ess test of metals						
11	11	Slende	er column test						
12	12	Helica	ll spring test	Assessment/Assignment					
13	13	Static	bending test						
14	14	Final (Quiz, Viva		Quiz				
ASSESS	MENT ST	RATE	GY		1				
	mponents		Grading	СО	Bloom's Taxonomy				
	us Assessn	nent	0		ř				
(Assignn	nent/Test/ N	Mid	450/	CO1 CO2 CO2	C1.C2				
	ctive Class		45%	CO1, CO2, CO3	CI.C2				
Participa	tion)								
	Quiz		50%	CO1, CO2, CO3	C1.C2				
	Viva		5%	CO1, CO3	C1				
	tal Marks								
	ENCE BO								
			s of Solids by – Pop						
	2. Theory and Problems of Strength of Materials by -William A Nash.								
	atory Manu								
4. Bear a	4. Bear and Johnson.								

4. Bear and Johnson.

COURSE INFORMATION							
Course Code: EWCE 213	Credit Hour: 3.0						
Course Title: Structural Analysis I	Contact Hour: 3.0						
PRE-REQUISITE							
EWCE 101 (Analytical Mechanics), EWCE 211 (Mechanics or	f Solids)						
CURRICULUM STRUCTURE							
Outcome Based Education (OBE)							
SYNOPSIS/ RATIONALE							
In this course students will learn how to analysis various structu	ral components subjected to both						
static and moving loads. Analysis technique learnt here will l	be useful in later courses where						
students will learn how to design different structural componen	ts. Knowledge gained from this						
course will be used in later semesters and in professional life.							
OBJECTIVE							
1. To analyze the statically determinate linear stru	ctural systems such as simple						
beams, cantilever beams, three-hinged arches, or frames.							

- 2. To analyze statically indeterminate structures such as frames, and trusses subjected to dead load, lateral, gravity and thermal load.
- 3. To analyze structures for moving load.
- 4. To construct an influence line diagram for the beam, frame and truss.
- 5. To draw internal force diagrams and calculate the displacements.

COURSE CONTENT

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

SKILL	KILL MAPPING (CO – PO MAPPING)												
No	Course Outcome				I OU	TCO	MES	G (PO	s)				
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to analyze statically determinate and indeterminate problems.												
2	CO2: Be able to determine lateral (gravity, wind, and seismic load) loads on structures in different areas of Bangladesh.												
3	CO3: Be able to develop knowledge of various types of structures and their load response.	\checkmark											
4	CO4: Be able to determine the axial load on columns of multistoried buildings.												
5	CO5: Be able to analyze the effect of moving loads on statically determinate structures.				~								
	SE OUTCOMES & GEN	ERIC	C SK	ILL	S				T				
No	Course Outcome	Corresponding POs	Bloom's	$Taxonomy^*$	Ę	5	CA		KP		Assessment Methods		
CO1	Be able to analyze statically determinate and indeterminate problems.	2		C4		1		-	5,	6		Гest, Mi inal Exa	d-term, um

	lateral (gra and seismic	determine avity, wind, bload) loads ctures in areas of a.	2	C4, C5	1	-	5,6	Presentation, Mid-term, Final Exam		
	knowledge types of str	to develop of various uctures ad response.	1, 2	C2, C5	1	-	3	Class Test, Assignment, Final Exam		
	the axial columns of buildings.	determine load on multistoried	2	C4	1	-	4, 5, 6	Assignment, Final Exam		
	effect of me on	analyze the oving loads statically structures.	2	C4	1	-	2, 3	Class Test, Final Exam		
	determinate structures. Image: Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile Profile/ KP= Knowledge Profile									
	C1 -	Bloom's Tax C2 –	conomy.		C4 –		C5 -	C6 –		
	Remember		tand	Apply	Analyze		Evaluate			
	(T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F – Final Exam)									
TEAC		DLEARNIN				-	-			
T (<u> </u>	and Learning	g Activit	ties]	Engagen	nent (Hours)		
	-face Learn Lecture (4 l	nng hours/week >	< 14 wee	eks)		56				
Guided	Learning									
	U	nts (3 hours/	week ×	6 weeks)		18				
Self- Di	rected Lear	ning								
•	Non-face-to	o-face learnin	ng			40				
•	Revision of	f the previou	s lecture	e at home		16				
•	Preparation	for the final	examin	ation		25				
	Assessment									
	Continuous .							2		
d) F	Final Examin							3		
		Total					1	60		
-	NG METHO) 137	.1 1						
		on, Problem-H	sased M	ethod						
Week	SE SCHEDU Lecture	Topics to b	A Cove	red			Age	sessment		
WEEK	01	Stability		determina		f structu				
	01	Stability		determina	•	f structu				
1	03	Earthquake								
04 Earthquake load calculation as per BNBC- 1993										
	04	1993								
	04	1993 Analysis o	of static	cally det	erminan	t truss				
2			of static	cally det	erminan	t truss				

		2014	
	08	Earthquake load calculation as per BNBC-	
	0.0	2014	
	09	Analysis of statically determinant arches	
3	10	Analysis of statically determinant arches	
5	11	Wind load calculation as per BNBC- 1993	
	12	Wind load calculation as per BNBC- 1993	
	13	Analysis of statically determinant arches	
	14	Analysis of statically determinant arches	
4	15	Wind load calculation as per BNBC- 2014	CT 1
	16	Wind load calculation as per BNBC- 2014	
	10	Influence line of beams	
	18	Influence line of beams	
	10	Approximate analysis of statically	
5	19	indeterminate truss	
	20	Approximate analysis of statically	
	0.1	indeterminate truss	
	21	Influence line of beams	
	22	Influence line of beams	
		Approximate analysis of statically	
6	23	indeterminate portal frame subjected to vertical	
0		load.	
		Approximate analysis of statically	
	24	indeterminate portal frame subjected to	
		vertical load.	
	25	Influence line of truss	Mid Term Exam
	26	Influence line of truss	
	20	Approximate analysis of statically	
	27		
7	21	indeterminate portal frame subjected to lateral	
		load using portal method	
	•	Approximate analysis of statically	
	28	indeterminate portal frame subjected to lateral	
		load using portal method	
	29	Influence line of truss	
	30	Influence line of truss	
		Approximate analysis of statically	
0	31	indeterminate portal frame using cantilever	
8		method	CT 2
		Approximate analysis of statically	
	32	indeterminate portal frame using cantilever	
	01	method	
	33	Moving load on beams	
	34	Moving load on beams	
9	35	Approximate analysis of tower truss	
	35	Approximate analysis of tower truss	
	30	Moving load on beams	
	37	Moving load on beams	
10		~ ~ ~	CT 3
	39	Approximate analysis of tower truss	
	40	Approximate analysis of tower truss	
	41	Moving load on frame	
	42	Moving load on frame	
11	43	Principle of work and energy.	
		Principle of virtual work	
	44	Analysis and deflection calculation of truss	
		using method of virtual work	

				-						
	45		ing load o							
	46		ing load o	on frame						
12	47		duction	to	Castigliano's theorem	m	CT 4			
	48				tion calculation					
	_		uss using ysis of su		ano's theorem					
	49									
	50		ysis of su							
13	51				ion calculation of bea	m				
15	51	using	g method	l of v						
	52	Anal	ysis and	deflect	ion calculation of frar	ne				
	52									
	53									
	54	Anal	ysis of su	spensio						
14	55	Anal	ysis and							
14	55	of be	am using	Castigl	liano's theorem					
	56	Anal	ysis and	deflect	tion calculation					
	50	of fra	ame using	Castig	liano's theorem					
ASSESS	MENT STR	RATE	GY							
Co	omponents		Grading		CO		Bloom's Taxonomy			
Continuo	ous Assessm	ent								
(Class as	signments/	CT/	400/	COI	CO1 CO2 CO4 CO5		C2 $C4$ $C5$			
Mid Tern	n/ Active C	ass	40%	COI,	CO2, CO3, CO4, CO5		C2, C4, C5			
Participat	tion)									
F	inal Exam		60%	CO1,	CO2, CO3, CO4, CO5		C2, C4, C5			
T	otal Marks		100%							
REFERI	ENCE BOO	OKS								
1. Struc	tural Analy	sis, R	C. Hibbel	er, Prer	ntice Hall, 8th Edition.					
	2. Elementary Structural analysis – C.H.Norris, J.B.Wilbur, I, utku									
3. Theory of simple structures- TC Shedd and J. Vawter										
	4. Structural Analysis – Aslam Kassimali									

5. Bangladesh National Building Code (BNBC,1993/2017)

COURSE INFORMATION	
Course Code: EWCE 261	Credit Hour: 3.0
Course Title: Fluid Mechanics	Contact Hour: 3.0
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

This course will be helpful for students to learn how to analyze the 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. In this course, students will also be introduced with the concept of 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 etc. which will be useful in various projects in the later semesters and in their professional life.

OBJECTIVE

1. To learn the basic properties of fluid and their applications,

- 2. To understand the governing equations of fluid flow i.e. continuity, energy, and momentum equations,
- 3. To learn fundamental concepts in designing pipes and analysis of pipe networks.

COURSE CONTENT

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.

SKI	ILL MAPPING (CO – PO MAI	PPIN	IG)										
No	``````````````````````````````````````	Course Outcome PROGRAM OUTCOMES (POs)											
110		1		3	4	5	<u>6</u>	7	8	9	1	0 11	12
1	CO1: Understand the	1			r	5	0	,		,		- 11	14
	essential fluid properties,												
	including viscosity, density,												
	and compressibility, and												
	their influence on fluid	v											
	behavior												
2	CO2: Apply fluid statics												
2	principles to analyze and												
	calculate pressures and												
	forces within fluids at rest,	,											
	and demonstrate proficiency												
	in determining equilibrium												
	conditions in various fluid												
	systems.												
3	CO3: Analyze fluid motion												
	through the study of												
	kinematics, including		,										
	velocity and acceleration												
	fields, streamlines, and path												
	lines.												
4	CO4: Apply the												
	fundamental equations												
	governing fluid flow,												
	including the continuity												
	equation, Bernoulli's		r										
	equation, energy equation,												
	and momentum equation and												
	analyze and solve problems												
	related to fluid behavior in												
	various scenarios												
5	CO5: Analyze steady,												
	incompressible flow in												
	pressure conduits,												
	understanding the concepts												
	of laminar and turbulent												
	flow, and applying empirical												
	equations for pipe flow												
CO	URSE OUTCOMES & GENER	RIC	SKII	LLS									
No	Course Outcome			50			1						
				din	U	, ž	1					ent	S
				on x	ء َ ا	om	0		Ā		<u>ہ</u> ا	ime and	pot
				Corresponding POs	Bloom'	Taxonomy*	C		CA	1 5	Ъ Т	Assessment	Methods
				JTTC	L I	Tax	1					Ass	Σ
				ŭ		[1					4	
CO	1 Understand the essential	flu	id				1				_		
	properties, including vis			1	0	C2	-	-	—		1	Pop	Ouiz
L	,		J ?		1		1			1		- ~ ~ ~ ~	<,

	density, and compressibility, and						Final			
	their influence on fluid behavior						Exam			
CO2	Apply fluid statics principles to analyze and calculate pressures and forces within fluids at rest, and demonstrate proficiency in determining equilibrium conditions in various fluid systems.	1	C3	_	_	1	Class Test, Mid- Term, Final Exam			
CO3	Analyze fluid motion through the study of kinematics, including velocity and acceleration fields, streamlines, and path lines.	2	C4	_	_	1	Mid- Term, Final Exam			
CO4	Apply the fundamental equations governing fluid flow, including the continuity equation, Bernoulli's equation, energy equation, and momentum equation and analyze and solve problems related to fluid behavior in various scenarios	2	C3, C4	_	_	1	Class Test, Mid-Term, Final Exam			
CO5	Analyze steady, incompressible flow in pressure conduits, understanding the concepts of laminar and turbulent flow, and applying empirical equations for pipe flow	2	C4	_	_	1	Class Test, Final Exam			
	WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3- Apply C4 - C5 - C6 - Remember Understand Analyze Evaluate Create (T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -									
	Presentation, R – Report, F – Fina	l Exan								
	CHING AND LEARNING STRAT	EGY			Enco	aomor	t (Hours)			
	ning and Learning Activities				Eliga	gemen	t (110u18)			
	ecture (3 hours/week \times 14 weeks)					42	2			
Self- D	Directed Learning Non-face-to-face learning Revision of the previous lecture at Preparation for final examination			09 18 46	3					
Forma	Assessment									
•	Continuous Assessment			02						
• Final Examination 03										
	Total					120	0			
TEACH	ING METHODOLOGY									
Lecture	and Discussion, Problem Based Me	thod								

Week	E SCHEDUI Lecture		Assessment		
vveek	1 1	Topics to be Covered Introduction to Fluids and Fluid Mechanics	Assessment		
	1	Definition of a fluid, shear, strain rate and			
1	2	viscosity			
	3	Different type of fluid flow			
	4	Fluid properties: density, pressure etc.			
2	5	Dynamic and Kinematic viscosity	CT/ Assignment/		
2	6	Surface Tension	Final Exam		
	7	Fluid Statics: Pascal's law			
	8	Variation of pressure, Manometers			
3		Forces on plane surface – concept and			
	9	problem			
	10	Forces on inclined surface			
4	10	Forces on curved surface – concept			
•	12	Forces on curved surface – problem			
	13	Laminar and Turbulent Flows - Concept	CT/ Assignment/		
	13	Laminar and Turbulent Flows - Problem	Final Exam		
5		Steady, Unsteady, Uniform, Non-uniform			
	15	Flows			
	16	1D, 2D and 3D Flows			
6	10	Streamlines, Path lines and Stream tubes -			
	17	Concept			
	18	Streamlines and Path lines - Problem			
	18	Continuity Equation for 1D Steady Flow			
ŀ	19	Stream Function, Potential Function and Flow			
7	20	-			
	21	net Navious Turnes of Energy in Eluid Eleve			
	21	Various Types of Energy in Fluid Flow			
	22	Bernoulli's Equation			
8	23	Kinetic Energy Coefficient – Concept and	Mid Term/		
	24	Problem	Assignment/ Fina		
	24	Energy Equation for 1D Steady Flow	Exam		
9	25	Total Energy Line and Hydraulic Grade Line,			
	26	Cavitations	-		
	26	Head and Power - Pump			
	27	Head and Power - Turbine			
10	28	Linear Momentum Equation			
10	29	Momentum Coefficient			
	30	Force Exerted on Pressure Conduits			
11	31	Force Exerted on Stationary Vane			
11	32	Force Exerted on Moving Vane			
	33	Reaction of a Jet			
	34	Flow in pressure conduits			
12	35	General equation for fluid friction			
	36	Darcy-Weisbach and Hagen-Poisevielle			
		Equation			
	37	Major and minor losses in pipe flow Pipes in series, expansions and contractions,	CT/ Assignment/		
13	38	Final Exam			
-		loss coefficients			
	39	Pipes in parallel, equivalent lengths			
	40	Branching pipes			
14	41	Pipe networks, Hardy-Cross method			
	42	Pipe networks, multiple pipe systems			

ASSESSMENT STRATEGY									
Components Grading CO Bloom's Taxonom									
Continuous									
Assessment									
(Class									
assignments/ CT/	40%	CO1, CO4	C2, C3						
Mid Term/ Active									
Class									
Participation)									
Final Exam	60%	CO2, CO3, CO5	C3, C4						
Total Marks	100%								
REFERENCE BO	OKS								
1. Fluid Mecha	anics with Engineering A	Application – Franzin	i						
2. Fluid Mecha	anics-Streeter & Wylie								
3. Fluid Mecha	anics – Frank M.White								

		NFORMATION												
Cour	se Co	de: EWCE 262							Credit			.5		
Cour	se Tit	le: Fluid Mechanics Sessiona	1					C	Contac	t Ho	our: 3	.0		
		JISITE												
None	e													
		LUM STRUCTURE												
		ased Education (OBE)												
		S/RATIONALE												
		sional course where student												
		proof of Bernoulli's theorem												
		of discharge; coefficient of										sh	arp-cr	ested
		friction in pipe etc. which w	ill ł	be use	eful	in the	ir p	profess	sional	life				
DBJ	ECTIV	νE												
	1.	To understand the basic prine	cip	les of	flu	id mee	cha	nics,						
	2.	To apply the basic principles	to	solve	e hy	drauli	c ei	nginee	ering p	orob	lems,			
	3.	To apply the theoretical know	wl	edge	to c	carry o	out	exper	iment	al ir	vesti	gati	ons of	f fluid
		problems.												
		CONTENT												
		pressure; proof of Bernoul												
		efficient of discharge; coeff												
cres	ted we	ir; fluid friction in pipe; com	pu	ter ap	plic	cations	s in	solvii	ng pip	e ne	twork	c pro	oblem	s.
KII	LMA	APPING (CO – PO MAPPIN	G)											
No		rse Outcome		ROG	RA	M OU	TC	COME	S (PC	s)				
			1	2	3	4	5		7	8	9	10) 11	12
	C01	: Understand the basic			-			-		_				
	princ	piples of fluid mechanics.												
2	CO2	: Apply the basic principles		_										
		fluid mechanics to solve												
		aulic engineering problems.												
3		: Apply the theoretical												
		vledge to carry out												
		rimental investigations of												
	TIUID	problems.												
TOT		OUTCOMES & GENERIC S	IVI	115										
1000 10	UNDE V	SUICOMES & GENERIC S		LLS			T		[
NU				а		~								
				libi		s vu	•						ц.	
		Course Outcome		Corresponding POs)	Bloom's Taxonomy*		CP	CA		KP		Assessment Methods	
				Fes	•	loc		0	0		X		od	
				LO LO		$^{\rm Ta}_{\rm B}$							Assessm Methods	
				0									Ϋ́Σ	
CO1		Understand the basi	с				\uparrow							
		principles of flui												
		mechanics i.e., Bernoulli		1		C2		1			5			port,
		theorem, continuit		1		C2		1	-		5			uiz
		equation, Reynold'											×	
		number, Froude number etc												
CO2		Apply the basic principle												
		of fluid mechanics to solv												
		hydraulic engineerin		~		~		4			~		Rei	oort,
		problems i.e., determinin		2		C3		1	-		3,6	b		uiz
		friction factor in a close												
		conduit, relationshi												
		between discharge and tota	u											

	head etc.						
CO3	Apply	the theoretical					
		ge to carry out	1 2.5 Report,				
	experime		1 - 3,5 Final Exam				
	investiga		T mui LAum				
	problems						
		shington Accord Complex Problem Solvi	ng/ CP= Complex Problem				
	Solving;		WK-Washington Assand				
		ing Activities/ CA= Complex Activities; V	WK = Wasnington Accord				
	Knowled	ge IP= Knowledge Profile					
		f Bloom's Taxonomy:					
		2 - C3- Apply $C4 - C5 - C$	6 –				
	Rememb	er Understand Analyze Evaluate	Create				
			create				
	(T – Test	, PR – Project, Q – Quiz, M – Mid Term I	Exam, Asg – Assignment, Pr –				
		ion, R – Report, F – Final Exam)					
TEACHI	NG AND I	LEARNING STRATEGY					
	Teachi	ng and Learning Activities	Engagement (Hours)				
Face-to-fa			· · ·				
		burs/week \times 10 weeks)	30				
Guided Lea		· · · · · · · · · · · · · · · · · · ·					
		ng (1 hour/week x 9 weeks)	10				
Independer			10				
	dividual lea		08				
Assessment		B					
	11z +Viva		2				
	<i>*12</i> + + 1 + 4	Total	60				
TEACHING	G METHOI						
		tice and Class Assessment					
,	,						
1							
COURSES	SCHEDUI	Æ					
COURSES Week		E Topics to be Covered	Assessment				
Week		Topics to be Covered	Assessment				
	Lecture		Assessment				
Week 1	Lecture 1	Topics to be Covered Introduction	Assessment				
Week	Lecture	Topics to be Covered	Assessment				
Week 1	Lecture 1	Topics to be Covered Introduction					
Week 1 2 3	Lecture 1 2 3	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi Meter	Assessment R, Asg/T				
Week 1 2	Lecture 1 2	Topics to be CoveredIntroductionProof of Bernoulli's Equation					
Week 1 2 3 4	Lecture 1 2 3 4	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi Meter					
Week 1 2 3	Lecture 1 2 3	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an Orifice					
Week 1 2 3 4 5	Lecture 1 2 3 4 5	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu Weir					
Week 1 2 3 4	Lecture 1 2 3 4	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu					
Week 1 2 3 4 5	Lecture 1 2 3 4 5	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu Weir	R, Asg/T				
Week 1 2 3 4 5 6 7	Lecture 1 2 3 4 5 6 7	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term Exam					
Week 1 2 3 4 5 6	Lecture 1 2 3 4 5 6	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notch	R, Asg/T				
Week 1 2 3 4 5 6 7	Lecture 1 2 3 4 5 6 7	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term ExamFluid Friction in a Pipe	R, Asg/T lar Mid Quiz				
Week 1 2 3 4 5 6 7	Lecture 1 2 3 4 5 6 7	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term ExamFluid Friction in a PipeDeterminationOfCo-efficient	R, Asg/T lar Mid Quiz				
Week 1 2 3 4 5 6 7 8	Lecture 1 2 3 4 5 6 7 8	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term ExamFluid Friction in a Pipe	R, Asg/T lar Mid Quiz				
Week 1 2 3 4 5 6 7 8	Lecture 1 2 3 4 5 6 7 8	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term ExamFluid Friction in a PipeDetermination of Co-efficient Resistance for Change in CrossSecti	R, Asg/T lar Mid Quiz				
Week 1 2 3 4 5 6 7 8	Lecture 1 2 3 4 5 6 7 8	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term ExamFluid Friction in a PipeDetermination of Co-efficient Resistance for Change in CrossSecti of Pipe	R, Asg/T lar Mid Quiz				
Week 1 2 3 4 5 6 7 8 9	Lecture 1 2 3 4 5 6 7 8 9	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term ExamFluid Friction in a PipeDetermination of Co-efficient Resistance for Change in CrossSection of PipeDetermination of Co-efficient of	R, Asg/T lar Mid Quiz				
Week 1 2 3 4 5 6 7 8 9 10	Lecture 1 2 3 4 5 6 7 8 9 10	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term ExamFluid Friction in a PipeDetermination of Co-efficient Resistance for Change in CrossSecti of PipeDetermination of Co-efficient of Discharge using Orifice Discharge Apparatus	R, Asg/T lar Mid Quiz				
Week 1 2 3 4 5 6 7 8 9	Lecture 1 2 3 4 5 6 7 8 9	Topics to be CoveredIntroductionProof of Bernoulli's EquationFlow through a Venturi MeterFlow through an OrificeFlow Over a Sharp crested Rectangu WeirFlow over a V-notchMid Term ExamFluid Friction in a PipeDetermination of Co-efficient Resistance for Change in CrossSecti of PipeDetermination of Co-efficient of Discharge using Orifice Discharge	R, Asg/T lar Mid Quiz				

13	13	Viva			
ASSESSME	ENT STRA	TEGY			
	Compone	ents	Grading	СО	Bloom's Taxonomy
Continuous		Report/Class ent/Assignments	20%	CO1, CO2	C2, C3
Continuous Assessment	Class	Participation	5%	CO1, CO2, CO3	C2, C3
(40%)	М	lid Term	25%	CO1, CO2, CO3	C2, C3
				CO1	C2
	Final Exa	am	50%	CO2	C3
				CO3	C3
	Total Ma	rks	100%		
REFEREN	CE BOOI	KS			
1. Fluid M	Aechanics	Sessional Lab M	Ianual Op	en Channel Flo	ow by V.T. Chow

Fluid Mechanics Sessional Lab Manual Open Channel Flow by V.T. Chow
 Fluid Mechanics with Engineering Application by Franzini
 Mechanics of fluids by Merle Potter and David Wiggert (Schaum's Series)

COURSE INFORMATION												
Course Code: EWCE 300Credit Hour: 1Course Title: Students' Internship Program (SIP)Contact Hour: 4 weeks												
Course Title: Students' Internship	Prog	ram (SIP)				Cont	act Ho	our: 4	week	s	
PRE-REQUISITE												
None												
CURRICULUM STRUCTURE												
Outcome Based Education (OBE)												
SYNOPSIS/ RATIONALE												
In this course the students will learn to communicate with industrial/ professional organizations/												
personnel as well as to be introduced with organizational/ project activities where they will find												
the application of their theoretical knowledge. Real life exposure of the students through this												
course will be very helpful in their professional life.												
OBJECTIVE												
1. To apply class room knowledge in solving real life engineering problems.												
2. To experience corpora	te cu	lture	and i	ts co	ntrib	ution	for th	e socie	ety.			
COURSE CONTENT												
Professional attachment in civil/ e												
projects/organization/firms prescri												
on a presentation and a report subm	nitted	l by tl	he int	tern a	and e	valua	tion of	the re	eporti	ng off	icer a	at the
organization/firm.												
SKILL MAPPING (CO – PO MA												
No Course Outcome				1		1	(POs)					
	1	2	3	4	5	6	7	8	9	10	11	12
1 CO1: Ability to gain												
practical professional												
experience in civil/	ŗ											
environmental/ water	V											
resources												
engineering												

2 3	CO2: Ability to work effectively as an individual and also as a member of a team during industrial attachment CO3: Ability to develop an appreciation of the breadth of civil/ environmental/ water resources engineering which helps to						\checkmark			√	
	gain life-long learning capability.										
4	CO4: Ability to perform verbal presentation on the gained knowledge										
COU	IRSE OUTCOMES & GENERI	C SKILLS	-		•	ĩ	•	1			
No	Course Outcome	Corresponding POs	Bloom's	Taxonomy*	CЪ	CA	KP		Assessment Methods	SPOIDAL	
CO1	Ability to gain practical professional experience in civil/ environmental/ water resources engineering	1	C	22	1	-	6, 7	Presentation Report, VIVA		rt,	
CO2	Ability to work effectively as an individual and also as a member of a team during industrial attachment	9	C	23	2, 6, 7	-	6, 7	ŀ	senta Repo VIV		
CO3	Ability to develop an appreciation of the breadth of civil/ environmental/ water resources engineering which helps to gain life-long learning capability	12	C	23	2, 6, 7	-	6, 7]	senta Repo VIV		
CO4		10	C	2	1	-	2	1	senta Repo VIV		
	WP= Washington Accord Com Engineering Activities/ CA= C Profile/ KP= Knowledge Profil *Level of Bloom's Taxonomy:	complex Active le									
	C1 - C2 - Remember Understand	C3- C4 Apply An			C5 - Evalu	ate	C6 Cre				
TE	(T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R –Report, F – Final Exam) TEACHING AND LEARNING STRATEGY										
Teaching and Learning Activities Engagement (Hours)											
Face-to-face Learning Eligagement (Hours) • Lecture 40 • Practical/ Tutorial/ Studio 40											

•	Student – Ce	entered Learnin	ng							
Guided	Learning		0							
	(2 hours/weel	k x 1 weeks)			10					
Indepe	ndent Learn	ing								
			\approx 1-hour learning)							
Prepara	tion for tests	and examination	on	7						
Assessm	nent									
Present	ation + Viva				3					
		Total		60						
	NG METHO									
Lecture and Discussion, Problem Based Method										
	SE SCHEDU	1	. C 1		A					
Week	Lecture	Topics to be	e Covered		Assessment					
1	01	Visit of one	industry							
2	02	Visit of anot	ther industry							
3	03	knowledge Preparing	eport based on their during industrial tra presentation for showledge Preparati	ining hearing						
ASSESS	MENT STRA	ATEGY								
Com	ponents	Grading	СО		Bloom's Taxonomy					
Asse	ContinuousStrutingAssessment50%(Report)			CO4	C2, C3					
V	Presentation & 50% CO1, CO2, CO3				C2, C3					
Total Marks 100%										
	ENCE BOO	KS								
N/A										

COURSE INFORMATION								
Course Code: EWCE 331	Credit Hour: 3.0							
Course Title: Water Supply Engineering	Contact Hour: 3.0							
PRE-REQUISITE								
None								
CURRICULUM STRUCTURE								
Outcome Based Education (OBE)								
SYNOPSIS/ RATIONALE								
In this course students will be presented with basic kn	owledge 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 a	and also in professional life.							
OBJECTIVE								
1. To gain knowledge on the basics of water supply tec	chnology.							
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								

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 CONTENT													
Introduction to Water Supply Engineering, Water requirement in urban and rural communities,													
	ost water supply option, Sources of												
	of wells and pumps, Design, drilli												
	ting system and alternative wat												
	ion, transportation, Analysis and												
	, Water loss control, Water qua												
	rds, Water treatment methods, C												
SKILI	MAPPING (CO – PO MAPPING	j)						<u>r</u>	(<u></u>		
No	Course Outcome	<u> </u>	OGI	RAM	OU	ГСОМ	ES ((POs)					
		1	2	3	4	5	6	7	8	9	10	11	12
1	Ability to estimate the fresh												
	water demand and assess the												
	requirements for preferred water												
	supply system in urban as well as												
	rural areas.	,											
2	Ability to identify problem												
	specific solutions to provide fresh												
	water supply												
	options including groundwater									1			
	well and RWH in urban as well									1			
	extremely water shortage areas.												
3	Ability to apply engineering												
	perception to construct complex												
	water supply distribution												
	networks in terms of economic,												
	public health, Environment and												
	sustainability												
4						-							
4	Ability to analyse water quality data and related treatment			Ň									
	methods to design and construct												
	efficient and cost-effective water												
	treatment plant, with appropriate												
	consideration for public health												
COLIE	and safety.	711 1	C										
	SE OUTCOMES & GENERIC SH		S		-								
No	Course Outcome	ng		*								Ħ	
		ndi		, s		(J		Ā		$\mathbf{\overline{N}}$		ds ds	
		od g	ŝ	E C C C C C C C C C C C C C C C C C C C		Z		E		Z		ssn tho	
		res	ц	Bloom's Taxonomy*		CP (WP)		CA (EA)		KP (WK)		Assessment Methods	
		Corresponding		щĘ	•	0		0		Å		Ϋ́	
001		<u> </u>											
CO1	Ability to estimate the fresh												
	water demand and assess the	1		0		1				2		ass T	
	requirements for preferred water supply system in urban as	1		C2	·	1		_	3			lid-ten nal Ex	
	well as rural areas.										1,11		saill
CO2	Ability to identify problem		_		-+		_		+				
	specific solutions to provide												
	•										Cl	ass T	est,
	fresh water supply options	1		C2		1		_		3	M	id-te	rm,
	including groundwater well and										Fir	nal Ez	kam
	RWH in urban as well extremely												
<u> </u>	water shortage areas.										Cl	a T	
CO3	Ability to apply Engineering perception to construct	7		C3		3		3		5		ass Te	
	perception to construct complex water supply	/		C3	'	3		3		5		d-ter	
	complex water supply											Group	,

	of econor	n networks in terms nic, public health,						Assignment Final Exam		
	environme	nt, and sustainability								
CO4	quality treatment and cons cost-effect plant,	to analyze water data and related methods to design truct efficient and ive water treatment with appropriate ion for public health	3	C4	2	_	4	Class Test, Mid-term, Final Exam		
	WP= Wasl EA= Engir Knowledg *Level of I	nington Accord Compl neering Activities/ CA e Profile/ KP= Knowle Bloom's Taxonomy: ember C2 – Understan	= Compl edge Prot	ex Activi file	ties; WK=	Washing	ton A	ccord		
	Create		ild C5	rippiy C	+ Thary20		Lvuiu			
	Presentatio	PR – Project, Q – Quiz on, R –Report, F – Fina	ıl Exam)		Exam, Asg	– Assign	iment,	Pr –		
		D LEARNING STRA	TEGY							
		arning Activities			Engag	ement (I	Hours)			
Face-to	b-face Learn Lecture (3	ing hours/week × 14 weel	ks)				42			
Self- D	irected Lean									
•		to-face learning					24			
• Prena		of the previous lecture nal examination	at home				11 20			
	l Assessmen						-			
•		s Assessment					20			
•	Final Exan						3			
		Total					120			
		ODOLOGY								
		on, Problem Based Me	thod							
	SE SCHED						•			
week	Lecture	Background of En	to be Co		aineering		Assess	sment		
	1	water supply, health								
	-	development of wate								
1	2	Importance of water public water supply,	r supply	Eng., Ele	ements of					
1	3	Environment and E Human Life, Wa	Environn ter sup	nental in ply, he	npacts on alth and					
	5	sanitation, Ecology Environmental Engi		vironmen	t, Role of					
	4	Population Estimation and water demand forecasting								
2	5	Fire demand calculat								
	6	Suitability of source and quality, Choice	es with 1	regards to	o quantity					
	7	Aquifer properties, aquifers, confined at	basic de	efinitions,	, types of					
3	8	Groundwater hydra	ulics, 1				Class	Test		
	9	infiltration, permeab Surface water collec		ts, Water	treatment					
units										

	10		v, discharge equ h example probl	ation for confined	1
4	11		equation for un	nconfined aquifers	3
	12		tribution syst	em, Distributior	1
	13	Withdrawal	of excessi es of groundwate		,
5	14	Basic conc		vell design, sieve	
	15		nission line desi		Group Assignment
	16	Gravel pack	design]
6	17		g and construction		
0	18	networks		al, and branched	
	19	Water well			Mid-Term Exam
7	20		groundwater in		
	21		vorks, Hardy Cr		
0	22	Pump and p of water pur	eries, Requiremen	t	
8	23		lity requirements		
	24	Water qualit			
	25	Plain sedime	entation		
9	26	Coagulation	, Flocculation		
	27		mance curve		
	28	Filtration			
10	29	Disinfection		Class Test	
	30		er intake design	-	
	31		nganese remova		
11	32	Arsenic rem			
	33			ne affected areas	
10	34			ater supply options	
12	35	Taste and ou			
	36	Water soften		lata ation in mate	
	37			letection in water ant appliances and	
13	38	Advanced C – reverse os		brane technologies	class Test
	39	Introduction		otechnology ir	
14				safety plans, Water	1
	40			er charging/ tariff	
		Water conse			
	41	Developing			
	42	Review of examples	water treatm	ent options with	1
ASSESS	SMENT ST	•			
	Compon		Grading	СО	Bloom's Taxonomy
Continue	ous Assessr		08		y
	ssignments/		40%	CO1, CO2	C2, C3
	•	Participation)	/ •	,	,
	Final Ex		60%	CO3, CO4	C3, C4
	Total Ma		100%		
REFER	ENCE BO		10070		
		igg. MA Aziz.			
			I Feroze Ahmed	l and MM Rahman	
				eith Todd, Larry W	
. Groui	лижанет пу	arology, sra E	union, Davia K	zini rouu, Larry W	. 1v1ays.

Principles of Water Treatment, Kerry J. Howe, David W. Hand.
 Water Supply Engineering, SK Gerg.

6. Integrated Design and Operation of Water Treatment Facilities (2nd Edition). Susumu Kawamura.

 Water Safety Plan (WSP) – A Risk Based Approach for Water Safety 1st Ed., ITN-BUET.
 Water and Environmental Engineering: M. Habibur Rahman, Abdullah Al-Muyeed, 1st Ed., ITN-BUET.

COUR	RSE INFORMATION												
	e Code: EWCE 332							C	redit I	Hour:	1.5		
	e Title: Environmental Engir	neerin	ng S	essio	onal-]	[t Hour	: 3.0		
	REQUISITE		0										
	E 105, CHEM-104, EWCE-3	31											
	LICULUM STRUCTURE	-											
	me Based Education (OBE)												
SYNC	OPSIS/ RATIONALE												
This is	s the practical course on en	viron	me	ntal	engin	eerin	ng w	here	stude	nts wi	ll be t	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.													
OBJECTIVE													
1	. To impart knowledge to d	etern	nine	e and	anal	lyze	diffe	rent	paran	neters	and su	ubstan	ces in
W	vater.					•			•				
2	. To make the students eff	icient	in	perf	ormi	ng d	iffer	ent e	nviro	nment	al exp	perime	ents to
	2. To make the students efficient in performing different environmental experiments to satisfy specific needs and interpret the findings.												
3	3. To introduce the students with standard procedure, how the test of water samples is												
С	onducted according to the sta	andar	d c	ode.	•							•	
COUR	RSE CONTENT												
Water	and wastewater sampling	g tecl	hnio	ques,	san	nple	pres	ervat	ion,	physic	al, ch	nemica	and and
biolog	gical tests of water and waste	water	r, bı	eakp	oint	chloi	inati	on, a	lum c	oagula	ation s	ampliı	ng and
	tory analysis of air, particul					ing a	nd la	bora	tory a	nalysi	s of so	oil and	l solid
waste	, sampling and laboratory an	alysi	$\frac{s \text{ of }}{2}$	nois	se.								
	L MAPPING (CO – PO MAI					TCO			<u>,</u>				
No	Course Outcome				I OU'			<u>`</u>	/	0	10	11	10
1		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Ability to use												
	sophisticated instruments to analyze water quality												
	parameters with their												
	standard test protocol in					N							
	terms of Engineering												
	practice.												
2	CO2: Ability to conduct											1	
-	experiments to analyze the												
	water quality parameters												
	against their standards and												
	also to interpret data in				'N								
	order to ensure safe water												
	supply requirements to												
1	protect public health and								1	1	1	1	

	environment.								
COUD	SE OUTCOMES & GENERIC								
No	SE OUTCOMES & GENERIC	SKILLS							
	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods		
CO1	Ability to use sophisticated instruments to analyze water quality parameters with their standard test protocol in terms of Engineering practice.	5	C3	1	-	6	Quiz, Report/Viva		
CO2	Ability to conduct experiments to analyze the water quality parameters against their standards and also to interpret data in order to ensure safe water supply requirements to protect public health and Environment.	4	C4	1	-	4	Quiz, Report/Viva		
	*Level of Bloom's Taxonomy: <u>C1 -</u> <u>Remember</u> <u>Understand</u>	<u>C3 -</u> <u>Apply</u>		<u>4 -</u> nalyze	<u>C5</u> Eva		<u>C6 -</u> Create		
	(CP – Complex Problems, CA PR – Project, Q – Quiz, M – M Report, F – Final Exam, Viva CHING AND LEARNING STR	/lid Tern - V)	n Exam, A						
	ing and Learning Activities	AILUI		agemen	t (Hou	urs)			
Face-to a) b)	b-face Learning Lecture (1 hours/week x 10 we Experiment (1 hr/week X10 w Data analysis and calculat hr/week X 10 weeks)	eeks)	75	10 10 5 7.5					
Guided a)	l Learning	x 10				20			
Indepe	ndent Learning Preparation for tests and exam	ination				07			
b) c)	ment Quiz Viva Class Performance (0.25 hr/wee weeks)	ek X 10				02 01 2.5			
	Total ING METHODOLOGY			60					
	and Discussion, Problem Based	Method							
	SE SCHEDULE								
week	Lecture Topics	to be Co	overed			As	sessment		

01	Introductio procedure	n, units of r	neasurements, sampling	
02	Determinat	ion of pH o	f water	
03	Determinat	ion Color o	f water	
04	Determinat	ion Turbidi	ty of water	
05	Determinat	ion TS, TD	S, TSS of water	
06	Determinat	ion of CO ₂		Report/ Mid Quiz
07	Determinat	ion of Alka	linity of water	
08	Determinat	ion of Hard	ness of water	
09	Determinat	ion of Chlo	ride of Water	
10	Determinat	ion of Total	l Iron of Water	
06	Mid Quiz			
11	Demand (E	BOD5)	Biochemical Oxygen	
12	Determinat (COD)	ion of Cher	nical Oxygen Demand	
13	Alum Coag	gulation		
14	Break Poin	t Chlorinati	on	
15	Determinat water	ion of Total	l and Fecal Coliform of	Report/ Final Quiz
16	Determinat water	ion of Arse	nic contamination of	Report I mai Quiz
17	Noise surve analysis	ey, data coll	lection and laboratory	
18	· ·	•	a collection and	
14	Final Quiz			
		Grading	СО	Bloom's Taxonomy
		30%	CO1, CO2	C3, C4
Quiz	,	70%	CO1, CO2	C3, C4
		100%		
		1 5 1		
ter Supp	ly and Sanita			
	02 03 04 05 06 07 08 09 10 06 11 12 13 14 15 16 17 18 14 15 16 17 18 14 15 16 17 18 14 15 16 17 18 14 15 16 17 18 18 14	01procedure02Determinat03Determinat04Determinat05Determinat06Determinat07Determinat08Determinat09Determinat10Determinat11Determinat06Mid Quiz11Determinat10Determinat11Determinat12Determinat13Alum Coag14Break Poin15Determinat16Determinat17Noise surva18Air quality14Final Quiz14Final Quiz14Final Quiz14Final Quiz15Determinat16Determinat17Noise surva18Air quality14Final QuizTotal MarksENCE BOOKSFextbook of Water Su	01 procedure 02 Determination of pH o 03 Determination of pH o 03 Determination Color o 04 Determination Turbidi 05 Determination TS, TD 06 Determination of CO2 07 Determination of Alka 08 Determination of Hard 09 Determination of Chlo 10 Determination of Total 06 Mid Quiz 11 Determination of Cher 06 Mid Quiz 13 Alum Coagulation 14 Break Point Chlorinati 15 Determination of Arse water Inalysis 18 Air quality survey, data coll analysis 14 Final Quiz SMENT STRATEGY	02 Determination of pH of water 03 Determination Color of water 04 Determination Turbidity of water 05 Determination TS, TDS, TSS of water 06 Determination of CO2 07 Determination of Alkalinity of water 08 Determination of Hardness of water 09 Determination of Chloride of Water 10 Determination of Total Iron of Water 06 Mid Quiz 11 Determination of Chloride of Water 06 Mid Quiz 11 Determination of Total Iron of Water 06 Mid Quiz 11 Determination of Chloride OXygen Demand (COD) 13 Alum Coagulation 14 Break Point Chlorination 15 Determination of Arsenic contamination of water 16 Determination of Arsenic contamination of water 17 Noise survey, data collection and laboratory analysis 18 Air quality survey, data collection and laboratory analysis 14 Final Quiz SMENT STRATEGY Conponents Components Grading CO Quiz

COUI	RSE INFORMATION												
	e Code: EWCE 333						Cred	it Ho	ur:	4.0			
Cours	e Title: Waste Water Engineering a	and S	anita	tion			Cont	act H	lour:	4.0			
	REQUISITE												
	A 103, EWCE-261 (Fluid Mechanic	cs), E	EWC	E-33	1 (W	ater S	Supp	ly En	igine	ering)		
-	RICULUM STRUCTURE												
	Outcome Based Education (OBE)												
SYNOPSIS/ RATIONALE													
In this course students will be presented with basic knowledge on wastewater source, design of													
sewage collection and treatment system, microbiology, characteristics, treatment and													
management of sewage sludge, sanitation system, and plumbing system. Knowledge gained													
from this course will be used in later semesters and also in professional life.													
	OBJECTIVE 1. To gain knowledge on the basics of waste water technology and sanitation options.												
													~ ~
	become skilled at the design and co	onstr	uctio	n oi s	sanita	ary se	ewer,	stori	m sev	wer,	waste	e wat	er
	atment plant.					مله له .	.:	~ f i					
	learn about the details of sewage tr						0					ant	
	understand the importance of sludgilities.	ge ma	anage	men	t and	lean	1 200	ut th	e siu	uge u	reatin	lent	
	be acquainted with the sanitation	taal	molo	gias	Acmo		v pro	otion	d in	low	inco	me	and
	veloping countries around the wor												
	propriateness of technologies suita								mue	5 KII	Jwills	g uie	
	RSE CONTENT		to sp	cent	5 5110		annoi	1.					
	luction to wastewater engineering,	esti	matic	n an	d col	lecti	on of	f was	stewa	iter	hvdra	mlics	of
	, design, construction and maintena												
	tenances, plumbing system for build										5000	,	
^	biology of sewage and waste w	•		tewa	ter c	harad	cteris	tics.	was	tewa	ter ti	eatm	ent
	ods and disposal, treatment and disp												
	supply, sanitation and health,												
	ruction of septic tanks, soak wells												
	tion services.									2			
SKIL	L MAPPING (CO – PO MAPPING	í)											
No	Course Outcome	PR	OGR		OUT	COM	IES (POs)					
		1	2	3	4	5	6	7	8	9	10	11	12
1	Ability to estimate the waste												
	water, solid waste and human												
	waste generation rate and assess												
	the requirements for preferred sanitation system in urban as well												
	as rural areas.												
2	Ability to identify likely												
-	Environmental impacts/risks							•					
	prior to start construction of any												
	development projects so that												
	adverse environmental impacts												
	could be minimized timely and												
	effectively.												
3	Ability to apply Engineering												
	perception to construct sewerage												
	networks and building plumbing												
	in terms of economic, public												
	health, environment and												
	sustainability.												
4	Ability to analyze waste-water												
	data and related treatment options												

	to design efficient and co effective ETP and STP wi appropriate consideration f public health and safety. SE OUTCOMES & GENERIC	th or								
No	Course Outcome									
		Corresponding POs	Bloom's Taxonomy*	CP (WP)	CA (EA)	KP (WK)	Assessment Methods			
CO1	Ability to estimate the waste water, solid waste and human waste generation rate and assess the requirements for preferred sanitation system in urban as well as rural areas.	1	C2	1	_	3	Class Test, Mid-term, Final Exam			
	Ability to identify likely Environmental Impacts/risks prior to start construction of any development projects so that adverse environmental impacts could be minimized timely and effectively.	7	C2	1	_	3	Class Test, Mid-term, Final Exam			
	Ability to Apply Engineering perception to construct sewerage networks and building plumbing in terms of economic, public health, environment, and sustainability.	7	C3	2	1	4,7	Class Test, Mid-term, Group Assignment Final Exam			
CO4	Ability to analyze waste-water data and related treatment options to design efficient and cost effective ETP and STP with appropriate consideration for public health and safety.		C4	3	4	5	Class Test, Mid-term, Final Exam			
	WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 – Remember C2 – Understand C3- Apply C4 – Analyze C5 - Evaluate C6 – Create									
(T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R –Report, F – Final Exam) TEACHING AND LEARNING STRATEGY										
	hing and Learning Activities		ngagemen	t (Hours)					
Face-to	o-face Learning Lecture (4 hours/week × 14 we	eks)			56					
Self- D	Directed Learning Non-face-to-face learning Revision of the previous lectur home	e at			12 22 65					

Prepa	ration for fina	examination									
	l Assessment										
•	Continuous A	Assessment	2								
Final	Examination		3								
		otal		160							
	ING METHOI										
		, Problem Based Method									
	SE SCHEDUI	-	he Coursed	A 222222							
week	Lecture		be Covered Vaste water Engg.	Assessment							
	1		supply and waste water								
	1	production	supply and waste water								
	2	1	e water, where does it								
	2	come? Generation of									
1			l health, Objectives of								
1	3		tion, Classification of								
		Wastes and Sanitation									
		sanitation system,	ion system, Types of Appropriateness of								
	4		Criteria for a good	Class Test							
		sanitation system	cintenta foi a good								
	5		water flow, discharge								
	5	computation	C								
	6	Per capita waste wa									
			riation, peak discharge								
2	7		stems for rural & low-								
		income urban commu Simple pit tech									
		Simple pit tech considerations and des	nology – design								
		Two pit latrine									
	8	considerations and des									
	9		aste water, dissolved								
		solids, suspended soli									
	10	Nutrients in waste wat	Class Test								
3	11	Ventilated Improved									
	11	Odorless Earth Closet (ROEC)									
		Pour-flash sanitation t									
	12	considerations and des									
	13	BOD, COD, DO	0								
	14	Environmental proble	ems of untreated waste								
4	14	water									
	15	Pour-flash sanitation t									
		considerations and des									
-	16 17	Septic tank – design c									
	1/		ity and water pollution sewage, Collection of								
_	18		ed system and separate								
5		system									
	19	Soak pit design		Group Assignment							
	20	Disposal of septic tan		Group Assignment							
	21	Sewer hydraulics,	Manning's equations,								
-		curved sewers	(1 01)								
6	22	Derivation of Part	1 2								
	23	hydraulic element diag Small Bore Sewerage									
L	23	Sinan Dore Sewerage	(SDS) System								

		Changes in design criteria for SBS compared	
		to Conventional Severage System	
-		Conventional Sewerage System	
	24	Simplified/ shallow sewerage system, Design	
		principles and design	
	25	Basic considerations of Sanitary sewer and	
		storm sewer design	Mid-Term Exam
	26	Example of sanitary sewer design of a	
		community	
7	27	Ecological sanitation technologies	
		Composition and types of sewage, Physical,	
	28	chemical and biological characteristics of	
	20	sewage, Environmental	
		significance of contaminants	
	29	Sulfide generation, sewer inspection,	
_		construction and maintenance of sewers	
_	30	Sewer appurtenances, manhole, Sewer test	
		Sewage treatment – purpose, phases and unit	
8		operations,	
U	31	Preliminary treatment methods – Screening,	
		cutting screen or comminutors and grit	
		chambers	
	32	Preliminary treatment methods – Skimming	
	32	tank, pre-aeration, and flow equalization	
	33	Importance, history and development of	
		plumbing system	
	34	Design of plumbing system for an apartment	
9	35	Primary treatment methods – Sedimentation,	
	20	septic tank (review)	
	36	Primary treatment methods – Imhoff tank,	
		dissolved air flotation	
		Secondary treatment – purpose, biological	
	37	treatment mechanism	
		Important organisms involved in biological	
-	38	treatment	Class Test
10	30	Role of bacteria in sewage treatment	
	39	Bacterial growth pattern in biological treatment	
-		Relation between Food/Microorganism	
	40	(F/M) ratio and biomass settling	
	40	characteristics	
		Types of biological treatment process,	
		Activated sludge process	
	41	Significance of F/M ratio in activated sludge	
		process	
11		Trickling Filter process – mechanisms and	
11	42	biological processes	
-		Advantages, disadvantages, influencing	
	43	factors in trickling filter process	
+	44	Design of trickling filter	
	45	Sustainability of water and sanitation services	
+		Participatory development approach in water	
	46	and sanitation sector	
		Waste stabilization ponds – process involved,	
12	47	advantages, disadvantages, Types of	
	- •	stabilization ponds	
	40	Anaerobic pond, facultative pond and	
	48	maturation ponds, Design preliminaries for	

-								
		waste stabilizat	tion ponds					
12	49		nanagement of water a ervices; introduction	to Class Test				
13	50	Introduction of	food sanitation					
	51	Design of wast	e stabilization ponds					
	52	Effluent dispos						
	53	E-waste						
	54	Env Risk Asse						
14	55	Sludge – types sludge	, characteristics, Collection	of				
	56	Importance of sludge management, Sludge treatment and disposal methods						
ASSESS	SMENT STRA	TEGY						
Co	mponents	Grading	CO	Bloom's Taxonomy				
Continu Assessm		40%	CO1, CO2, CO3	C2, C3				
	0		01,002,005	02, 03				
CT/ Mid Term/ Active Class Participation)								
Final Exam		60%	CO3, CO4	C3, C4				
То	tal Marks	100%						
REFER	ENCE BOOH	KS						

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe.

2. EWCE 333 Handouts and Class Lectures.

3. Water Supply, waste disposal and Sanitary Engineering – AK Chatterjee.

4. Water Supply and Sanitation – M Feroze Ahmed and MM Rahman.

5. Environmental Sanitation, Wastewater Treatment and Disposal – Tanveer Ferdous Saeed, Abdullah Al-Muyeed, Tanvir Ahmed.

6. Wastewater Engineering- Metcalf and Eddy.

7. Water Supply and Sewerage- Terence J. McGhee.

COURSE INFORMATION															
	Code: EWCE 341						Credit Hour: 3.0								
Course T	Title: Geotechnical Engineerin	ng-I: P	rinc	iple	and			Contact Hour: 3.0							
Practices	s of Soil Mechanics	-		-											
PRE-REQUISITE															
None															
CURRI	CURRICULUM STRUCTURE														
Outcome Based Education (OBE)															
SYNOPSIS/ RATIONALE															
This is the fundamental course on geotechnical engineering where students will be imparted with															
basic knowledge on types and identification of soils, soil properties and theories on soil mechanics.															
Student will be further exposed to soil parameters which will be helpful at later stages in the design															
of different soil related structures in their professional carriers.															
OBJEC															
	1. To gain insight on the ba	isics of	f soi	l typ	bes, d	iffer	ent g	round	d for	matio	ons/se	oil pr	ofiles	s and	
	soil properties.	а •		с ·	1			1.1			1	1.	1 •1•.		
COLID	2. To understand the basic	theori	es o	t soi	I me	chani	lcs a	nd the	eir pi	ractic	al ap	plica	bility	7	
	SE CONTENT		1		1.	<u>,</u>	1				<u>c</u>			1	
	Geotechnical Engineering: S							0		0.					
	ation of soils, soil composit														
	es of soils, engineering clas														
	stresses, stress distribution														
	stress-strain-strength charac	teristi	cs o	t so	ils, c	comp	ressi	bility	and	sett	leme	nt be	havi	or of	
soils, dif	ficult soils.														
	MAPPING (CO – PO MAPP	'ING)	חח		DAN		TCC		1 (DC						
No	Course Outcome		1 1					OMES	5 (PC) 8	9	10	11	10	
1	CO1. Able to comprehen	d tha	-	2	3	4	5	6	/	8	9	10	11	12	
1	CO1: Able to comprehen														
	physical and index propert														
	soils and their uses in engine	eering	v												
2	classifications/practices. CO2: Able to estimate	414.0													
2															
	distribution of stresses with														
	soil mass due to overburden	, pore		v											
3	water and external loading.														
3	CO3: Able to analyze the fail														
	soil mass considering stress,														
	and strength character														
	compressibility of soil an														
	effect of overburden and s				v										
	loading on earth retaining	g and													
4	bearing structures. CO4: Able to evaluate	1.													
4															
	performance of soils du														
	difficult soils and consoli-	dation													
COUD	processes.	C OIZI													
COURS	SE OUTCOMES & GENERI	C 2KI	LLS								1				
		ຊ			N										
		dir		0	° st							ent	\mathbf{s}		
No	No Course Outcome SO		Dloom'	Taxonomy*	E F	CA CP			Ϋ́		Assessment	Methods			
140	Course Outcome	lesi	Σ,		No To		ر	CA		X		ses	Iet		
		JOIT O		ם	L ^a							$\mathbf{A}_{\mathbf{S}}$	2		
		U U			-										
CO1	Able to comprehend the					+						Class	s Tes	t.	
	physical and index			$ C_2 $	2, C3	· ·	-	1		1,5		Final			
L	i jaarin und maan	1		I		- 1			-1		1				

	properties of soils and their						
	uses in engineering						
	classifications/practices.						
CO2	Able to estimate the						
	distribution of stresses						Class Test,
	within the soil mass due to	2	C2, C4	-	1	1,5	Mid-term,
	overburden, pore water and					-	Final Exam
	external loading.						
CO3	Able to analyze the failure of						
	soil mass considering stress,						
	strain and strength						
	characteristics,						Assignment
	·	2	C2, C5		1	1,6	Assignment, Class Test,
	compressibility of soil and the effect of overburden and	5	C2, C3	-	1	1,0	Final Exam
							I mai Exam
	surface loading on earth						
	retaining and bearing						
004	structures			_			
CO4	Able to evaluate the						
	performance of soils due to	4	C2, C4	_	1	1,6	Class Test,
	difficult soils and	·	02, 01		1	1,0	Final Exam
	consolidation processes.						
	WP= Washington Accord C	omplex Pr	oblem So	olving/ C	P= Cor	nplex Pr	oblem Solving;
	EA=	~					
	Engineering Activities/ CA=		Activitie	es; WK=	Washir	ngton Ac	cord Knowledge
	Profile/ KP= Knowledge Pro						
	*Level of Bloom's Taxonor		<i></i>		~-		94
	C1 – C2 –	C3-			C5 -		C6 –
	Remember Understand	Apply	Analyz	ze	Evalua	ate	Create
			A. 1 m	г			(D
	(T-Test, PR - Project, Q - Q)			i Exam, .	Asg - P	ssignme	ent, Pr –
	Presentation, R – Report, F –						
IEAC	CHING AND LEARNING ST						
	Teaching and Learning A	ctivities			-		. (**
					Eng	gagemen	t (Hours)
	o-face Learning				Eng		t (Hours)
•	Lecture (3 hours/week × 14 v	weeks)			Eng	gagemen 42	t (Hours)
	Lecture (3 hours/week \times 14 v	weeks)			Eng		t (Hours)
Guideo	Lecture (3 hours/week \times 14 v				Eng	42	t (Hours)
Guideo Tutoria	Lecture (3 hours/week × 14 v d Learning d/ Assignments (2 hours/week		s)		Eng		t (Hours)
Guideo Tutoria	Lecture (3 hours/week \times 14 v		s)		Eng	42	t (Hours)
Guideo Tutoria	Lecture (3 hours/week × 14 v d Learning d/ Assignments (2 hours/week		s)		Eng	42	t (Hours)
Guideo Tutoria	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning	$x \times 6$ week			Eng	42	t (Hours)
Guideo Tutoria	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect	$x \times 6$ week ture at hom			Eng	42 12 11	t (Hours)
Guided Tutoria Self- D	Lecture (3 hours/week × 14 v d Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar	$x \times 6$ week ture at hom			Eng	42 12 11 18	t (Hours)
Guideo Tutoria Self- D • • •	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment	$x \times 6$ week ture at hom			Eng	42 12 11 18 32	t (Hours)
Guideo Tutoria Self- D • • Formal a)	Lecture (3 hours/week × 14 v d Learning d/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment	$x \times 6$ week ture at hom			Eng	42 12 11 18 32 2	t (Hours)
Guideo Tutoria Self- D • • Formal a)	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment	$x \times 6$ week ture at hom			Eng	42 12 11 18 32	t (Hours)
Guideo Tutoria Self- D • • Formal a)	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination	$x \times 6$ week ture at hom			<u>En</u> §	42 12 11 18 32 2 3	t (Hours)
Guideo Tutoria Self- D • • • • • • • • • • • • • • • • • • •	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total	$x \times 6$ week ture at hom			Enş	42 12 11 18 32 2	t (Hours)
Guideo Tutoria Self- D • • • • • • • • • • • • • • • • • • •	Lecture (3 hours/week × 14 v d Learning d/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY	$x \times 6$ week the sure at homogeneous the second se				42 12 11 18 32 2 3	t (Hours)
Guideo Tutoria Self- D • • • • • • • • • • • • • • • • • • •	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY and Discussion, Problem-Based	$x \times 6$ week the sure at homogeneous the second se				42 12 11 18 32 2 3	t (Hours)
Guideo Tutoria Self- D • • • • • • • • • • • • • • • • • • •	Lecture (3 hours/week × 14 v d Learning d/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY	$x \times 6$ week the sure at homogeneous the second se			Eng	42 12 11 18 32 2 3	t (Hours)
Guideo Tutoria Self- D • • • • • • • • • • • • • • • • • • •	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY and Discussion, Problem-Based SE SCHEDULE Lecture Total	$x \times 6$ week the sure at homogeneous the second se	ne			42 12 11 18 32 2 3 120	t (Hours)
Guideo Tutoria Self- D • • Formal a) 0 b) 1 TEACH1 Lecture a COUR3	Lecture (3 hours/week × 14 v d Learning l/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY and Discussion, Problem-Based SE SCHEDULE Lecture Te 01 Introduction	x × 6 week ure at hom nination	e Covere			42 12 11 18 32 2 3 120	
Guideo Tutoria Self- D • • Formal a) (b) 1 TEACH1 Lecture a COUR3 Week	Lecture (3 hours/week × 14 v I Learning I/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY and Discussion, Problem-Based SE SCHEDULE Lecture To 01 Introduction	x × 6 week ure at hom nination	e Covere			42 12 11 18 32 2 3 120	
Guideo Tutoria Self- D • • Formal a) 0 b) 1 TEACH1 Lecture a COUR3	Lecture (3 hours/week × 14 v d Learning l/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY and Discussion, Problem-Based SE SCHEDULE Lecture Te 01 Introduction	$x \times 6$ week oure at hom- nination Method opics to be ochnical En	e Covere	g: Soil		42 12 11 18 32 2 3 120	
Guideo Tutoria Self- D • • Formal a) (b) 1 TEACH1 Lecture a COUR3 Week	Lecture (3 hours/week × 14 v d Learning d/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY and Discussion, Problem-Based SE SCHEDULE Lecture To 01 Introduction 02 Scope of Geote	x × 6 week aure at hom nination Method opics to be connical En foundatio	e Covere	g: Soil ering		42 12 11 18 32 2 3 120	
Guideo Tutoria Self- D • • Formal a) 0 b) 1 TEACH1 Lecture a COUR3 Week	Lecture (3 hours/week × 14 v d Learning l/ Assignments (2 hours/week irected Learning Non-face-to-face learning Revision of the previous lect Preparation for the final exar Assessment Continuous Assessment Final Examination Total ING METHODOLOGY and Discussion, Problem-Based SE SCHEDULE Lecture To 01 Introduction 02 Scope of Geote Mechanics and	x × 6 week ure at hom nination	e Covere	g: Soil ering of soils		42 12 11 18 32 2 3 120	

	05	Soil composition					
ſ	06	Soil structure and	fabric	Mid Term Exam			
	07	Soil particle size					
3	08	Specific gravity					
	09	Particle size distri	bution curve				
	10	Weight-Volume R	elationship				
4	11	Weight-Volume R	elationship (cont.)				
	12	Weight-Volume R	elationship (cont.)				
	13	Index properties o					
5	14	Engineering classi	fication of soils				
	15	Engineering classi	fication of soils (cont.)				
	16	Soil compaction					
6	17	Soil compaction (cont.)				
	18	Principles of total	and effective stresses				
	19	Principles of total	and effective stresses (cont.)				
7	20		and effective stresses (cont.)				
/	21		within the soil mass due to				
		external loadings Seepage					
	22						
8				- CT 2			
	24	012					
	25						
9		Permeability (cont					
		Permeability (cont		_			
_	28		gth characteristics of soils				
	29		gth characteristics of soils				
10		(cont.)		_			
	30		gth characteristics of soils				
		(cont.)		_			
	31	Shear strength of s		_			
11	32		near strength of soil (cont.)				
	33	Shear strength of s					
12		Lateral earth press					
_		Lateral earth press		CT 3			
		Lateral earth press					
13	37	Compressibility of		4			
ļ	38	Compressibility of		4			
1.4	39	Compressibility of	t soils (cont.)	4			
14	40	Soil settlement		4			
-	41	Soil settlement (co		_			
demos	42	Review and proble	em solving				
	MENT STRA						
	nponents	Grading	СО	Bloom's Taxonomy			
	us Assessme						
	signments/ C		CO1, CO2, CO4				
	n/ Active Cla	ss 40%					
Part	icipation)						
T ,		<u> </u>	<u> </u>				
	al Exam	60%	CO1, CO2, CO3, CO4	C2, C3, C4, C5			
	al Marks	100%					
	ENCE BOOI						
	-	-	W.E. Hanson and T.H. Thornb	our.			
2. Introd	iuction to Ge	otechnical Enginee	ring - B.M. Das.				

3. "Geotechnical Engineering, Principles and Practices", by Donald P. Coduto.

Course	RSE INFORMATION e Code: EWCE 342					Cred	it Ho	ır: 1.5			
		~ • •									
	e Title: Geotechnical Engineering	Sessional	1			Cont	act He	our: 3.0			
	REQUISITE										
None	ICULUM STRUCTURE										
	ICULUM STRUCTURE										
	me Based Education (OBE)										
	PSIS/RATIONALE s sessional course students will l	a givon	tha	basia	kno	wlada	10.00	difforor	ot typ	asof	<u>coi</u>
	gation equipment and techniques	•				-	-		• •		
	edge will be will be useful in la										
	professional life.										
OBJE	CTIVE										
	. To gain knowledge on the basics										
	. To determine various properties									oility,	a
	xisting pressure in soil, strain-stres. To analyze the performance of di									enage	<u>م</u> د
	2 1		<u> </u>			pactio		sonuari	<u> </u>	cpage	
	RECONTENT		. ,		_				· c:	•.	
	identification tests of soils, Grain s berg limits test, Permeability tests										
	y test, Direct shear tests, Consolid			comp	1000		<i>s</i> t, co	inpuetio	n test	, 1001	uu
SKII I	MAPPING (CO – PO MAPPINC	<i>z)</i>									
No	Course Outcome	PROGE	2 4 1/			MES	POs				
INU	Course Outcome	1 2	3	4	5	6	$\frac{10s}{7}$	8 9	10	11	1
	Ability to determine various					-					
	properties of soil such as index										
1	properties, compressibility, and existing pressure in soil, strain-										
	stress characteristics using										
	standard equipment.										
	Ability to analyze the		r								
2	performance of different soils under compaction, consolidation,										
	seepage etc.	,									
COUR	SE OUTCOMES & GENERIC S	KILLS			1		I			1	
0001											
		gui		*						Ħ	
		Corresponding POs		Bloom's Taxonomy*	ه	•				Assessment Methods	
No	Course Outcome	solos		onc		C	CA	KP		eth	
		<u>j</u>		Ble						Ass M	
		Q					1	1			
		Co									
	Ability to determine various	C							Clas		
	properties of soil such as index	CO							Asse	essme	
CO1	properties of soil such as index properties, compressibility,	0 1		C1, C	24	1	_	1,3	Asse Lab	essme Repo	ort
CO1	properties of soil such as index				24	1	_	1,3	Asse Lab Mid	essme	ort 2,
CO1	properties of soil such as index properties, compressibility, and existing pressure in soil, strain-stress characteristics using standard equipment.				24	1	_	1,3	Asse Lab Mid Fina Viva	essme Repo Quiz l Qui a	ort 2,
CO1	properties of soil such as index properties, compressibility, and existing pressure in soil, strain-stress characteristics				24	1	_	1,3	Asse Lab Mid Fina Viva Clas	essme Repo Quiz l Qui a	ort z, z,

	consolidat	tion, seepage etc.			d Quiz, nal Quiz,				
	Engineerii	hington Accord Complex Probl ng Activities/ CA= Complex Ac P= Knowledge Profile		Complex Problem So	lving; EA=				
	*Level of C1 – Remembe	Bloom's Taxonomy: C2 – C3- Apply r Understand	y C4 – Analyze		C6 — Create				
TEAC	Presentation	PR – Project, Q – Quiz, M – M on, R –Report, F – Final Exam) D LEARNING STRATEGY		g – Assignment, Pr –					
		g and Learning Activities	E	Engagement (Hours)					
Face-to	o-face Learn Lecture (3	ning hours/week × 12 weeks)		36					
Self- D	Revision of	rning to-face learning of the previous lecture at home on for final examination		10 5					
	•			4					
•	Assessmer Continuou Final Exar	is Assessment		2 3					
		Total		60					
		IODOLOGY ion, Problem Based Method							
	SE SCHED								
	Lecture	Topics to be Co	vered	Assessme	nt				
1	1	Introduction		-					
2	2	Field identification tests of so	ils						
3	3	Grain size analysis of so hydrometer	oil by sieve and	d Class Assess	ment,				
4	4	Specific gravity test of soil		Lab Repo	ort				
5	5	Atterberg limits test							
6	6	Relative density test							
7		Mid Quiz + Viva		Quiz, Viv	/a				
8	7	Constant head and falling tests	head permeability	7					
9	8	Unconfined compression test							
10	9	Compaction test (standard and	d modified)	Class Assess Lab Repo					
11	10	Direct shear tests							
12	11	Consolidation test (one dimen	usional)						

13	12	Consolidation t	nsolidation test (one dimensional)							
14		Final Quiz + V	iva	Quiz, Viva						
ASSESS	SMENT ST	RATEGY								
Components Grading CO Bloom's Taxonomy										
Asso (Class a Lab repo	tinuous essment ssessments/ orts/ Active urticipation)		CO1, CO2	C1, C4						
(Quiz	60%	CO1, CO2	C1, C4						
Tota	l Marks	100%								
REFER	ENCE BO	OKS								
1. Geot	echnical En	gineering Labor	atory Handout: MIST							
2. Soil	Mechanics 1	Laboratory Man	ual – B.M. Das							
	3. ASTM Standards for Geotechnical Engineering									
4. Engi	neering proj	perties of soils a	nd their measurement – J E I	Bowles						

5. Manual of Soil Testing – K H Head

COUI	RSE INFORMATION												
Course Code: EWCE 343 Credit Hour: 3.0													
Course	Course Title: Geotechnical Engineering-II: Foundation Contact Hour: 3.0												
Engine	0 0												
	REQUISITE												
None													
	RICULUM STRUCTURE												
	ome Based Education (OBE)												
SYNC	OPSIS/RATIONALE												
This co	ourse will help the students to get	in-dep	oth k	nowl	edge	abou	t sub	-soil	cor	nditio	ons a	nd d	esign,
	ction of different types of foundati	ons w	hich	will	be ve	ery he	lpful	in t	heir	prof	essio	nal l	ife.
OBJE	CTIVE												
	1. To become skilled in explor	ing su	ibso	il con	ditio	n and	in de	eterr	nini	ng tl	ne pro	oper	ties of
	underlying soil of a site.												
	2. To gain knowledge on the a					cons	tructi	on o	of fo	otin	g, rai	ft an	d pile
	foundations in various types					_		_					_
~~~~	3. To acquire knowledge on the	e anal	ysis	and c	lesign	ı of n	atura	l and	d ma	ın-m	ade s	oil s	lopes.
	RSE CONTENT		- 11										
	of foundations, bearing capacity												
-	ues, settlement and distortion of f				agn a	ind co	onstru	ictio	on of	too	tings	, raf	ts and
	ateral earth pressures, slope stabilit		yses	5.									
	L MAPPING (CO – PO MAPPINO		CD				70 (D						
No	Course Outcome	PRO 1	$\frac{GR}{2}$	AM ( 3	4	<u>5</u>	2 <u>5 (P</u> 6	<u>()</u>	8	9	10	11	12
1	CO1: Able to explore the subset	1	2	5	4	5	0	/	0	9	10	11	12
1	CO1: Able to explore the subsoil condition of a site and to												
	determine the properties of												
	1 1	_											
	foundation soils in order to design	v											
	and construct proper types of foundation of any civil												
	5												
2	engineering structures. CO2: Able to evaluate the bearing												
2	capacity and settlement for the												
	purpose of designing footing and												
	raft foundations for a structure on			√									
	various subsoil and loading			v									
	conditions.												
3	CO3: Able to evaluate the bearing												
5	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	CO4: Able to analyze the												
'	performance of existing												
	foundation and construct new												
	footing, raft and pile foundation		v										
	in various subsoil conditions.												
5	CO5: Able to analyze the stability	1											
5	of any soil slopes in order to												
	determining proper and stable												
	slopes on various subsoil and												
	groundwater conditions.												
COU	RSE OUTCOMES & GENERIC SI	KILLS	1		<u> </u>		l		I		l		
0001	TOP OF LOWIED & OFFICIAL DI		,										

NI-								
No		lg	×.					
		Corresponding POs	Bloom's Taxonomy*				t	
	Course Outcome	POs	, m	G	CA	KP	ent	
	Course Outcome	P(	ioo uo	0	U	X	spc	
		ліс	Bl				ses	
		Ŭ					Assessment Methods	
CO1	Able to explore the subset							
COI	Able to explore the subsoil condition of a site and to							
	determine the properties of		C1 C2	1 4	1	1.2	Class Test,	
	foundation soils in order to		C1, C2	1,4	1	1,3	Final Exam	
	design and construct proper							
	types of foundation of any civil							
	engineering structures.							
CO2	Able to evaluate the bearing							
	capacity and settlement for the						Class Test,	
	purpose of designing footing	3	C2, C3		2	3	Mid-term,	
	and raft foundations for a		02, 03	1,4	2	5	Final Exam	
	structure on various subsoil and							
	loading conditions.							
CO3	Able to evaluate the bearing							
	capacity and settlement for the						Assignment,	
	purpose of designing single and		C5, C6	1,4	1	3	Class Test,	
	group pile foundation for a		00,00		-	5	Final Exam	
	structure in various types of							
	subsoil and loading conditions.							
CO4	Able to analyze the							
	performance of existing							
	foundation and construct new	2	C5		1,2	1,6	Class Test,	
	footing, raft, and pile		0.5	1,4	1,2	1,0	Final Exam	
	foundation in various subsoil							
	conditions.							
CO5	Able to analyze the stability of							
	any soil slopes in order to						Assignment	
	determining proper and stable	1	C3		1,2	1,6	Assignment, Final Exam	
	slopes on various subsoil and			1,4				
	groundwater conditions.							
	WP= Washington Accord Com	plex Prob	lem Solving	g/ CP= C	omplex	Problem	n Solving; EA=	
	Engineering Activities/ CA= C		ctivities; W	K= Was	hington .	Accord	Knowledge	
	Profile/ KP= Knowledge Profil							
	*Level of Bloom's Taxonomy: C1 – C2 –		C4 –	C5 -		C6		
	Remember Understand	Apply A			- luate		- eate	
	Cincensent Cincerstand	TPPI I	muryze	Lva	iuut	CI	Juit	
	(T-Test, PR – Project, Q – Quiz	z, M – Mio	l Term Exa	m, Asg -	- Assign	ment, P	r —	
	Presentation, R – Report, F – Fi			. 0		, 		
TEA	CHING AND LEARNING STR							
Teac	hing and Learning Activities		Engagen	nent (Ho	urs)			
Face-	to-face Learning			_	_			
•	Lecture (3 hours/week $\times$ 14 we	eeks)			42			
Guide	d Learning							
	al/ Assignments (2 hours/week >	< 6			12			
weeks	-				14			
	Directed Learning							
•	Non-face-to-face learning				11			
	rion face to face fourning				11			

•		of the previous lecture at home		18				
• Former 1	Preparation Assessment	on for the final examination		32				
		nt s Assessment		2				
	Final Exan							
b)	FINAL EXAIL	Inauon		5				
		Total		120				
TEACH	ING METH	HODOLOGY						
		sion, Problem-Based Method						
	SE SCHEL							
	Lecture			Assessment				
	01	Scope and aspects of foundat	ion engineering.					
		Purpose and stages of subso	oil investigation,					
		Information required from	om a subsoil					
	02	investigation, Planning	of subsoil					
		investigation, Cost of explor	ation, Number					
1		and location of boring, Dep						
		Types of shallow found	dation, Failure					
		mechanism of foundation so						
	03	General bearing capacity	equations for					
	05	shallow foundation, Bearing	capacity factors					
		and angle of internal friction	of soil, Bearing					
		capacity factors proposed by						
		Types of boring: Auger bor		CT 1				
	04	auger boring, Wash boring	g, Percussion					
		boring, ODEX drilling.						
		Types of boring: Auger bor						
2	05	auger boring, Wash boring	g, Percussion					
		boring, ODEX drilling.						
		Bearing capacity of str		Mid Term Exam				
	06	cohesionless soil, Effect of	of footing shapes					
		on bearing capacity.	( (11 C 1					
	07	Determination of ground v	water table, Soil					
		sampling techniques.	notration test or 1					
3	08	Penetration tests, Standard pe SPT N-values, Corrections f						
5	00	SPT and soil strength parame						
	6.5	Design charts for the design						
	09	cohesionless soil.	,					
		Types of soil samplers, Type	es of soil samples					
	10	and their usages, Samp	le disturbance					
		and its measurement, Rock qu						
4	11	Dynamic cone penetration t						
	11	penetration (CPT), Cone and						
	12	0 1 7	oting on clay,					
		Skempton's equation.						
		CPT friction ratio and its relat	A .					
	13	types, use of piezocone						
		porewater pressure and water	table, CPT-SPT					
_		relations.	C 1 1					
5	1.4	Geophysical methods of						
	14	investigation, Field vane sl	near test, Subsoil					
		investigation report.	ta, an 1					
	15	Effect of load eccentrici						
		capacity Meyerhof concept	or equivalent					

		footing width.	
		Types of deep foundation, Classification and	
	16	use of pile foundation.	
		Driven and bored piles, Friction and bearing	
6	17	piles, Analysis of skin friction and end bearing	
0	17	for driven piles in sand.	
	10	Bearing capacity of raft foundation, Factor	
	18	of safety in bearing capacity.	
		Critical depth concept for piles in	
	19	cohesionless soil, Estimation of skin friction	
		and end bearing using critical depth concept.	
7	20	Computation of skin friction of driven piles	
	20	in clay, $\alpha$ -method.	
	21	Construction problems of footing and raft	
	21	foundation.	
	22	Computation of skin friction of driven piles	
		in clay, $\beta$ -method, $\lambda$ -method.	
	_	End bearing for piles in clay soil, Bearing	CT 2
8	23	capacity of group piles in sand and clay,	
U	24	Efficiency of pile group.	
	24	Computation of settlement of footing, Elastic	
		settlement, immediate settlement and	
0	25	consolidation settlement.	
9	25	Effect of load eccentricity on group piles,	
		Estimation of bearing capacity from SPT-	
	26	value for piles in sand, clay and silty soil. Pile driving formula, Uplift capacity of	
	20	individual pile and group	
	27	Construction problems of driven piles.	
10	28	Negative skin friction and remedial	
		measures. Bearing capacity of bored Piles.	
	29	Pile load test and interpretation of load test	
		data.	
	30	Construction problems of bored piles,	
		Methods of advancing holes.	
11	31	Introduction to stability of slopes,	
		Analysis of infinite slopes of cohesionless,	
		cohesive and $c-\phi$ soils.	
	32	Planner method of stability analysis of finite	
	- 22	slopes, Culmann's analysis.	
	33	Properties of bentonite to be used in advancing	
		boreholes for cast in situ piles, Limitations of	
12	34	bentonite method.	
12	54	Effect of submergence and seepage on stability of infinite slopes.	CT 3
	35	Different modes of circular finite slope failure,	
	55	Mass method of stability of slopes.	
	36	Actions to be taken before concreting of bored	
		piles, Concreting of bored piles, Reverse	
		circulation method.	
13	37	Slices methods of stability of slopes,	
		Ordinary method of slices,	
	38	Various methods of determining centre or	
	20	locus of slip surface.	
	39	Ground Improvement Methods Soil	

		Stabilization an	nd Preloading									
14	40	Simplified B	sishop method of stabili	ity								
		analysis										
	41	Taylor's chart.	in analyzing stability of slope	es.								
	42 Ground Improvement Methods SCP and Stone											
		Columns										
ASSESS	SMENT ST	RATEGY										
Com	Components Grading CO Bloom's Taxonomy											
Assessn assignn Mid Ter C	tinuous nent (Class nents/ CT/ rm/ Active Class cipation)	40%	CO1, CO2, CO3, CO4	C1, C2, C3								
Fina	l Exam	60%	CO1, CO2, CO3, CO4, CO5	C1, C2, C3, C5,C6								
Tota	l Marks	100%										
REFER	ENCE BO	OKS										
			Peck, W.E. Hanson and T.H.	Thornburn								
			eering: SI Edition - B.M. Das									
3. "F	oundation A	Analysis and De	sign" by Joseph E. Bowles									

0001													
	e Code: EWCE 351												
Cours	ourse Code: EWCE 351     Credit Hour: 4.0       ourse Title: Transportation Engineering     Contact Hour: 4.0       RE-REQUISITE     Contact Hour: 4.0												
	REQUISITE												
None													
	RICULUM STRUCTURE												
	ome Based Education (OBE)												
	OPSIS/RATIONALE	1	1			1						1	1
	s course students will be intro												
	n, geometric design of high way												d to
	gent transportation system and t		IC IN	npact	asse	essmen	t wh	ich wi	II be	e uset	ul 1n la	ater	
	sters and also in professional life	e											
OBJE	CTIVE												
	1. To acquire knowledge on									201			
	2. To orient with road traffic						amen	tals of	trat	fic ei	ngineer	rıng.	
	3. To understand basics of t						a .		a)	1 00	сс <b>:</b> т		
	4. To get acquainted with In	tellı	gen	t Trai	ispoi	rtation	Syste	m (IT	S) at	nd Tr	affic I	mpac	t
COLU	Assessment (TIA).												
	RSE CONTENT	1.1		1			1	1 1	• ,		<u>a</u> .		
	port planning, concepts, scope a												
	ties, land use-transport interac												
	adesh. Geometrical design of hi												
	nent types, materials, function												
-	eering, vehicle and traffic char	racte	erist	ics, t	ratti	c conti	rol de	evices	and	l syst	ems,	Intell	igent
	ortation system.												
SKIL	L MAPPING (CO – PO MAPPI	NG)	)		DI			UTO	<u></u>		0		
No	Course Outcome	1	2	3		ROGRA	1					11	12
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1: Explore the problems												
	related to different geometric	r											
1	features of the highways	$\checkmark$											
	including finding solutions												
	to common challenges												
	encountered.							-	<u> </u>				
	CO2: Forecast travel												
2	demands using contemporary		r										
	methods for effective		V										
	transportation planning.								<u> </u>				
	CO3: Plan and design two												
3	phase traffic signal,												
	considering the rudiments of												
	traffic engineering					ļ		-					
	CO4: Illustrate various type of												
4	pavement, their components												
COL	and material requirement	1 0 1 7	<b>TT T</b>										
COU	RSE OUTCOMES & GENERIC	: SK	ILL	S									
		δί	)										
		din		s	ly*							ent	
NT-		Corresponding	S	'n,	Faxonomy*	പ		<b>√</b>		Ь		Assessment Methods	
No	Course Outcome	dSe	PC	Bloom'	on	CP		CA		KP		sest	
		)IT(		Bl	Гах							Ass M	
		Ŭ										7	
$CO^{1}$	Evelope the such la 1 ( 1				+						CI	T	ost
CO1	Explore the problems related	г	01	$C^{1}$	$\sim$					12		ass T lid-ter	
	to different geometric	ŀ	<b>P</b> 1	C1,	C2	-		-		1,3		nal Ex	
		1	110								1.11		aill
		_	119										

COURSE INFORMATION

	features of	the highways							
		finding solutions							
	to comm	on challenges							
	encountered	•							
CO2	Forecast t	ravel demands							
	using conter	mporary methods	P2	C2, C5			124	Assignment	
	for effectiv	re transportation	ГΖ	C2, C3	-	-	1,2,4	Assignment	
	planning.	_							
CO3	Plan and des	sign two phase						Class Test,	
i	traffic signal	, considering the	P3	C1, C3	-	-	5	Mid-term,	
	rudiments of t	raffic engineering						Final Exam	
CO4	Illustrate v	various type of							
		their components	P1	C1, C4	-	-	1,3	Presentation	
		l requirement							
		ngton Accord Com							
		Activities/ CA= C		Activitie	es; WK= Wasl	nington A	Accord	Knowledge	
		Knowledge Profil	e						
	*Level of Bl C1 –	loom's Taxonomy:	C3-	$\mathbf{C}\mathbf{A}$	<b>C</b> 5		CC		
	-	C2 – Understand		C4 –	C5 -	luate	C6	- eate	
	Remember	Understand	Арріу	Analyz	e Eva	luale	Cre	eate	
	(T-Test PR	– Project, Q – Quiz	• M – M	fid Term	Exam Aso -	Assimn	ient P	r – Presentation	
		F - Final Exam	2, IVI IV.		LXaiii, 713g	7 <b>1</b> 551g111	iciit, I	i resentation,	
TEA		D LEARNING STR	RATEG	Y					
		rning Activities		*			Enc	gagement (Hours)	
	to-face Lear								
Lace		hours/week × 14 w	veeks)				56		
Guide	ed Learning		eeks)				50		
		ents (3 hours/week	× 6 wee	eks)				18	
	Directed Lear		<u>× 0 wee</u>	<b>(K</b> 5)				10	
Sell-1		o-face learning						40	
•		-	ma at ha	-				40 16	
•		f the previous lectu		me				25	
•	1	n for the final exam	ination					23	
	al Assessment	-						2	
a)	Continuous							2	
b)	Final Exami	nation						3	
			otal					160	
	HING METHO								
		on, Problem-Based	Method						
	RSE SCHEDU								
Wee	k Lecture	Topics to be Cov		<del></del>			Asse	ssment	
	01	Introduction to tra	attic eng	gineering	5				
		Dead the ff and the		40.00					
1	02	Road traffic syste							
1	03	Traffic character			characteristics	i			
		and road user cha			ahorostaristi	and			
	04	Traffic character		venicie	characteristics	and			
	05	road user characte		2					
	05	Traffic survey and		8				CT 1	
2	06 07	Traffic volume st Traffic volume st						CII	
	07	Traffic speed stud							
	08	Traffic speed stud					<u> </u>		
3	10	Traffic delay stud							
5	10	Origin destination					<u> </u>		
L	11	ongin destination	i sui vey				1		

	12	Parking studies	
		Traffic Control Devices, traffic signs and road	
	13	markings	
4	14	Traffic Control Devices, traffic signs and road	
4	14	markings	
	15	Traffic signal, types and design	
	16	Traffic signal, types and design	
	17	Street lighting	
	18	Terminals – Bus and truck terminals	
5	19	Elements of Geometric Design and design	
		controls/criteria	
	20	Traffic Elements of highway design and LOS	
	21	Functional classification of road and road	
-	21	hierarchy	
	22	Roadway cross-section and various elements of	
6		a road	
Ũ	23	Roadway cross-section and various elements of	
-		a road	Mid Term Exam
	24	Sight distances - Passing sight distance and stopping	
		sight distance	
	25	Sight distances - Passing sight distance and	
-	20	stopping sight distance	
_	26	Sight distances - Passing sight distance and	
7		stopping sight distance	
-	27	Super elevation and its characteristics	
	28	Intersection- Design principle, alignment,	
		classification	
	29	Intersection- Design principle, alignment,	
8	30	classification	
0	30	Grade separation and interchange Grade separation and interchange	
-	32	Horizontal alignment and horizontal curves	
	33	Vertical alignment and vertical curves	
-		Basic elements of transportation planning and	
	34	concepts	
9		Basic elements of transportation planning and	CT 2
,	35	concepts	
-		Scope of transportation planning, goals and	
	36	objectives	
		Classification of transportation system and	
	37	functional classification of land transport	
		system	
10	20	Socio-economic activities and land use pattern-	
10	38	transport iteration	CT 3
	39	Data collection and travel surveys	
	40	Travel demand forecasting, trip generation, trip	
	40	distribution and modal split	
	4.1	Travel demand forecasting, trip generation, trip	
	41	distribution and modal split	
11	40	Travel demand forecasting, trip generation, trip	
11	42	distribution and modal split	
ľ	43	Transportation system of Bangladesh	
ſ	44	Pavement and its types	
	45	Function of various pavements	
12	46	Materials used in pavement construction	CT 4
	47	Aggregates - classification and properties	

	40		C' 1 .!								
	48		fication and properties								
	49	Bituminous mater	rials – classification and								
	49	properties									
13	50	Bituminous mater	rials – classification and								
15	50	properties									
	51	Flexible pavement	design								
52 Flexible pavement design											
53 Rigid pavement design											
14	54	Rigid pavement des	sign								
14	55	Intelligent transpor	tation system								
	56	Intelligent transpor									
ASSESS	MENT ST	RATEGY									
0	Component	s Grading	СО	Bloom's Taxonomy							
Continuc	us Assessn	nent									
	ous Assessm signments/										
(Class as		CT/	CO1, CO2, CO3	C1, C2, C3, C4, C5							
(Class as Mid Terr	signments/ n/ Active C	CT/	CO1, CO2, CO3	C1, C2, C3, C4, C5							
(Class as	signments/ n/ Active C	CT/	CO1, CO2, CO3	C1, C2, C3, C4, C5							
(Class as Mid Terr Participa	signments/ n/ Active C	CT/ lass 40%	CO1, CO2, CO3 CO1, CO2, CO3, CO4	C1, C2, C3, C4, C5							
(Class as Mid Terr Participa	signments/ n/ Active C tion)	CT/ lass 40%									
(Class as Mid Terr Participa	signments/ n/ Active C tion) Final Exam Fotal Marks	CT/ lass 40% 60% 100%									
(Class as Mid Terr Participa REFER	signments/ n/ Active C tion) Final Exam Fotal Marks ENCE BO	CT/ lass 40% 60% 100%	CO1, CO2, CO3, CO4								

Transportation Engineering and Transport Planning – L.R. Kadiyali
 Transportation Planning and Traffic Engineering – O'Flaherty

COUR	SE INFORMATION												
	e Code: EWCE 352						Cre	dit H	lour:	15			
	e Title: Transportation Engin	eering	Sessio	nal					Hour		)		
	EQUISITE	<u> </u>	,				1						
	E 351 (Transportation Engine	ering)	)										
CURR	ICULUM STRUCTURE	- 0/											
	me Based Education (OBE)												
	PSIS/RATIONALE												
In this	course the students will lear	n to p	erform	mix d	esig	n for	highv	vay r	nater	ials a	and c	apacit	у
analysi	is for road traffics, which the	ey can	apply	profes	sion	ally.	-	-				_	-
OBJEC	CTIVE												
	1. To learn testing of high					k desi	gn						
	2. To perform analysis or	ı road	traffic	capaci	ty								
	SE CONTENT												
	g and quality control of high	ghway	mater	ials, t	oitur	ninoı	is miz	x des	sign,	road	lway	traffic	and
capacit	ty analysis.												
SKILL	MAPPING (CO – PO MAI	PPINC	5)		DD	OCP	AM C		TOM	<b>FS</b> (1	DO _c )		
No	Course Outcome	1	2	3	4	5	$\frac{1}{6}$	7	8	9	10	11	12
	CO1: Able to <b>determ</b>			5		0	0	,	Ŭ		10		12
	properties of aggregates	and	$\checkmark$										
	bitumen using stand												
	methods												
2	CO2: Able to identify optim	num											
	bitumen content by Mix Des			v									
	CO3: Able to determ												
	properties of aggregates	and											
3	bitumen using stand												
	methods and road way capa												
	& traffic saturation flow.												
COUR	SE OUTCOMES & GENER	RIC SI	KILLS										
		50											
		din	$\mathbf{v}_{\mathbf{s}}$								ent	2	
N		sponding POs	Bloom's Taxonomy*	Ъ		<	Ъ				essment ethods		
No	Course Outcome	sOd	oot	CP	(	CA	$\mathbf{K}$						
		Corre	Bl								Ass M		
		Ŭ									7		
CO1	Able to <b>determine</b>												
	properties of aggregates								_		_		
	and bitumen using standard	1	C2	1, 5		-	5		Viv	a/Qı	uiz/La	ab Rep	port
	methods												
CO2	Able to <b>identify</b>												
	optimum bitumen content	3	C4	1, 5		-	5		Viv	a/Qu	uiz/La	ab Rep	oort
	by Mix Design									`		1	
CO3	Able to <b>determine</b>												
	properties of aggregates												
	and bitumen using standard	4	C1	1 2	-		<b>F</b> (		<b>1</b> 7!-		.;_/т	h D -	o att
	methods and road way	4	C4	1, 3, 3	5	-	5,6		<b>V</b> 1V	a/Qi	u1Z/L8	ab Rep	ort
	capacity & traffic												
	saturation flow.												
	WP= Washington Accord	Compl	ex Prol	olem S	olvi	ing/ C	CP = C	ompl	ex Pr	oble	m So	lving;	EA=
	Engineering Activities/ CA	= Cor											
	Profile/ KP= Knowledge P	rofile										-	
	*Level of Bloom's Taxono	my:	122										

	C1 – Rememb	C2 – Understand	C3- Apply	C4 – Analyze	C5 Eva	- luate	C6 – Create				
		PR – Project, Q – Qui ort, F – Final Exam)	z, M – M	lid Term Exa	m, Asg -	- Assignm	nent, Pr – Presentation,				
TEACH		D LEARNING STRA	TEGY								
	7	Feaching and Learning	g Activiti	es		Eng	agement (Hours)				
Face-te	o-face Le	arning									
		(3 hours/week × 12 w l/ Tutorial/ Studio	eeks)				36				
Self- D	irected L	earning									
•	Non-fac	e-to-face learning					3				
•	Revision	n of the previous lectu	re at hom	ne			12				
•	Preparat	ion for the final exami	ination				3				
Formal	Assessm	ent									
a)	Continuo	us Assessment					3				
b)	Quiz and	viva					3				
		Total					60				
TEACH	ING MET	HODOLOGY									
Lecture	and Discu	ssion, Problem Based	l Method								
COUR	SE SCHE	DULE									
Week	Lecture	Topics to be Cover	ed			Assessm	nent				
1	01	Determination of ag Determination of agg									
2	02	Determination of ten Determination of ang									
3	03	Determination of flak Determination of elor				-					
4	04	Specific gravity of s materials	semi-soli	d bituminous	8						
5	05	Loss on heating of compounds	of oil a	and asphaltic	0						
6	06	Penetration of bitumi	nous mat	terials							
7	07	Softening point of bit	tuminous	materials			Test, Reports, Class				
8	08	Ductility of bitumino	ous mater	ials		р	articipation, Viva				
9	09	Flash and fire j materials	points o	of bitumino	us						
10	10	Determination of roa Measuring saturation									
11	11	Standard test m laboratory compacted	of								
12	12	Marshal method of m									
13	13	Final Quiz Test									
14	14	Viva									
ASSESS	SMENT S	TRATEGY									

Components	Grading	СО	Bloom's Taxonomy							
Continuous										
Assessment										
(Assignment/Test/ Mid	30%	CO1, CO2, CO3	C2							
Term/ Active Class										
Participation)										
Quiz	60%	CO1, CO2	C2							
Viva	10%	CO1, CO2, CO3	C4							
Total Marks	100%									
<b>REFERENCE BOOK</b>	S									
1. Highway Engineering – Paul H. Wright, 6th Ed.										
2. Transportation Engineering and Transport Planning – L.R. Kadiyali										
3. Laboratory Manual										

COURS	E INFORMATION												
	Code: EWCE 361						1	[¬] redi	t Hoi	ir. 3	3.0		
	Title: Open Channel Hydraulic	20					-			$\frac{1}{2}$ our: $\frac{1}{2}$			
		.5					<b>`</b>	_01112		Jui	5.0		
	EQUISITE	1060	(E1)		lacha	nico	Sac	aion	,1)				
	261 (Fluid Mechanics), EWCE	2 202	(ГП		viecna	mes	268	siona	u)				
	CULUM STRUCTURE												
	e Based Education (OBE)												
	PSIS/ RATIONALE		1	1			1	1.0	c			6.4	0
	urse will be helpful for stude												
	flow and its classification; w												
energy and transition problems; critical flow and control. In this course, students will also be introduced with the concept of uniform flow, Chezy and Manning equations, estimation of resistance													
introduced with the 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 etc. which will be useful in designing open channel i.e. drainage channels or irrigation canals													
etc													
OBJECT		ort	m 41.			f1	., 41-		0	. al	anala		
	To learn the energy and mom											-	
	To understand the Manning's										channel	S.	
3.	To estimate energy dissipatio	n aue		iyui	aunc	Jum	ps n		11 110) 1 +h	NS. Sflor	mentil		
4.	To design different types of c	mann	ers a		comp	ne n	ume	encal	iy the		/ prom	es.	
		tion		anit		1		no di	atuika	tions			tion
	hannel flow and its classification problem												
	energy and transition problem												
	vices, concept of uniform flow												
	ents and computation of uni												
•	ic jump theory and analysis of	gradu	any	var	ied flo	ow, o	com	putat	10n o	I IIOV	v prom	es, desi	gn of
channels	s. MAPPING (CO – PO MAPPII												
No	Course Outcome	1		P A	MOU	TC			<b>20</b> c)				
INU	Course Outcome	1	2	3		5	6	<u>-</u> 5 (1	8	9	10	11	12
1	CO1: Understand the	1		5		5	0	/	0	)	10	11	12
1	open channel flow,												
	including the	Ň											
	classifications of different												
	types of open channels												
	and <b>analyze</b> the key												
	characteristics of various												
	open channel geometries												
	and their influence on												
	flow behavior												
1													
2													
2	CO2: <b>Apply</b> principles of flow measurement to												
2	CO2: Apply principles of												
2	CO2: <b>Apply</b> principles of flow measurement to	$\checkmark$											
2	CO2: <b>Apply</b> principles of flow measurement to select and use appropriate	$\checkmark$											
2	CO2: <b>Apply</b> principles of flow measurement to select and use appropriate devices in open channel flow and to design and implement control	$\checkmark$											
2	CO2: <b>Apply</b> principles of flow measurement to select and use appropriate devices in open channel flow and to design and implement control structures for managing	$\checkmark$											
2	CO2: <b>Apply</b> principles of flow measurement to select and use appropriate devices in open channel flow and to design and implement control	V											

3	CO3: Understa	and th	ne 🗸								
	concept of unifo	orm flo									
	and apply Che	ezy ar	nd								
	Manning equat	ions	to								
	estimate r	esistan	ce								
	coefficients	ar	nd								
	proficiency in co	omputir	ng								
	uniform flow, co										
	the hydraulic										
	influencing	chann	el								
	design.										
4	CO4: Analyze										
	varied flow us										
	momentum equa	tion ar	nd								
		omentu									
	concepts and un										
	hydraulic jump th										
	its application		in								
	controlling		nd								
	dissipating energ channel flow	y in ope	en								
5	CO5: Apply kr										
	of open channel										
	design efficient										
	considering fact										
	as velocity, bed r										
	specific energ		nd								
		roblem									
	Ability to comp										
	profiles and	desig									
	channels that										
		gineerir	ng								
COUDSI	criteria E OUTCOMES & O	TENIED	IC SVI								
No	E OUTCOMES & C		IC SKI								
		din	s *							ent s	
	Course	on( )S	'n, om	പ		<	۵	_		sme nod	
	Outcome	spor POs	Bloom' axonon	ß		CA	dЛ	4		Ssessmer Methods	
		Corresponding POs	Bloom's Taxonomy*							Assessmen Methods	
		Ŭ								1	
CO1	Understand										
	the open										
	channel flow,										
	including the										
	classifications										
	of different	1	C2	1		_		1	Pop	Quiz, I	Final
	types of open								1	Exam	
	channels and										
	analyze the key characteristics										
	of various open										
	channel										

1							
	geometries and						
	their influence						
	on flow						
	behavior						
CO2	Applyprinciplesofflowmeasurement toselect and useappropriatedevices in openchannel flowand to designand implementcontrolstructures formanagingandregulating flowinopenchannels.	1	C3	1	l	1	Class Test, Mid- Term, Final Exam
CO3	Understand						
	the concept of uniform flow and apply Chezy and Manning equations to estimate resistance coefficients and proficiency in computing uniform flow, considering the hydraulic factors influencing channel design.	1	C2	1	Ι	1	Mid-Term, Final Exam
CO4	Analyze gradually varied flow using the momentum equation and specific momentum concepts and understand hydraulic jump theory and its application in controlling and dissipating	2	C2, C4	1	_	1	Class Test, Mid- Term, Final Exam

	energy in open									
	channel flow									
CO5	Apply knowledge of open channel flow to design efficient channels, considering factors such as velocity, bed materials, specific energy, and transition problems. Ability to compute flow profiles and design channels that meet specified engineering	3	C3	1		-	1,5	Class Test, Final Exam		
	engineering criteria WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledg Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3- Apply C4 - C5 - C6 - Remember Understand Analyze Evaluate Create (T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -									
	Presentation, R –	Report	, F – Fin	al Exam)		7				
	HING AND LEARN			GY	F	ngagement	(Hours)			
	ng and Learning Act	uvines			E	ngagement	(110uls)			
	ture (3 hours/week	× 14 we	eeks)				42			
• 1	rected Learning Non-face-to-face lea Revision of the prev Preparation for final	ious lee		home			09 18 46			
	Assessment									
	Continuous Assessn	nent					02			
• ]	Final Examination						03			
	Total						120			
TEACHIN	NG METHODOLO									
Lecture an	nd Discussion, Prob	lem Ba	sed Met	hod						

1	E SCHEDULI		
Week	Lecture	Topics to be Covered	Assessment
	1	Basic concepts of Open Channel Flow	
1	2	Characteristics of open channel flow	
	3	Effect of gravity and viscosity on flow	
	4	Velocity and pressure distribution	
2	5	Correction factors for velocity and	
2		momentum	CT/ Assignment/ Final Exam
	6	Continuity and Energy equation	
	7	Concept of Specific energy, specific	
3		energy curve	
	8	Transition problem	
	9	Concept of Critical flow	
-	10	Theories related to critical flow	
	11	Computation of critical depths:	
4		analytical method	
	12	Computation of critical depths: trial	CT/ Assignment/ Final Exam
		and error method	6
~	13	Concept of uniform flow	
5	14	Uniform flow formulas	
	15	Chezy's and Manning's equation	
	16	Resistance coefficients	
6	17	Computation of normal depth	
	18	Uniform flow for complex channels	
	19	Hydraulic exponent for uniform flow	
-		computation	
7	20	Computation of normal and critical	
-		slopes Channel sections with composite	
	21	roughness	
	22	Compound Cross-sections	
•		Principles of flow measurement and	
8	23	devices	
_	24	Gradually Varied Flow (GVF):	
	24	definition	Mid Term/ Assignment/ Final
	25	Dynamic equations of GVF, channel	Exam
	25	slopes	
9	26	Flow profiles on Mild and Steep slopes	
	27	Flow profiles on Critical, Horizontal	
	27	and Adverse slopes	
	28	Draw simple profiles	
10	29	Practice complex profiles	
10	30	Calculation of critical and uniform	
	30	depths	
	31	Calculation of simple flow profiles	
11	32	Description of Direct Step method	
11	33	Numerical computation of flow profiles	
	55	using direct step method	
	34	Hydraulic Jump: definition, practical	CT/ Assignment/ Final Exam
12		use, types etc	
	35	Hydraulic Jump: derivation of different	

		theories						
	26	Hydraulic Jump	computation of	f jumps				
	36	and losses of en	ergies					
	37	Design of Chan	nels: basics, defi	nition,				
13	57	design of simple	e channels					
15	38	Design of best h	nydraulic section	s				
	39	Design of erodi	ble channels (the	eory)				
	40		es of erodible cha					
14	41		vial channels: the					
	42		es of Alluvial cha	annels				
	IENT STRATE		I					
Compone		Grading	CO	Bloom's Taxonomy				
(Class assi	s Assessment ignments/ CT/ / Active Class on)	40%	CO1, CO4		C2, C4			
Fina	al Exam	60%	CO2, CO3, CO5		C2, C3			
Tota	al Marks	100%						
REFERE	NCE BOOKS							
-	•	ulics - V T Chov						
	<b>U</b>	channels - K G Ranga Raju						
	•	nnels - K Subramanyan						
4. Open	Channel Hydra	ulics - R H Fren	ch					

COURSE INFORMATION														
Course	Code: EWCE 362								Credi	t H	our:	1.5		
Course	Title: Open Channel I	Hydraul	ics Se	ssion	al				Cont	act l	Hour	: 3.0		
	EQUISITE													
	261(Fluid Mechanic	s), EW	CE 2	62(F	luid	Μ	lechan	ics	Sess	iona	al), E	EWCE	E-361	(Open
	el Hydraulics)	_												
	ICULUM STRUCTUF													
	ne Based Education (C	BE)												
	PSIS/ RATIONALE	11		1 (1				1	11		. 1.	11		
	course the students wil										n hy	draul	ic proj	perties
	of open channel in practical fields for designing open channel systems. OBJECTIVE													
ODJEC														
	1. To gain knowledge on the basics of open channel flow focusing critical, uniform, and gradually varied flow													
	and gradually varied flow. 2. To devise energy and momentum theories for flow through open channels.													
COUR	SE CONTENT	nu mon	liciitui	II the		5 10	1 110 w	un	Jugn	ope		annen	5.	
		e, venti	ıri flu	me. p	arsh	a11	flume	, cut	-thro	at fl	ume	hvdr	aulic i	ump
	Broad-crested weir, sluice gate, venturi flume, parshall flume, cut-throat flume, hydraulic jump.													
	Velocity distribution profile, Manning's roughness coefficient, specific force and specific energy. River modelling basic concepts.													
	SKILL MAPPING (CO – PO MAPPING)													
No	Course Outcome			DGR/	AM	ΟU	ITCOI	MES	S (PO	s)				
			1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able		Г Г											
		state of												
	flow while passing t	•												
	open channels	with												
		scharge												
-	variation.													
2	CO2: Be able to <b>dev</b>			./										
	flow profiles and lo			$\checkmark$										
	energy when open of													
	flows passing t													
		draulic												
	structures i.e. weir,	sluice												
3	gate etc. $CO^{2}$ : Re able to an	alw the				-								
3	CO3: Be able to <b>ap</b> theories of energy an													
	on open channel flow			v							1			
COUR	SE OUTCOMES & G		C SKI	LLS	I	L		I			I	I		
							[	T						
		ng	*									ţ	1	
		Corresponding POs	Bloom's Taxonomy*									nen	Methods	
No	Course Outcome	spor POs	Bloom' Faxonom		Ð		CA		KP			Los	thc	
		H H	3lo axc		-		Ŭ					933	Me	
CO1	Be able to										-		<b>.</b> –	
	understand the	1	C2		1,4		-		1, 3, 5		5 Report, Mid Term,		erm,	
	state of flow while				, -				, 2	,	Fina	al Qu	1Z	
	passing through													

	onen char							
	-	nnels with						
	velocity	and						
<u> </u>	discharge							
CO2	Be able							
	-	ofiles and						
		f energy						
	-	n channel						Report, Mid Term,
	flows	passing	2	C3	1,4	-	1, 3, 5	Final Quiz
	÷	different						
	hydraulic	structures						
	i.e. weir, s	sluice gate						
	etc.							
CO3	Be able to	apply the						
	theories of	of energy	2	C3	1,4		1 2 5	Report, Final Quiz
	and force	on open	2	CS	1,4	-	1, 5, 5	Report, Pillar Quiz
	channel fl	ows.						
								plex Problem Solving;
						Activiti	es; WK=	Washington Accord
		e Profile/ K			ge Profile			
		Bloom's Ta			1 C4		05	01
		C2 -		C3- Ap			C5 -	
	Remember	r Under	stand		Analyz	e	Evaluate	Create
	(T - Test)	PR = Pro	iect (	- 0	iz M – Mi	d Term I	Evam Ac	g – Assignment, Pr –
		$r_{\rm N} = 110$ on, R – Repo					Sam, As	g – Assignment, 11 –
TEAC		D LEARNI						
Teach	ing and Le	arning Activ	vities		Er	gagemen	t (Hours)	
		arning Activ <b>min</b> g	vities		Er	igagemen	t (Hours)	
Face-to	o-face Lear	rning			Er	igagemen		
Face-to	o-face Lear				Er	ngagemen	nt (Hours) 30	
Face-to Lecture	e (3 hours/v	<b>ming</b> veek × 10 w			Er	igagemen	30	)
Face-to Lecture Guided	<b>-face Lear</b> e (3 hours/v <b>Learning</b>	<b>ming</b> veek × 10 w	veeks)		Er	igagemen		) I
Face-to Lecture Guided Report V	<b>b-face Lean</b> (3 hours/v <b>Learning</b> Writing (1)	rning veek × 10 w hour/week x	veeks)		Er	ngagemen	30	) I Ə
Face-to Lecture Guided Report V Indeper	<b>D-face Lean</b> e (3 hours/v <b>Learning</b> Writing (1) <b>Indent Lean</b>	rning veek × 10 w hour/week z	veeks)		Er	agagemen	3( 0) 0) 1(	) I 9 )
Face-to Lecture Guided Report V Indeper Individu	<b>D-face Lean</b> (3 hours/v <b>Learning</b> Writing (1) <b>Indent Lean</b> Ial learning	rning veek × 10 w hour/week z	veeks)		Er	ngagemen	30	) I 9 )
Face-to Lecture Guided Report V Indeper Individu Assessn	<b>Learning</b> Writing (1) <b>Indent Lear</b> al learning	rning veek × 10 w hour/week z	veeks)		Er	agagemen	3( 0) 0) 1(	) I 9 )
Face-to Lecture Guided Report V Indeper Individu	<b>Learning</b> Writing (1) <b>Indent Lear</b> al learning	rning veek × 10 w hour/week z	veeks)		Er	agagemen	3( 0) 0) 1(	) I 9 )
Face-to Lecture Guided Report V Indeper Individu Assessn	<b>Learning</b> Writing (1) <b>Indent Lear</b> al learning	rning veek × 10 w hour/week z rning	veeks)		Er	agagemen	30 01 09 10 08 22	)             
Face-to Lecture Guided Report V Indeper Individu Assessn Quiz +V	D-face Lean (3 hours/v Learning Writing (1) ndent Lean tal learning nent /iva	rning veek × 10 w hour/week z rning 5 Total	veeks) x 9 we		Er	agagemen	3( 0) 0) 1(	) I 9 ) 3
Face-to Lecture Guided Report V Indeper Individu Assessn Quiz +V	D-face Lean e (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva	rning veek × 10 w hour/week 2 rning 5 Total	veeks) x 9 we	eeks)		agagemen	30 01 09 10 08 22	)             
Face-to Lecture Guided Report V Indeper Individu Assessm Quiz +V TEACHI Lecture,	D-face Lean (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva NG METH Laboratory	rning veek × 10 w hour/week 2 rning 5 Total IODOLOGY 7 Experimen	veeks) x 9 we	eeks)		ngagemen	30 01 09 10 08 22	)             
Face-to Lecture Guided Report V Indeper Individu Assessm Quiz +V TEACHI Lecture, COURS	b-face Lean e (3 hours/v Learning Writing (1) ndent Lean ial learning nent /iva NG METH Laboratory SE SCHED	rning veek × 10 w hour/week 2 rning 5 Total IODOLOGY 7 Experimen	x 9 we	eeks) ass Ass	sessment		30 01 09 10 08 22	
Face-to Lecture Guided Report V Indeper Individu Assessm Quiz +V TEACHI Lecture,	D-face Lean (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva NG METH Laboratory	rning veek × 10 w hour/week 2 ming ming Total ODOLOGY Experimen	veeks) x 9 we t nts, Cl To	eeks) ass Ass pics to	sessment be Covered			) I 9 ) 3
Face-to Lecture Guided Report V Indeper Individu Assessn Quiz +V TEACHI Lecture, COURS Week	D-face Lean (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva NG METH Laboratory SE SCHED Lecture	rning veek × 10 w hour/week 2 rning 5 Total IODOLOGY 7 Experimen OULE	x 9 we x 9 we <u>t</u> <u>t</u> <u>t</u> ts, Cl <u>To</u> on to	ass Ass pics to O Ope	sessment be Covered on Channel	flow	3( 0) 0) 1( 0) 2 6( and	
Face-to Lecture Guided Report V Indeper Individu Assessm Quiz +V TEACHI Lecture, COURS	b-face Lean e (3 hours/v Learning Writing (1) ndent Lean ial learning nent /iva NG METH Laboratory SE SCHED	rning veek × 10 w hour/week x rning ming Total ODOLOGY Experimen ULE Introduction different	x 9 we x 9 we <u>t</u> <u>t</u> <u>t</u> ts, Cl <u>To</u> on to	ass Ass pics to O Ope	sessment be Covered	flow	3( 0) 0) 1( 0) 2 6( and	
Face-to Lecture Guided Report V Indeper Individu Assessn Quiz +V TEACHI Lecture, COURS Week	D-face Lean (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva NG METH Laboratory SE SCHED Lecture	rning veek × 10 w hour/week × rning 5 Total IODOLOGY 7 Experimen ULE Introduction different Course	x 9 we x 9 we nts, Cl To on to device	ass Ass ass Ass pics to p Ope es to b	sessment be Covered on Channel be used three	flow	30 01 09 10 08 22 60 40 40 40 40 40 40 40 40 40 40 40 40 40	
Face-to Lecture Guided Report V Indeper Individu Assessn Quiz +V TEACHI Lecture, COURS Week	D-face Lean (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva NG METH Laboratory SE SCHED Lecture	rning veek × 10 w hour/week > rning 5 Total IODOLOGY 7 Experimen PULE Introduction different Course Determina	x 9 we x 9 we ttion	ass Ass pics to po Ope es to b of state	sessment be Covered on Channel be used three e of flow	flow	30 01 09 10 08 22 60 40 40 40 40 40 40 40 40 40 40 40 40 40	) 1 3 3 2 1 3 2 1 1 3 1 1 1 1 1 1 1 1 1 1
Face-to Lecture Guided Report V Indeper Individu Assessn Quiz +V TEACHI Lecture, COURS Week	D-face Lean e (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva NG METH Laboratory SE SCHED Lecture 1	rning veek × 10 w hour/week × rning 5 Total IODOLOGY 7 Experimen ULE Introduction different Course	x 9 we x 9 we ttion	ass Ass pics to po Ope es to b of state	sessment be Covered on Channel be used three e of flow	flow	30 01 09 10 08 22 60 40 40 40 40 40 40 40 40 40 40 40 40 40	) 1 2 3 2 3 4 5 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7
Face-to Lecture Guided Report V Indeper Individu Assessn Quiz +V TEACHI Lecture, COURS Week	D-face Lean e (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva NG METH Laboratory SE SCHED Lecture 1	rning veek × 10 w hour/week > rning 5 Total IODOLOGY 7 Experimen PULE Introduction different Course Determina	x 9 we x 9 we nts, Cl To on to device ution pen ch	ass Ass ass Ass pics to po Ope es to b of state nannel f	sessment be Covered on Channel be used three e of flow a low	flow	30 01 09 10 08 22 60 40 40 40 40 40 40 40 40 40 40 40 40 40	) 1 3 3 2 1 3 2 1 1 3 1 1 1 1 1 1 1 1 1 1
Face-to         Lecture         Guided         Report V         Indeper         Individu         Assessm         Quiz +V         TEACHI         Lecture,         COURS         Week         1         2	D-face Lean (3 hours/v Learning Writing (1) ndent Lean nal learning nent /iva NG METH Laboratory SE SCHED Lecture 1 2	rning veek × 10 w hour/week × rning 5 Total ODOLOGY 7 Experimen OULE Introduction different Course Determina depth in o	x 9 we x 9 we nts, Cl To on to device ttion pen ch Broad	ass Ass pics to po Ope es to b of state nannel f d Creste	sessment be Covered on Channel be used three e of flow flow ed Weir	flow	30 01 09 10 08 22 60 40 40 40 40 40 40 40 40 40 40 40 40 40	) 1 3 3 2 1 3 2 1 1 3 1 1 1 1 1 1 1 1 1 1

1						
5	5	Flow 7	Гhrough a Pa	rshall Flume		
6	6	Mid T	erm Quiz			Mid Quiz
7	7	Flow I				
8	8	Deterr an Op	city of			
9	9		nination of (	Change in Water Leve Bottom	el due	Report, Assignment/Test
10	10		opment and y and Specifi	d Generalized Sp c Force Curves	ecific	
11	11	Study	on Hydraulic	Jump		
12	12	Final (	Quiz			Final Quiz
13	13	Viva				
ASSES	SMENT ST	RATEC	GY			
(	Component	s	Grading	СО		Bloom's Taxonomy
Continu (Lab Re Assessn	ous Ass port/Class nent/Assign articipation	essment		C2, C3		
	Final Exam			C2, C3		
r	Fotal Marks	3				
REFER	RENCE BC	OKS				
	b Manual a					
-		•	ics - V T Ch			
3. Flo	ow in open	channel	s - Subraman	ya		

COUD	SE INFORMATION												
								C	. 1.4	11			
	Code: EWCE 363									Hour			
	Title: Engineering Hydr	rolog	у					Co	ontac	t Ho	ur: 3.0		
	EQUISITE												
None													
	CULUM STRUCTUR												
Outcom	ne Based Education (O	BE)											
SYNOF	PSIS/ RATIONALE												
Basic u	nderstanding of hydrol	ogic	cycl	e, hyd	rolog	ical	param	eters	and	the i	nterrelat	ionship	os
-	d from this course will	be he	elpfu	ıl for l	ater s	eme	sters a	and p	rofes	ssion	al fields.		
OBJEC	TIVE												
	To understand the basic												
	To gain knowledge abo									esses			
	To get basic idea about SE CONTENT	. 11000	u rot	ning a	ina st	ausi		ethoc	15				
	ogic cycle, physics of a	vir flo	www.m	racini	tation	s St	raam f	low	infil	tratic	n and so	vil mois	ture
	ation and evapo-transp												
	raph analysis, flood rou												p.s,
	MAPPING (CO – PO								<u> </u>	2			
No	Course Outcome	PF	ROG	RAM	OUT	COI	MES (	POs)					
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Able to												
	describe the basic												
	concepts of hydrology, various												
	process,												
	measurement and												
	estimation of	$\checkmark$	v										
	hydrological												
	components: precipitation,												
	evaporation,												
	infiltration, stream												
	flow etc.												
2	CO2: Able to												
	<b>analyze</b> rainfall- runoff												
	relationship,	,											
	hydrographs and												
	apply various												
	statistical methods												
	for hydrological												
3	analysis CO3: Able to												
5	compute basic		,										
	calculation on flood		$\checkmark$										
	routing and other												
COUD	routing parameters.				C								
COOK	SE OUTCOMES & GE	INER		SKILL	S								

		I					
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods
CO1	Able to <b>describe</b> the basic concepts of hydrology, various process, measurement and estimation of hydrological components: precipitation, evaporation, infiltration, stream flow etc.	1, 2	C1, C2	_	_	1,2	Class Test, Mid-term, Final Exam
CO2	Able to <b>analyze</b> rainfall- runoff relationship, hydrographs and apply various statistical methods for hydrological analysis	1, 2	C2, C4	-	_	3	Class Test, Mid-term, Final Exam
CO3	Able to <b>compute</b> basic calculation on flood routing and other routing parameters	2	C3, C4	_	_	3	Class Test, Final Exam
TEAC	Engineering Activities/ CA= Knowledge Profile/ KP= Knowledge Prof *Level of Bloom's Taxonom C1 – C2 – Remember Understand (T-Test, PR – Project, Q – Qu Presentation, R –Report, F –	file y: C3- App uiz, M Final I	C4 Iy Ana – Mid T Exam)	_ alyze	C5 - Evalua	te	C6 – Create
	ing and Learning Activities	TLU		Engager	nent (Hou	irs)	
	-face Learning						
	3 hours/week × 14 weeks)					42	
Tutorial weeks)	Learning // Assignments (2 hours/week ×	6				12	
Non-face Revision Preparati	rected Learning e-to-face learning of the previous lecture at home on for the final examination		11 18 32				
Continu	Assessment lous Assessment xamination				2 3		
	Total				120		
TEACHI	NG METHODOLOGY						

		on, Problem-Based Method	
COURS	SE SCHEDU	LE	
Week	Lecture	Topics to be Covered	Assessment
	01	Introduction: Hydrological Cycle, Catchment Area	
1	02	Introduction: Water Budget Equation, Residence Time	CT 1
	03	Weather System: Temperature and Pressure Variation in the atmosphere,	
	04	Weather System: Weather parameter estimation	
2	05	Weather System: Precipitable water in the air column	
	06	Precipitation: Formation of precipitation, Forms of precipitation	
2	07	Precipitation: Measurement of precipitation, Computation of average rainfall	
3	08	Precipitation: Analysis of Rainfall Data.	
	09	Precipitation: Presentation of Rainfall Data	
	10	Evaporation: Evaporation process, Estimation of evaporation	
4	11	Evaporation: Transpiration and Evapo- transpiration,	
	12	Evaporation: Estimation of Potential Evapo transpiration	
_	13	Infiltration: Infiltration and Infiltration Capacity, Horton's equation for Infiltration Capacity	
5	14	Infiltration: Horton's equation for Infiltration Capacity, Infiltration Index	
	15	Infiltration: Infiltration Index	
	16	Hydrograph: Storm Hydrograph and its component,	Mid Term Exam
6	17	Hydrograph: Factors affecting flood/storm hydrograph	
	18	Hydrograph: Base flow separation technique for Measuring Direct Runoff Hydrograph(DRH)	
7	19	Hydrograph: Effective Rainfall, Effective Rainfall Hyetograph (ERH) Hydrograph: Relationship between ERH and DRH	
/	20		
	21	Unit Hydrograph: Unit Hydrograph and its characteristics	
8	22	Unit Hydrograph: Time invariance and Linear Response Unit Hydrograph: Derivation of Unit Hydrograph	
0	23		
	24	Unit Hydrograph: Synthetic Unit Hydrograph	
	25	Runoff: Components of runoff, Stream characteristics,	CT 2
9	26	Runoff: Yield of a river, Rainfall & Runoff correlation	
	27	Runoff: Flow-Duration curve, Drought: Occurrence	

			gy– K. Subraman	ya. how, Maidment and M	Iova M	Crow Hill
	ENCE BOO					
]	Fotal Marks		100%			
]	Final Exam		60%	CO1, CO2, CO3		C1, C2, C3, C4
Participa		ubb				
(Class assignments/ CT/ Mid Term/ Active Class40%CO1, CO2, CO3						C1, C2, C3, C4
	Continuous Assessment					
Compon	ients		Grading	СО	Blo	oom's Taxonomy
ASSESS	MENT STR	ATEGY				
	42	Hydro	ologic Data Acqui	sition		
14	41	Hydro	ologic Data Acqui	sition		
	40	Hydro	ologic Data Acqui	sition		
	39	Flood	routing and statis	tical methods		
13	38	Flood	routing and statis	tical methods		
	37		: Risk and safety	factor		
	36	Flood Peak		analysis for estimating	g	CT 3
12	35	Peak	flood	analysis for estimating	•	
	34	Ratio	nal Method	nitude of peak flood		
	33		itude of peak floo		e	
11	32	(Q) R	elationship, Extra	ent: Stage (G)-Discha polation of rating curv	e	
	31	(Q)Re	lationship	Stage (G)-Discharge		
	50	of Dis Stream	scharge by Area-V n Flow Mea	Velocity method surement: Shifting a	and	
	30		rement n Flow Measu	nt		
10	29		s measurement, St			
				ent: Stream, Stream F	low	
	28		ff: Drought: Occu gement	rrence, Classification a	and	

International Editions.
 Elementary Hydrology, V.P. Singh, Prentice Hall, 1992

COUR	SE INFORMATION												
Course (	Code: GEPM 375					C	Credit	Hou	r: 3.0	)			
Course 7	itle: Project Planning and Constru	uction	Ma	nage	ment	: C	Conta	ct Ho	our: 3	3.0			
PRE-R	EQUISITE												
None													
	CULUM STRUCTURE												
	e Based Education (OBE)												
	PSIS/RATIONALE												
	rse is to gain basic knowledge												
	and various tools of project mana,												
	cheduling, project appraisals, fi									urce	allo	catio	n b
	n research technique which will be	e usefu	ıl in	in th	neir p	orofe	ssion	al lif	e.				
OBJEC													
	1. To gain knowledge on basics												
	management, resource mana		nt, ii	nven	tory	man	agem	ent,	dema	and f	oreca	isting	g an
	construction site managemen												
	2. To develop fundamental ski		r un	ders	and	ng a	nd ev	valua	ting	a pr	oject	spec	lall
	based on BCR, NPV, IRR et						1.					1	
	3. To impart knowledge to solv	e the p	oroje	ect pr	oblei	ms b	y line	ear pr	ogra	mmi	ng an	d ma	nag
COUD	a project by Gantt chart & ne SE CONTENT	etwork	tec	nniq	ies a	na pi	rojeci	t mar	ager	nent	SOILV	vare.	
		-1		21.0.0.0	:		مام ما		DE		CDM		
	Planning: project planning and evaluation of the second seco												
	ng, Project management software												
	tion Management: Principles of m												
	tion, methods and practices, tec												
	nent, contracts and specifications,												
	nent, Psychology in administra												
	nent. Demand forecasting, inventor uction, environmental regulation												
	et present value, internal rate of r												
	nalysis case studies.	etuin,	11511			or m	leiset	Juon	, uen		.051 1	auo,	cos
	MAPPING (CO – PO MAPPING	5											
No	Course Outcome	PRO	GR	AM (	TUC	CON	IES (	POs	,				
110	course outcome		2	3	4	5	6	7	8	9	10	11	12
1	CO1: Able to explain the		_	0		-		,	0		10		
-	principles of project management												
	& organizations, human resource												
	nanagement, inventory												
	nanagement, demand forecasting											ľ	
	and construction site												
	nanagement.												
												1	
	CO2: Able to plan a project												

schedule by Gantt charts, network techniques and project						
management software and						
execute allocation of resources by						
linear programming.						
CO3: Able to understand the						
financial aspects of projects and						
apprise a project based on BCR,						
NPV, IRR etc.						
CO4: Able to understand project						

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	risks, project conflicts, e & management project conflicts.	risks	and					
COUR	SE OUTCOMES & GEN	VERIC	C SKILL	S				
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP		CA	KP	Assessment Methods
	Able to explain the principles of project management & organizations, human resource management, inventory management, demand forecasting and construction site management.	11	C2	-		1,4	1,3	Assignment, Class Test , Mid- term, Final Exam
	Able to plan a project schedule by Gantt charts, network techniques and project management software and execute allocation of resources by linear programming.	5	C2, C4	-		1,2	1,8	Class Test, Final Exam
	Able to understand the financial aspects of projects and apprise a project based on BCR, NPV, IRR etc.		C5	-		1	1	Assignment, Class Test , Mid-term, Final Exam
CO4	Able to understand project risks, project conflicts, evaluation & management project risks and conflicts.	12	C2, C4	1, 2		1	1,7	Assignment, Class Test , Mid-term, Final Exam
	WP= Washington Acco Engineering Activities/ Profile/ KP= Knowledg *Level of Bloom's Taxo C1 - C2 - Remember Understa	CA= 0 e Prof onomy and	Complex ïle y: C3- Apply	C4 – Analy	ies; /ze	WK= Wash C5 - Evaluate	nington Ac C6 – Create	cord Knowledge
TEAG	(T-Test, PR – Project, Q Presentation, R – Report CHING AND LEARNIN	, F – I	Final Exa	um)	m E	xam, Asg –	Assignme	ent, Pr –
	hing and Learning Activit			-	F	ngagement	(Hours)	
	o-face Learning				Ľ	ngugoment	(110013)	
I acc-t	Lecture (3 hours/week :	× 14 v	veeks)				42	

Tutorial/Assignments (2 hours/week × 6 weeks)         12           Self-Directed Learning         11           • Non-face-to-face learning         11           • Revision of the previous lecture at home         18           • Preparation for the final examination         32           Formal Assessment         2           a) Continuous Assessment         2           b) Final Examination         3           Total         120           TEACHING METHODOLOGY         2           Lecture and Discussion, Problem-Based Method         COURSE SCHEDULE           Week Lecture Topics to be Covered         Assessment           01         Definition and characteristics of a project         Assessment           1         01         Definition and characteristics of a project         Assessment           2         OT Principles of Project Management         03         Principles of Project Management           03         Principles of project Management         04         Feasibility study, feasibility report           04         Peasibility study, feasibility report         05         Hutoduction to Construction Planning and discounting formulas           3         08         Project Organization: Methods and Practices. Technology         CT/ Assignment-1           11         Proje	Guide	d Learnin	g				
• Non-face-to-face learning       11         • Revision of the previous lecture at home       18         • Preparation for the final examination       32         Formal Assessment       2         a) Continuous Assessment       2         b) Final Examination       3         Total         Total         Total         Total         Continuous Assessment         0         Total         120         Teta         120         Total         120         Total         120         Total         120         Total         120         Total         120         Meek Lecture Topics to be Covered         Assessment         0         Principles of Project Management         Of Introduction to Construction Planning and discounting formulas         Assessment         CT/ Assignment-1 <t< td=""><td></td><td></td><td></td><td></td><td>12</td></t<>					12		
•     Revision of the previous lecture at home     18       •     Preparation for the final examination     32       Formal Assessment     2       a)     Continuous Assessment     2       b)     Final Examination     3       Total       120       TetACHING METHODOLOGY       Lecture and Discussion, Problem-Based Method       COURSE SCHEDULE       Week Lecture Topics to be Covered       Assessment       01     Definition and characteristics of a project       1     02     Principles of Project Management       04     Feasibility study, feasibility report     Assessment       CT/ Assignment-1       04     Feasibility study, feasibility report       05     Introduction to Construction Planning and Management     Midagement       06     Project Organization: Methods and Practices, Technology     Offeasibility report       11     Project Ife, time value of money compounding and discounting formulas     CT/ Assignment-1       3     08     Project Organization: Methods and Practices, Technology     CT/ Assignment-2       4     11     Project Ieadership     CT/ Assignment-2       5     14     Project Communication     CT/ Assignment-2       6	Self- D	irected Le	arning				
• Preparation for the final examination     32       Formal Assessment     2       a) Continuous Assessment     2       b) Final Examination     3       Total       120       TEACHING METHODOLOGY       Lecture and Discussion, Problem-Based Method       COURSE SCHEDULE       Week Lecture Topics to be Covered       01     Definition and characteristics of a project     Assessment       03     Principles of Project Management     0       04     Feasibility study, feasibility report     Assessment       05     Introduction to Construction Planning and Management     CT/ Assignment-1       06     Project Organization: Methods and Practices, Technology     CT/ Assignment-2       07     Project Ife, time value of money compounding and discounting formulas     CT/ Assignment-2       3     08     Project Organization: Methods and Practices, Technology     CT/ Assignment-2       4     11     Project Communication     CT/ Assignment-2       5     14     Project Communication     CT/ Assignment-3       6     17     Site Management     CT/ Assignment-3       7     20     Illustrative example with CPM, Project Planning software     Mid Term/ Assignment-3       7     20     Illustrative example	•	Non-face	e-to-face learning		11		
•         Preparation for the final examination         32           Formal Assessment         2           a) Continuous Assessment         2           b) Final Examination         3           Total           120           TeacHING METHODOLOGY           Lecture and Discussion, Problem-Based Method           COURSE SCHEDULE           Week Lecture Topics to be Covered           Assessment           01         Definition and characteristics of a project           1         0.2         Principles of Project Management           0.3         Principles of Project Management         Assessment           03         Project Organization: Methods and Practices, Technology         CT/ Assignment-1           1         0.6         Project Organization: Methods and Practices, Technology         OF           03         Project Organization: Methods and Practices, Technology         CT/ Assignment-2           4         11         Project Communication         CT/ Assignment-2           5         14         Project Communication         CT/ Assignment-2           6         17         Site Management         Mid Term/ Assignment-3           7         20         Illus	•	Revision	of the previous lecture at home		18		
Formal Assessment     2       a) Continuous Assessment     2       b) Final Examination     3       Total       Colspan="2">Total       Total       Total       Total       Total       10       Definition and characteristics of a project       Optication: To Construction Planning and Management       04       Feasibility study, feasibility report       OPticet Organization: Methods and Practices, Technology       OP project Team       OP Project Organization: Methods and Practices, Technology       OP Project Communication       CT/ Assignment-1       12       Motivation       12       Motivation       12       Motivation       13 <td cols<="" td=""><td>•</td><td></td><td>•</td><td></td><td>32</td></td>	<td>•</td> <td></td> <td>•</td> <td></td> <td>32</td>	•		•		32	
b)     Final Examination     3       Total     120       TEACHING METHODOLOGY       Lecture and Discussion, Problem-Based Method       COURSE SCHEDULE       Week     Lecture Topics to be Covered     Assessment       01     Definition and characteristics of a project     Assessment       02     Principles of Project Management     Assessment       03     Principles of Project Management     Assessment       04     Feasibility study, feasibility report     Introduction to Construction Planning and Management     CT/ Assignment-1       06     Project Organization: Methods and Practices, Technology     Orgenization: Methods and Practices, Technology     CT/ Assignment-2       0     Project Ife, time value of money compounding and discounting formulas     CT/ Assignment-2       1     10     PBP, NPB     Introduction       1     Project Communication     CT/ Assignment-2       5     14     Project Communication     CT/ Assignment-2       6     17     Site Management     Ctr/ Assignment-3       7     20     Illustrative example with CPM, Project Planning software     Illustrative example with CPM, Project Planning software       7     21     Inspection and Quality Control     Mid Term/ Assignment-3       8     23     Illustrative	Formal	•					
6)       Final Examination         Total         Total         120         TeacHing MetHodOlocy         Course and Discussion, Problem-Based Method         Course and Discussion, Problem-Based Method         Course ScheDulle         Assessment         01       Definition and characteristics of a project       Assessment         03       Principles of Project Management       Assessment         04       Feasibility study, feasibility report       Introduction to Construction Planning and Management       Assessment         05       Introduction to Construction Planning and discounting formulas       CT/ Assignment-1         3       06       Project Organization: Methods and Practices, Technology       CT/ Assignment-2         09       Project Corganization: Methods and Practices, Technology       CT/ Assignment-2         11       Depet Team       CT/ Assignment-2         12       Motivation       CT/ Assignment-2         13       BCR, IRR       CT/ Assignment-2         5       14       Project Communication       CT/ Assignment-2         16       Project Planning, WBS, network technique       Illustrative example with CPM, Project Planning software	a)	Continuou	is Assessment		2		
TEACHING METHODOLOGY         Lecture and Discussion, Problem-Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         01       Definition and characteristics of a project       Assessment         03       Principles of Project Management       0         04       Feasibility study, feasibility report       0         05       Introduction to Construction Planning and Management       CT/ Assignment-1         06       Project Organization:       Methods and Practices. Technology       CT/ Assignment-1         07       Project Organization:       Methods and Practices. Technology       CT/ Assignment-2         08       Project Organization:       Methods and Practices. Technology       CT/ Assignment-2         08       Project Conganization:       Methods and Practices. Technology       CT/ Assignment-2         10       PBP, NPB       PB       PH       Phile       CT/ Assignment-2         13       BCR, IRR       CT/ Assignment-2       CT/ Assignment-2         14       Project Communication       CT/ Site Management       CT/ Assignment-2         15       Management       Matagement       Mid Term/ Assignment-3         16       Project Planning, Sof	b)	Final Exar	nination		3		
TEACHING METHODOLOGY         Lecture and Discussion, Problem-Based Method         COURSE SCHEDULE         Meek Lecture Topics to be Covered       Assessment         01       Definition and characteristics of a project       Assessment         02       Principles of Project Management       Assessment         03       Principles of Project Management       Assessment         04       Feasibility study, feasibility report       Introduction to Construction Planning and Management       CT/ Assignment-1         06       Project Organization: Methods and Practices, Technology       Project Organization: Methods and Practices, Technology       CT/ Assignment-1         07       Project Organization: Methods and Practices, Technology       CT/ Assignment-2         08       Project Corganization: Methods and Practices, Technology       CT/ Assignment-2         10       PBP, NPB       PB         4       11       Project Communication       CT/ Assignment-2         5       14       Project Communication       CT/ Assignment-2         6       17       Site Management       CT/ Assignment-2         16       Project Planning, WBS, network technique       Illustrative example with CPM, Project Planning software       CT/ Assignment-3         7			Total		120		
Instrument         Instrument         CT/Assignment-2           1         0         Perinciples of Project Management         Assessment           0         0         Definition and characteristics of a project         Assessment           0         0         Definition and characteristics of a project         Assessment           0         0         Principles of Project Management         Assessment           0         4         Feasibility study, feasibility report         Introduction to Construction Planning and Management         CT/Assignment-1           0         Project Organization: Methods and Practices, Technology         Project Organization: Methods and Practices, Technology         CT/Assignment-1           3         0         Project Team         CT/Assignment-2           4         11         Project Communication         CT/Assignment-2           5         14         Project Communication         CT/Assignment-2           6         17         Site Management         CT/Assignment-2           6         18         Contracts and Specifications         CT/Assignment-2           7         20         Illustrative example with CPM, Project Planning software         Mid Term/Assignment-3           7         21         Inspection and quality Control         Z         Z<	TEACH	ING MET					
COURSE SCHEDULE         Assessment           01         Definition and characteristics of a project         Assessment           1         02         Principles of Project Management         Assessment           03         Principles of Project Management         Assessment         CT/ Assignment-1           04         Feasibility study, feasibility report         CT/ Assignment-1         CT/ Assignment-1           05         Introduction to Construction Planning and Management         CT/ Assignment-1         CT/ Assignment-1           06         Project Organization: Methods and Practices, Technology         CT/ Assignment-2         CT/ Assignment-1           3         08         Project Organization: Methods and Practices, Technology         CT/ Assignment-2           09         Project Iife, time value of money compounding and discounting formulas         CT/ Assignment-2           1         Project Cream         CT/ Assignment-2           1         Project Communication         CT/ Assignment-2           1         Project Communication         CT/ Assignment-2           1         Project Planning, WBS, network technique         CT/ Assignment-2           1         Project Planning, WBS, network technique         CT/ Assignment-3           1         Project Planning software         CT/ Assignment-3							
WeekLectureTopics to be CoveredAssessment01Definition and characteristics of a projectapplication and characteristics of a projectAssessment102Principles of Project Management03Principles of Project ManagementCT/Assignment-104Feasibility study, feasibility reportIntroduction to Construction Planning and ManagementCT/Assignment-106Project Organization:Methods and Practices, TechnologyCT/Assignment-1307Project Organization:Methods and Practices, TechnologyCT/Assignment-209Project Organization:Methods and Practices, TechnologyCT/Assignment-211Project Corganization:Methods and Practices, TechnologyCT/Assignment-212MotivationCT/Assignment-213BCR, IRRCT/Assignment-214Project CommunicationCT/Assignment-215Management of Materials and Equipment16Project Planning, WBS, network technique18Contracts and Specifications19CPM, Project Planning software720Illustrative example with CPM, Project Planning software823Illustrative example with PERT24Safety926Illustrative example for crashing a network926Illustrative example for crashing a network10PSEconomy23Introduction to Linear Programming24Safety25Graphical solution of linear progra							
01         Definition and characteristics of a project           1         02         Principles of Project Management           03         Principles of Project Management           04         Feasibility study, feasibility report           06         Project Organization: Methods and Practices. Technology           07         Project Organization: Methods and Practices. Technology           09         Project Organization: Methods and Practices. Technology           09         Project Team           11         Project Corganization: Methods and Practices. Technology           09         Project Cream           10         PBP, NPB           11         Project Cadership           12         Motivation           13         BCR, IRR           16         Project planning, WBS, network technique           15         Management           16         Project Planning software           19         CPM, Project Planning software           11         Inspection and Quality Control           22         PERT           8         23           11         Inspection and network to find the optimum duration software           12         Inspection and network to find the optimum duration           18					Assessment		
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29 Graphical solution of linear programming	10	20					
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	31	Illustra	ative examp	les of graphical methods			
11	32	Illustra	ative examp	les of graphical methods			
		Projec	t Risk mana	gement			
	34	Invent	ory manage	ment			
12	35	EOQ					
	36	Confli	ct Managem	lent			
	37	Dema	nd Forecasti	ng			
13	38	Metho	ds of Dema	nd Forecasting		CT/ Assignment-4	
	39	Psych	ology in Adı	ninistration			
	40	Constr	ruction safet	y, ethics, procurement			
14	41	Huma	n Factors in	Management			
	42	Huma	n Resource l	Management			
ASSESS	SMENT S	TRATE	GY				
Compor	nents		Grading	СО	Bloom	's Taxonomy	
Continu	uous Asse	ssment	40%	CO1, CO2, CO3, CO4		C2, C4, C5	
(Class a	assignmen						
Mid Term/ Active Class							
Pa	articipation	1)					
Final Exam 60% CO1, CO2, CO3, CO4						C2, C4, C5	
						, ,	
Т	otal Mark	s	100%				
REFERENCE BOOKS							

## **REFERENCE 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.

COURSE I	NFORMATION						
Course Code	e: EWCE 400	Credit Hour:4.00					
Course Title	: Project and Thesis	Contact Hour: 8.00					
PRE-REQU	JISITE						
-							
CURRICU	LUM STRUCTURE						
Outcome B	ased Education (OBE)						
SYNOPSIS	S/ RATIONALE						
This course	will enable the students to identify real life probl	ems, perform background studies,					
brainstorm,	assess the problems, draw interpretations, and rec	commend solutions, which will be					
beneficial fo	peneficial for their professional life.						
OBJECTIVE							
1.	1. Understand the research process with the help of relevant literature review.						
2.	Work independently to solve a problem with a little	e help from supervisor.					
3.	Become a critical thinker with analytical skills.						

- 4. Become ethical and socially responsible.
- 5. Become more competent in oral, written and communication/presentation.

6.	Create a prope	r engineering	project wo	ork as per	rengineering	dissertation/	thesis f	ormat.
COURSE (	CONTENT							

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

## COURSE INFORMATION

COURSE INFORMATION	
Course Code: EWCE 402	Credit Hour: 3.0
Course Title: Capstone Project	Contact Hour: 6.0
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SVNODSIS/DATIONALE	

SYNOPSIS/ RATIONALE

This is an open-ended capstone design project encompassing several Civil, Environmental, Water Resources, and Coastal Engineering disciplines. Develop a preliminary design for a project; prepare a regular team report; design memos engineering drawing and presentation; and present findings during a seminar. Students will apply cross-disciplinary (Civil/Environmental/Water Resources/Coastal Engineering) theories, methodologies, and skills to assess the technical, environmental, and social feasibility of the project including design and cost estimation. Students will present their project and submit project reports at the end of the work.

## OBJECTIVE

The objectives of this course are

- To provide the students of opportunity to apply the structure approach of problem solving, covered in previous Civil, environmental, water resources, and coastal engineering courses, to a specific design project
- To develop design presentation report writing, project management and complex problemsolving skill.

## COURSE CONTENT

Planning, analysis, and design of an integrated Civil, environmental, water resources, and coastal engineering project with emphasis on environmental/water resources/coastal engineering specialization. Students shall work in teams to apply civil engineering theories, methodologies, and skills to assess the technical, environmental, and social feasibility of the project including design and cost estimation. Students will analyze a wide range of technical engineering and other issues that arise in the real-life scenario. Students shall engage their diverse civil engineering and cross disciplinary knowledge to prepare final project reports, professional drawings and engage with industry mentors.

SKILL MAPPING (CO – PO MAPPING)													
No	Course Outcome	PROGRAM OUTCOMES (POs)											
		1	2	3	4	5	6	7	8	9	10	11	12
	<b>CO1:</b> <i>apply</i> the techniques, skills and modern engineering tools necessary for engineering practice												
2	CO2: demonstrate teamwork												

	ability to work collaboration with fellow team members											
	end users	ns une	•									
3	CO3: <i>evaluate</i> alternative approaches to identify best solutions considering						_					
	economic, environm	nental	,									
	social, ethical, health		1									
	safety, constructability, a	and										
	sustainability aspects		-									
4	CO4: comprehend		and					.7				
	<i>demonstrate</i> profession	nal a	and					V				
5	ethical responsibility CO5: integrate	previ	0116			_						
5	knowledge and exper											
	enhance life- long	learn										
	abilities for their future											·
	and professional pursuits											
6	CO6: apply knowledg		r									
	effective project manag	ement	t									
	to ensureefficient use of	o ensureefficient use of time,										
	financial resources, and	other	r									
	materialsresources.					_						
7	<b>CO7:</b> <i>communicate</i>	the										
	design and outcomes of											
	project in educational	and								-		
COLU	professional settings	IEDIC		C C								
No	RSE OUTCOMES & GEN	IEKI	SKILL	3	1							
NO	Course Outcome	Corresponding POs	Bloom's Taxonomy*	đ	CA		KP		Assessment Methods			
CO1	Apply the techniques, skills and modern engineering tools necessary for engineering practice	5	C3	1,2,7	1,3		6		Project Report Submission, Presentation			
CO2	Demonstrate teamwork abilityto work collaboratively with fellow team members and end users	9	C3	-	2		7		Project Report Submission, Presentation			
CO3	<i>Evaluate</i> alternative approaches to identify best	6,7	C6	1,2,3,6	1,2	2,3 7			Project Report Submission, Presentation			,

CO4	solutions considering economic, environmental, social, ethical,health and safety, constructability, and sustainability aspects <i>Comprehend</i> and							
	<i>demonstrate</i> professional and ethical responsibility	8	C3	4	-	7	Project Report Submission, Presentation	
CO5	Integrate previous knowledge and experience to enhance life- long learning abilities for their future personal and professional pursuits	12	C5	1,6	4	-	Project Report Submission, Presentation	
CO6	<i>Apply</i> knowledge for effective project management to ensureefficient use of time, financial resources, and other materialsresources.	11	C3	1,2,4	2,4	-	Project Report Submission, Presentation	
CO7	<i>Communicate</i> the design andoutcomes of the project in educational and professional settings	10	C5		-	-	Project Report Submission, Presentation	
	WP= Washington Acco Engineering Activities/ Profile/ KP= Knowledg *Level of Bloom's Tax C1 - C2 -	CA= ( e Profi onomy	Complex ile 7: C3-	Activities; C4 –	WK= Wasl	hington Ac	ccord Knowledge C6 –	
	RememberUnderstandApplyAnalyzeEvaluateCreate(T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R –Report, F – Final Exam)							

COURSE INFORMATION

Course Code: EWCE 411

Course Title: Structural Analysis II

PRE-REQUISITE

EWCE 101 (Analytical Mechanics), EWCE 211 (Mechanics of Solids I), EWCE 213 (Structural Analysis I)

Credit Hour:

Contact Hour: 3.0

3.0

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

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

#### OBJECTIVE

1. To gain knowledge on analyzing the statically indeterminate beams and frames by moment distribution, consistent deformation/ flexibility and stiffness methods.

2. To become skilled at developing algorithm using stiffness matrix.

3. To get acquainted with how commercial software works to solve multi degree of indeterminacy.

4. To gain knowledge on developing influence lines of statically indeterminate beams and frames. COURSE CONTENT

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.

	L MAPPING (CO – PO MAPPING	<u> </u>				~~~							
No	Course Outcome	PR	OGR				1ES (P	Os)					1
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to <b>analyze</b> statically	7	./										
	indeterminate problems.		$\checkmark$										
2	CO2: Be able to <b>develop</b>												
-	algorithms by using direct		7										
	stiffness method.		$\checkmark$										
3	CO3: Be able to <b>solve</b> influence												
Č	lines for statically indeterminate												
	structures.												
4	CO4: Be able to <b>develop</b>												
	understanding of the basic		√										
	principles of structural analysis.												
COUF	RSE OUTCOMES & GENERIC S	KILI	LS		1		1	<u> </u>	I	1		I	
No	Course Outcome		Bloom's Taxonomy*		CP		CA	4	X		Assessment	Methods	
CO1	Be able to <b>analyze</b> statically indeterminate problems.	2	C4		1		-	1, 1	3,4		ss Te ter Final	m,	
CO2	Be able to <b>develop</b> algorithms by using direct stiffness	2	C6	1	1,3		-	4	,5		Mid- Final		

SKILL MAPPING (CO – PO MAPPING)

	method.											
	Be able to	solve	infl	uence line	8					Assignment/ Class		
				leterminate		C4	1	-	4, 5,6	Test,		
	structures.	2							, ,	Final Exam		
CO4	Be able	e	to	develop	)					A		
	understand	ing	of			C2, C5	1,3	-	4,5	Assignment,		
	principles of						,			Final Exam		
	WP= Was	hingt	on A	Accord Cor	nplex	Problem	Solving/	CP=Com	plex Pr	oblem Solving; EA=		
	Engineerin	ng Ác	tivit	ies/ CA= C	Comp	lex Activ	ities; WK	K= Washin	gton Ac	cord Knowledge		
				ledge Profi								
				Taxonomy								
	C1 –		C2 -		C3-			C5 -		C6 –		
	Remembe	r	Und	erstand	Apj	oly Ana	lyze	Evalua	te	Create		
	(T-Test, P	R – P	roje	ct, Q – Qui	z, M	– Mid Te	erm Exan	n, Asg – A	ssignme	ent, Pr –		
	Presentati	on, R	–Ře	eport, F – F	inal E	Exam)		,	0			
	CHING AN				ATE	GY						
	hing and Le			ctivities			Enga	gement (H	lours)			
Face-t	o-face Lea											
	Lecture (3	hour	s/w	$eek \times 14 w$	eeks)	)			42			
Cuida	d L comina											
	<b>d Learning</b> al/ Assignm		() h	our /wool	× 6 m	(aalka)			12			
	Directed Lea			Juis/week	× 0 w	eeks)		12				
		•		·					11			
•	Non-face-			•					11			
•			-	vious lectu					18			
•	<b>A</b>		the	final exam	inatio	n			32			
	l Assessmer											
· · ·	Continuous			lent								
b)	Final Exam	inatio	on				3					
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			Tot				120					
	ING METH				1	1						
	and Discuss			em-Based I	Metho	bd						
	SE SCHED			ha Carra					<b>A</b> agog			
week	Lecture							and	Asses	sment		
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				noment dis					4			
				istribution					4			
	04 Moment distribution method - Be											
2										CT 1		
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3	08	Aome	ent d	istribution	meth	od - Fra	me					
	09 N	<i>Mome</i>	ent d	istribution	meth	od - Fra						
	10 N	Moment distribution method - Fra						Frame				
4	-			istribution								
12 Basic of Stiffness method												
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	1.4	Stiff.	an mathed Daam			
	<u>14</u> 15		ess method - Beam			
	15	Stiffne	ess method - Beam	1		-
-	16	Stiffn	ess method – Plane	e Grid		
6	17		ess method – Fram			
	18	Stiffne	ess method – Fram	e		
	19	Stiffne	ess method – Fram	e		
7	20	Stiffne	ess method – Fram	e		
	21		ess method – Fram			
	22	Stiffne	ess method – Fram	e		
8	23		ess method – Fram			
	24	Stiffne	ess method – Truss	3		CT 2
	25	Stiffne	ess method – Truss	5		
9	26	Direct	t stiffness method			
	27	Devel	oping algorithm fo	r multiple degree of f	reedom.	
	28	Basic	of flexibility meth	od		
10	29	Flexib	vility method - Bea	m		
	30	Flexib	vility method - Bea	m		
	31		oility method - Bea			
11	32		vility method - Fran			
	33		vility method - Fran			
	34	Flexib	vility method - Fran	ne		
12	35	Flexib	vility method - Fran	ne		CT 3
	36	Flexib	ility method - Tru	SS		015
	37	Flexib	oility method - Trus	SS		
13	38		s of Influence line			
	39	Influe	nce line of indeter	minate structures- Bea	am	
	40	Influe	nce line of indeter	minate structures- Bea	am	
14	41	Influe	nce line of indeter	minate structures- Fra	me	
	42	Influe	nce line of indeter	minate structures- Fra	me	
ASSESS	SMENT S	STRAT	EGY			
Compo	nents		Grading	СО	Bloom	's Taxonomy
Continu	ous Asse	ssment				
(Class a	ssignmer	ts/ CT/	40%		C2, C4, C5, C6	
Mid Ter	m/ Activ	e Class	40%	CO1, CO2, CO3		$C_{2}, C_{4}, C_{3}, C_{0}$
Participation)						
Final Exam			60%	CO1, CO2, CO3, CO4		C2, C4, C5, C6
То	otal Mark	s	100%			
REFER	ENCE F	BOOKS	5			
1.	Structura	l Analy	sis, R C. Hibbeler,	Prentice Hall,8th Editi	on	

1. Structural Analysis, R C. Hibbeler, Prentice Hall,8th Edition

2. Indeterminate Structural Analysis, C K Wang, McGraw-Hill International Edition

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.

Structural Analysis by Aslam Kassimali (4th Edition)

COI	JRSE INFORMATION												
	rse Code: EWCE 431						Cree	dit H	our	3.0			
	rse Title: Environmental and Social	Impo	ot A a	0000	pont			tact 1					
	-REQUISITE	mpa	ct As	sessi	lient		Con		noui	. 5.0			
		VCE	222										
EW	CE 105, EWCE 131, EWCE 331, EV RRICULUM STRUCTURE	VCE	333										
	come Based Education (OBE)												
	NOPSIS/ RATIONALE		т	71.4		OT A	<u></u>	•	1 .	1		1	•••••
In tr	his course, the students will learn to	perio	orm E	EIA 8	ina E	SIA	IOT V	ariou	is de	veloj	omen	it pro	jects
	ch will be helpful in their professiona ECTIVE	ai iiie											
		. 1 17	OTA C	·	•	1.	.1		1				
	To learn the methodologies of EIA a												1
2.	To achieve workable knowledge on e	evalu	ating	EIA	and	ESIA	A of r	natior	nal ar	nd int	erna	tiona	I
	development projects.												
3.	To apprehend the importance of st	akeh	older	part	icipa	tion	and	othe	r soc	ial p	erspe	ective	es of
	development projects.	_	_			_					_		
-	JRSE CONTENT												
	oduction to ESIA, methodology of E												
	IA, application of EIA, EIA for prot												
deve	elopment and poverty index; pover	ty ree	duction	on st	rateg	jies i	n Ba	ngla	desh	and	gend	ler is	sue
relat	ed to human development. Environn	nenta	l law	s and	l regi	ılatio	ons.						
Prep	paration of Environmental manage	ement	t and	l mo	nitor	ing	plan,	En	viron	ment	al Is	ssues	in
	gladesh, Public Participation in Envi												
	elopment project; land loss, land u												
	ttlement and rehabilitation strategy, s												
		0010	ccom	011110	541 1	0,00	450 51	.uure	J. 202	Sur uc	peeu	5 01 L	
case studies SKILL MAPPING (CO – PO MAPPING)													
NO	Course Outcome		OGR/	AM (	OUT	COM	IES (	POs)					
No	Course Outcome		OGR	AM ( 3	OUT 4	COM	IES ( 6	POs) 7	8	9	10	11	12
No 1		PRO 1					· · · · · ·			9	10	11	12
	CO1: Identify the various socio-	PRO 1					· · · · · ·			9	10	11	12
	CO1: Identify the various socio- economic impacts of development	PRO 1					· · · · · ·			9	10	11	12
	CO1: Identify the various socio- economic impacts of development projects; including the land	PRO 1					6			9	10	11	12
	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related	PRO 1					· · · · · ·			9	10	11	12
	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale	PRO 1					6			9	10	11	12
	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing	PRO 1					6			9	10	11	12
1	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context	PRO 1					6			9	10	11	12
	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of	PRO 1					6			9	10	11	12
1	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact	PRO 1					6			9	<u>10</u>	11	12
1	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various	PRO 1					6 √			9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects.	PRO 1					6 √			9		11	12
1	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and	PRO					6 √			9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community	PR(					6 1 1 1 1 1 1 1 1 1 1 1 1 1			9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available	PR(					6 √			9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available resources in development projects	PR(					6 1 1 1 1 1 1 1 1 1 1 1 1 1			9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available resources in development projects CO4: Integrate tools for	PR(					6 1 1 1 1 1 1 1 1 1 1 1 1 1			9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available resources in development projects CO4: Integrate tools for incorporating Client Centered	PRO					6 1 1 1 1 1 1 1 1 1 1 1 1 1			9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available resources in development projects CO4: Integrate tools for incorporating Client Centered	PRO					6 1 1 1 1 1 1 1 1 1 1 1 1 1			9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available resources in development projects CO4: Integrate tools for incorporating Client Centered Approach for design, planning, and	PRO								9		11	12
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available resources in development projects CO4: Integrate tools for incorporating Client Centered Approach for design, planning, and implementing development	PRO								9			12
1 2 3 4	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available resources in development projects CO4: Integrate tools for incorporating Client Centered Approach for design, planning, and implementing development projects	PRO						7 √ √		9			
2	CO1: Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context CO2: Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects. CO3: Understand the importance and means of local community participation and locally available resources in development projects CO4: Integrate tools for incorporating Client Centered Approach for design, planning, and implementing development	PRO								9			

	economic Development Indicators							
	to evaluate the effects of various development projects	8						
No	IRSE OUTCOMES & GENERIC S Course Outcome	KILLS	T	1	-			
INO	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods	
CO1	Identify the various socio- economic impacts of development projects; including the land acquisition and resettlement related key issues for large scale development projects emphasizing the Bangladesh context	6	C4	1,2,6	-	7	Class Test, Mid-term, Final Exam	
CO2	Prepare outlines of Environmental and Social Impact Assessment (ESIA) of various development projects.	6,7,10	C4, C6	1, 2,3	-	7	Class Test, Mid-term, Final Exam	
CO3		6,7	C2	1,6,7	-	7	Class Test, Mid- term, Group Assignment Final Exam	
CO4	Integrate tools for incorporating Client Centered Approach for design, planning, and implementing development projects project	6,7	C4, C6	1,3,6	-	7	Class Test, Mid- term, Final Exam	
CO5	Integrate SDGs goals, targets, indicators, various socio- economic Development Indicators to evaluate the effects of various development projects	6,7	C3, C5	1,3,5	-	7	Class Test, Mid- term, Final Exam	
	WP= Washington Accord Comple Engineering Activities/ CA= Comp Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 – Remember C2 – Understand	plex Activ	vities; W	K= Was	shingto	n Accord	Knowledge	
	(T – Test, PR – Project, Q – Quiz, R – Report, F – Final Exam)		Term Ex	am, As	g – Ass	ignment,	Pr – Presentation,	
	ACHING AND LEARNING STRA	TEGY	Eners	mont (T	Iour			
	ching and Learning Activities		Engage	ment (I	iours)			
race	-to-face Learning Lecture (3 hours/week × 14 wee	eks)	42					
Self-	Directed Learning Non-face-to-face learning Revision of the previous lecture	at	24 11					

	home		20					
•	Preparation	for final examination						
Formal	Assessment							
•	Continuous	Assessment		20				
•	Final Exam			3				
	I mui Linui							
		Total		120				
TEACH	ING METHO	DDOLOGY						
		on, Problem Based Method						
	SE SCHEDU							
Week	Lecture	Topics to be	Covered	Assessment				
	1	Concept of Environment						
1	2	Introduction to Environmen	ntal Management					
-	3	Goals of Environmental Ma						
	4	Major Environmental Issue						
2	5	Formulation of Environment	<u> </u>					
~	6		2					
		Environmental Policy in Ba						
	7	History of Environmental I						
3	8	Environmental Laws in Ba		Class Test				
	9	Assessing critically endang						
	10	Process of Environmental G	Clearance Certificate					
4	11	Objectives of EIA						
-	12	Focus Group Discussion						
	13	Steps of EIA						
5	14	Scope of EIA						
	15	Environmental Managemen	nt Plan	Group Assignment				
	16	EIA Methodologies						
6	17	Composition of EIA Team						
-	18	Environmental Quality Star	ndards					
	19	Impact Chain Approach		Mid-Term Exam				
7	20	Purpose of Setting Standard						
	21	Importance of EMP in EIA						
	22	Project Cycle and EIA						
8	23	Format of EMP						
-	24	Typical content of EMP Re						
	~ -	EIA in water resources an						
	25	Different EIA index calcul	lation, Environmental					
9	• -	laws and regulations						
	26	Application of EIA, EIA fo						
	27	EIA of draughts in dry seas						
		impact of flood, solid wast						
	28	Economic and social struct	ure in an ESIA report					
10		population		Class Test				
-	29	Development and economi						
	30	Introduction to socio-econo						
	31	Rehabilitation strategy duri						
	32	Productivity, land loss, land						
11		ownership pattern assessme						
	33	Analysis of communication						
		industries and other econor						
12	34	Analysis of inequalities in a	distribution of					

		1	1.1		
			s and losses		
	35	Social	Survey		
	36	Econor	nic and Financial	analysis	
	37	Gender	issues in an ESL	A report	
13	38	Legal a	spects of EIA		Class Test
	39	Case st			
	40	Examp	le of EIA report		
14	41	Examp	le of EIA report		
	42	Review	of procedure of	EIA Report	
ASSES	SMENT STR	ATEGY	•	•	
	a .				
	Components	5	Grading	СО	<b>Bloom's Taxonomy</b>
Continu	Components		Grading	СО	Bloom's Taxonomy
	•	ent			•
(Class a	ous Assessme	ent	Grading 40%	CO CO1, CO3, CO4	Bloom's Taxonomy C2, C3, C4, C5, C6
(Class a	ous Assessme ssignments/ C Active Class	ent			•
(Class a Term/ A	ous Assessme ssignments/ C Active Class	ent			•
(Class a Term/ A	ous Assessme ssignments/ C Active Class ation)	ent	40%	CO1, CO3, CO4	C2, C3, C4, C5, C6
(Class a Term/ A Participa	ous Assessme ssignments/ C active Class ation) Final Exam	ent CT/ Mid	40%	CO1, CO3, CO4	C2, C3, C4, C5, C6
(Class a Term/ A Participa <b>REFER</b>	ous Assessme ssignments/ C Active Class ation) Final Exam Total Marks RENCE BOO	ent CT/ Mid	40% 60% 100%	CO1, CO3, CO4 CO1, CO2, CO3, CO4	C2, C3, C4, C5, C6 C2, C3, C4, C5, C6
(Class a Term/ A Participa <b>REFER</b> 1. En	ous Assessme ssignments/ C Active Class ation) Final Exam Total Marks <b>RENCE BOO</b> vironmental I	ent CT/ Mid DKS Impact A	40% 60% 100% ssessment - Larry	CO1, CO3, CO4	C2, C3, C4, C5, C6 C2, C3, C4, C5, C6

H. Eccleston, CRC Press.
3. Evaluating Environmental and Social Impact Assessment in Developing Countries - Salim Momtaz, S. M. Zobaidul Kabir Waltham, Mass, Elsevier, 2013.Methods of Environmental

Impact assessment - Therivel, Riki, 1st Ed. UCL press.

COURS	E INFORMATION														
	Code: EWCE 432									dit H		1.5			
Course '	Title: Environmental	Engine	ering I	Dest	ign S	lessio	onal		Con	tact	Hour	: 3.0			
	EQUISITE														
	100, EWCE 261, EW		, EWO	CE :	333										
	CULUM STRUCTU														
	e Based Education (	OBE)													
	SIS/RATIONALE														
	course the students														
	al, domestic and fire														
	networks, sewerage network, sanitary facilities, drainage network, septic tanks, waste water														
	treatment plans, building plumbing system, which they will be able to apply in their professions.														
OBJEC							_								
1. To	impart knowledge to	o concep	otual de	esig	gn an	d ana	alyze	diffe	erent	com	pone	nts of	f an i	ndus	trial
are															
	develop the student's										wer s	system	m des	sign,	
	ter distribution desig	n for an	y build	ling	g, res	ident	tial/ i	ndus	trial a	area.					
	E CONTENT						C	• 1	. • 1	1		1		1	1
Design of	f water supply and s	ewerage	syste	m:	estin	natio	n of	indu:	strial	, don	nestic	c and	l fire	dema	ands,
	g deep tube well an ial wastewater gene														
	water and wastewater					k ue	sign,	nou	seno	ia pi	umo	ing s	syster	n de	sign,
	MAPPING (CO – PO			lant	5.										
No	Course Outcome	<i>J</i> 1917 11 1	/	PRO	OGR	AM	OUT	CON	IES (	POs	)				
110	Course Outcome			1	$\frac{3000}{2}$	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to predict the				_	C		-	Ŭ		Ŭ	-	10		
	fresh water supply														
	wastewater discha														
		sanita			N										
	requirement in urba	an as we	ll as												
	rural areas.														
2	CO2: Be able to														
	construct water we					1									
	sewers, storm sev	wers, s	eptic												
3	tanks.	1 .	1												
3	CO3: Be able to	Ũ													
		wastewa													
	treatment plants a	na sew	age												
4	treatment options.	• 1													
4	CO4: Be able to de	0													
COUDS	plumbing facilities e			тта	a										
COURS	E OUTCOMES & C	JENEKI	C SKI		5										
		ള													
		dir	s *	<u></u>									ent Is		
No	Course Outcome	spon POs	, n d		ſ	J.		CA	0.2	4 I			sm		
INU		Corresponding POs	Bloom's Tavonomu*	5	C	$\mathcal{L}$		C	1	4			Assessment Methods		
		011	B	1 97									As V		
		C)	L												
CO1	Be able to predict						_								
001	the fresh water	2	C2	1 –		_		3	Mid Term Exam,			۱,			
	supply	-	02			•						Rep	ort, V	/iva	
L	~~~~~~~		I												

no quinom ont			1				
requirement, wastewater							
discharge, storm							
water flow and							
sanitation							
requirement in							
urban and rural	-						
areas.							
CO2 Be able to design							
and construct							
water wells.	<b>`</b>	C6	3		_	1.5.6	Mid Term Exam, Report,
sanitary sewer,			_			, ,	Viva
storm sewer, septic							
CO3 Be able to design							
and construct							
wastewater							
treatment plants and	3	C6	3		-	1,5,6	Final Exam, Report, Viva
sewage treatment							
options							
CO4 Be able to design							
house plumbing		C6	3		_	1.5.6	Final Exam, Report, Viva
facilities efficiently	C	00	C C			1,0,0	r mai Enam, report, viva
	Accord C	Complex I	Problem	Solving	/CP=	Comp	lex Problem Solving;
EA=		· ·		0	, -	- r	8,
Engineering Activi	ties/ CA	= Comple	ex Activ	ities; WI	K= Wa	ashing	ton Accord Knowledge
Profile/ KP= Know						-	_
*Level of Bloom's			~ (		~	_	<i></i>
C1 - C2		C3-	C4 -		C:		C6 –
Remember Und	lerstand	App	ly Ana	lyze	E	valuate	e Create
(T-Test, PR – Proje	r = 0 - 0	Juiz M_	Mid Te	rm Exar	n Aso	σ _ Δss	ignment Pr_
Presentation, R – Re					11, 1 155	, 1100	"Igninioni, I i
TEACHING AND LEARN							
Teaching and Learning Ac	tivities			Engag	gemen	t (Hou	rs)
Face-to-face Learning						·	
Lecture (3 hours/we	$ek \times 12$	weeks)					36
Guided Learning							
Tutorial/Assignments (1 ho	urs/weel	$x \times 08$ we	eeks)				08
Self- Directed Learning							
Non-face-to-face lea	• Non-face-to-face learning						
Revision of the prev	ture at ho	me				13	
Preparation for the f	Preparation for the final examination						
Formal Assessment							
a) Continuous Assessme	ent						3
b) Quiz and viva	b) Quiz and viva						
Tota	1						60
TEACHING METHODOLOC	GY						
Lecture and Discussion, Prob	lem Bas	ed Metho	d				
COURSE SCHEDULE							

1       01       Introduction         2       02       Layout of Industrial Village         3       03       Preparation of Organograms         4       04       Population Estimation of the Industrial Village         5       05       Water Demand Calculation for of the Industrial Village         6       06       Development of Water Source for the Industrial Village         7       07       Mid Term Quiz + Viva         8       08       Determination of Pump Capacity & Pumping Schedule         9       09       Design of Water Distribution Network (Branch Network)         10       10       Design of Sanitary Waste Water System: Sanitary Sewer Design         12       12       Introduction to Plumbing System         13       13       Design of Plunbing System of a 10 Storied Building         14       14       Final Quiz + Viva         Assessment Good Continuous 30% Continuous 30% Continuous 30% Continuous 30% Col, CO2, CO3, CO4         Assessment Colspan="2">Action of Col, CO2, CO3, CO4         Quiz (Mid Term+       60% CO1, CO2, CO3, CO4       C2, C6         Viva       10% Cont, CO2, CO3, CO4       C2, C6         Viva       10% CO1, CO2, CO3, CO4       C2, C6         Viva       10% CO1, CO2, CO3, CO4	Week	Lecture	Тор	oics to be Covered	Assessment
3       03       Preparation of Organograms         4       04       Population Estimation of the Industrial Village         5       05       Water Demand Calculation for of the Industrial Village         6       06       Development of Water Source for the Industrial Village         7       07       Mid Term Quiz + Viva         8       08       Determination of Pump Capacity & Pumping Schedule         9       09       Design of Water Distribution Network (Branch Network)         10       10       Design of Sanitary Waste Water System: Sanitary Sewer Design         12       12       Introduction to Plumbing System         13       13       Design of Plumbing System         14       14       Final Quiz + Viva         Assessment A	1	01			
4       04       Population & sign equivalent         4       04       Population & Sign equivalent         4       04       Population & Sign equivalent         5       05       Water Demand Calculation for of the Industrial Village         7       07       Mid Term Quiz + Viva         8       08       Determination of Pump Capacity & Pumping Schedule       Report/ Mid Exam/ Viva         9       09       Design of Water Distribution Network (Loop Network)       Report/ Final Exam/ Viva         10       10       Design of Water Distribution Network (Loop Network)       Report/ Final Exam/ Viva         11       11       Design of Plumbing System       Report/ Final Exam/ Viva         13       13       Design of Plumbing System of a 10 Storied Building       Bloom's Taxonomy         14       14       Final Quiz + Viva       Sassessment (Assignment/Test/R eport/Active Class Participation)       CO1, CO2, CO3, CO4       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6       Viva         Quiz (Mid Term+ Final)       60%       CO1, CO2, CO3, CO4       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6         Viva	2	02	Layout of Indu	strial Village	
Viilage         5       05       Water Demand Calculation for of the Industrial Village       Report/ Mid Exam/ Viva         6       06       Development of Water Source for the Industrial Village       Report/ Mid Exam/ Viva         7       07       Mid Term Quiz + Viva       Report/ Mid Exam/ Viva         8       08       Determination of Pump Capacity & Pumping Schedule       Report/ Mid Exam/ Viva         9       09       Design of Water Distribution Network (Branch Network)       Report/ Final Exam/ Viva         10       10       Design of Sanitary Waste Water System: Sanitary Sewer Design       Report/ Final Exam/ Viva         12       12       Introduction to Plumbing System       Report/ Final Exam/ Viva         ASSESSMENT STRATEGY       Components       Grading       CO         Continuous       30%       Sasessment       Sasessment         (Assignment/Test/R       CO1, CO2, CO3, CO4       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6	3	03	Preparation of	Organograms	
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11       11       Design of Sanitary Waste Water System: Sanitary Sewer Design       Report/ Final Exam/ Viva         12       12       Introduction to Plumbing System       Report/ Final Exam/ Viva         13       13       Design of Plumbing System of a 10 Storied Building       Report/ Final Exam/ Viva         14       14       Final Quiz + Viva       Report/ Final Exam/ Viva         ASSESSMENT STRATEGY         Components       Grading       CO         Assessment       CO1, CO2, CO3, CO4       C2, C6         Port/Active Class       Participation)       CO1, CO2, CO3, CO4       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6         Total Marks       100%       Intervalone       Intervalone	10	10	Design of Wate	er Distribution Network	
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Building         14       14       Final Quiz + Viva         ASSESSMENT STRATEGY       Components       Grading       CO       Bloom's Taxonomy         Continuous       30%       Assessment       Assessment       CO1, CO2, CO3, CO4       C2, C6         Participation)       Participation)       CO1, CO2, CO3, CO4       C2, C6       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6       C04         Viva       10%       CO1, CO2, CO3, CO4       C2, C6         Total Marks       100%       Image: Context and the c	12	12	Introduction to	Plumbing System	
14       14       Final Quiz + Viva         ASSESSMENT STRATEGY         Components       Grading       CO       Bloom's Taxonomy         Continuous       30%       Assessment       CO1, CO2, CO3, CO4       C2, C6         eport/Active Class       Participation)       CO1, CO2, CO3, CO4       C2, C6         Quiz (Mid Term+       60%       CO1, CO2, CO3, CO4       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6         Viva       10%       CO1, CO2, CO3, CO4       C2, C6         Total Marks       100%       REFERENCE BOOKS       I.       A Text Book of Water Supply Engineering - M. A. Aziz, 1st ed., Hafiz Book Center         2.       Water and Environmental Engineering - M. Habibur Rahman, 1st ed., ITN- BUET       S.       Water and Environmental Engineering - M. Habibur Rahman, Abdullah Al-Muyeed, 1st ed ITN-BUET.         4.       Environmental Engineering - Howard S. Peavy, Donald R. Rowe and Georg Tchobanoglous, International Edition, McGraw Hill Companies.       5.         5.       Environmental Sanitation, Wastewater Treatment and Disposal – Tanveer Ferdous Saeed	13	13	-	bing System of a 10 Storied	
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<ol> <li>Water and Environmental Engineering - M. Habibur Rahman, Abdullah Al-Muyeed, 1st ed ITN-BUET.</li> <li>Environmental Engineering - Howard S. Peavy, Donald R. Rowe and Georg Tchobanoglous, International Edition, McGraw Hill Companies.</li> <li>Environmental Sanitation, Wastewater Treatment and Disposal – Tanveer Ferdous Saeed</li> </ol>					
<ul> <li>ITN-BUET.</li> <li>Environmental Engineering - Howard S. Peavy, Donald R. Rowe and Georg Tchobanoglous, International Edition, McGraw Hill Companies.</li> <li>Environmental Sanitation, Wastewater Treatment and Disposal – Tanveer Ferdous Saeed</li> </ul>			•		
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<ul> <li>Tchobanoglous, International Edition, McGraw Hill Companies.</li> <li>Environmental Sanitation, Wastewater Treatment and Disposal – Tanveer Ferdous Saeed</li> </ul>				g - Howard S. Peavy,	Donald R. Rowe and George
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<ol> <li>Introduction to Environmental Engineering – Gilbert M. Masters and Wendell P. Ela, 3rd ed Prentice-Hall Inc.</li> </ol>	6. II	ntroduction	to Environmen		Masters and Wendell P. Ela, 3rd ed.,
<ol> <li>Wastewater Engineering- Metcalf and Eddy.</li> <li>Water Supply and Sewerage- Terence J. McGhee.</li> </ol>	7. V	Vastewater	Engineering- N		

9.	Plumbing Practices – Syed Azizul Haq, Peng.
10.	Plumbing Installation and Design – L. V. Ripka, 4th ed.

COL	JRSE INFORMATION												
	rse Code: EWCE 433								Credi	t Hoi	ır: 3.0	)	
	rse Title: Solid and Hazard	lous W	aste M	anao	emer	nt					our: $3.0$		
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	4. To design an integ			anag	emer	nt sys	tem	for th	le cor	nmui	nity.		
COU	JRSE CONTENT										2		
Soli	d Waste Management: so	urces a	and ch	aract	eriza	tion	of sc	lid v	vaste	s, so	lid was	te gener	ration,
onsi	te handling, storage, proce	essing,	collect	ion, 1	rans	fer ar	nd tra	nspo	rt of	SW,	resourc	ces and e	energy
reco	overy and recycling, treatment	nent a	nd disp	posal	opti	ons o	of SV	<i>N</i> . H	azaro	lous	Waste	Manage	ement:
sour	ces and characterization	of haz	zardou	s wa	stes,	type	es an	id ge	enera	tion	of haz	ardous	waste,
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	te management, legal and			ects o	of wa	ste m	lanag	eme	nt.				
No	LL MAPPING (CO – PO I Course Outcome		GRAM		TCO	MES		a)					
INO	Course Outcome	1	$\frac{3}{2}$	3	4	5	6	s) 7	8	9	10	11	12
1	<b>CO1:</b> Ability to	-	2	5	4	5	0	/	0	2	10	11	12
1	understand the	r											
	characterization of	•											
	different kinds of solid												
	and hazardous wastes and												
	their treatment.												
2	CO2: Ability to analyze		_										
	health and environmental												
	issues related to solid and												
	hazardous waste												
	management.								ļ				
3	CO3: Ability to solve												
	various steps in solid			. /									
	waste management												
	reduction at source, collection techniques,												
	materials and resource												
	recovery/recycling,												
	optimization of solid												
I	opullization of solid					I	I	I	1	I	1	1	L

	waste transport, treatment and disposal techniques.						
4 COU	CO4: Ability to minimize the impact of waste management solutions on society and the environment and demonstrate the knowledge of and need for sustainable engineering solution RSE OUTCOMES & GEN	ERIC	SKILLS			√	
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods
CO1	Ability to understand the characterization of different kinds of solid and hazardous wastes and their treatment.	1	C2	1	_	1	Assignment, Pop quiz, Final Exam
CO2	and environmental issues related to solid and hazardous waste management.	2	C3	1	_	6	Class Test, Mid-term, Pop quiz, Final Exam
CO3	steps in solid waste management such as waste reduction at source, collection techniques, materials and resource recovery/recycling, optimization of solid waste transport, treatment and disposal techniques.	3	C4	1	_	4	Class Test, Mid-term, Pop quiz, Final Exam
CO4	Ability to minimize the impact of waste management solutions on society and the environment and demonstrate the knowledge of and need for sustainable engineering solution	7	C4	1,2	_	7	Class Test, Mid-term, Pop quiz, Final Exam
	WP= Washington Accord Engineering Activities/ CA Profile/ KP= Knowledge P *Level of Bloom's Taxond	A= Co Profile	mplex Ac				
	C1 – C2 – Remember Understand	-		4 – nalyze	C5 Evalu		C6 – Create

		R – Project, Q – Quiz, M – Mid Term Ex F – Final Exam)	am, Asg – Ass	ignment, Pr – Presentation,							
		ND LEARNING STRATEGY									
		earning Activities	Engagemer	nt (Hours)							
	Face-to-face Learning										
	Lecture (	3 hours/week $\times$ 14 weeks)		42							
	Guided Learning										
		nents (2 hours/week $\times$ 6 weeks)		12							
Self- D	virected Le	e		22							
•		e-to-face learning		32							
•		of the previous lecture at home		8 20							
•		on for the final examination		20							
	Assessme			2							
,		as Assessment		3 3							
b)	Final Exa	mination		3							
		Total		120							
TEACH	ING MET	HODOLOGY									
		sion, Problem-Based Method									
	SE SCHE										
Week	Lecture	Topics to be Covered		Assessment							
		Introduction to solid waste manageme									
	01 and composition of Solid Waste, Characteristics of										
1	02	Solid Waste									
	02	Characterization of hazardous waste	266								
	03	Exposure to hazardous waste, E toxicity, Dose-Response relationships	affects of								
			ces and								
	04	characterization of solid wastes									
		Non carcinogens, assessment of non-ca	arcinogenic								
2	05	risk, Carcinogens, testing for carcino	0	CT 1							
		dose-response relationships for carcino	ogens	ULI							
	06	Hazardous waste management strategi									
	50	reduction – process modification, segr	<u> </u>								
	07		Waste								
	07		Steps in								
3		Integrated Solid Waste Management Toxicity reduction of hazardous waste	process								
	08	modification, equipment modification									
	00	substitution	, material								
	09	Recycling and exchange of hazardous	waste								
4		Generation, on-site handling and tr									
4	4 10 Generation, on-site handling and transfer of solid wastes										
	11 Treatment methods for hazardous waste,										
Physicochemical treatment processes											
	12 Biological treatment processes for hazardous CT 2										
		waste									
5	13	Composting of solid waste	harandara								
5	14	Stabilization and solidification of waste	nazardous								
L		music		1							

	15	Thermal treat	nent meth	ods for hazardous wast	e								
				lecomposition of soli									
	16	waste	united u	composition of som	iu								
6	17	Disposal meth	ods for ha	zardous waste									
Ŭ				thcare waste (HCW);									
	18	Factors affecti											
	19	Integrated Sol											
7	20	Integrated Sol											
	21	Healthcare wa											
	22	Types of land				Mid Term Exam							
8	8 23 Landfill operation												
_	24			healthcare waste (HCV	W)								
	25	Pollution from			,								
	26	Landfill Desig											
9				s waste, sharps, cher	nical								
-	27			waste, radioactive w									
		· 1		e waste treatment met	-								
	28	Sanitary Land			nous								
10	28			Wastes in landfills									
10	30	Public health	impacts of	HCW									
	31	I litimate Disn	osal of Sol	lid Waste: Method									
	31			covery and recycling									
11				aste minimization, safe		CT 3							
	33	reuse, recyclir											
	34			cts of waste manageme	unt I								
	35			cts of waste manageme									
12				gregation systems, was									
12	36												
	50	healthcare fac		standards, Collection fr	OIII								
				cal departments, Centra	a1								
	37	storage inside			ai								
13	38			port of healthcare waste	<b>_</b>								
15				logies I – thermal,	-								
	39	chemical, and		0									
				ogies II –biological an	d								
	40	mechanical pr		ogies ii –biologicai ali	u								
				HCW categories –									
14	41		•	0	na								
	41	heavy metals	us, chennic	als and wastes containi	ng								
	42	Disposal meth	ode for he	althears wests									
ACCECC		TRATEGY	ious for ne	annuare waste									
ASSESS			Cual	00	1	Dloom'a Towara							
<u>a</u> .:	Compo		Grading	СО		Bloom's Taxonomy							
	ous Assess												
		s/ CT/ Mid	40%	CO1, CO2, CO3, CO4		C2, C3, C4							
[l'erm/ A	ctive Clas	s Participation)		····, ···, ···, ···, ···, ···, ···, ··		-=, 50, 0.							
Final Exam         60%         CO1, CO2, CO3, CO4         C2, C3, C4													
Total Marks 100%													
	ENCE B												
1. Sol	id and Ha	zardous Waste N	Manageme	nt - M. Habibur Rahma	in and	Abdullah Al Muyeed ITN-							
	ET.		-			-							
2. Env	vironment	al Engineering	- Howard S	S. Peavy, Donald R. Ro	owe an	d George Tchobanoglous,							

International Edition, McGraw Hill Companies.

- 3. Integrated solid waste management: engineering principles and management issues -Tchobanoglous, George, Theisen, Hilary, Uigil, Samuel. 1st Ed. McGraw Hill Book Company.
- 4. Hazardous Waste Management in Bangladesh A Country Inventory Department of Environment (DoE), Bangladesh.

COURSE INFORMATION	
Course Code: EWCE 434	Credit Hour: 1.5
Course Title: Environmental Modelling Sessional	Contact Hour: 3.0

PRE-REQUISITE

EWCE-331 (Water Supply Engineering), EWCE-435 (Air Pollution and Control), EWCE-206 (GIS in Environmental and Water Resources Engineering)

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

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

#### OBJECTIVE

1. To learn the basics of water, air, and noise models.

2. To become skilled at designing and analyzing a water distribution network system.

3. To get acquainted with noise modeling software.

4. To be able to demonstrate air dispersion models and RS software.

### COURSE CONTENT

Basic components and processes, and internal dynamics of a water supply system, Modeling concept, Overview of water distribution network, Different analysis methods i.e. distribution main design, sensitivity analysis etc. in steady-state or extended period simulation, Designing and analyzing of a water distribution network, Environmental Noise Modelling and its application using software, Basics of regulatory air dispersion modeling, Meteorological data processing, Overview and data input for air dispersion model, Puff, and plume models.

SKILL	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome	PROGRAM OUTCOMES (POs)											
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Ability to <b>understand</b> the role and nature of modelling environmental systems												
2	CO2: Have a clearer <b>understanding</b> of the challenges and decisions associated with model implementation and validation of model outputs												
3	CO3: Ability to <b>identify</b> a particular environmental problem and <b>apply</b> an appropriate modeling framework												

4	CO4: Ability to <b>analyze</b> results of environmental models and co-relate them with physical phenomena SE OUTCOMES & GENERIC SK		/					
No	Course Outcome							
		Corresponding POs	Bloom's Taxonomy*	đ	CA	KP	Assessment Methods	
CO1	Ability to <b>understand</b> the role and nature of modelling environmental systems.		C2	-	-	1	Mid Term, Final Exam	
CO2	have a clearer <b>understanding</b> of the challenges and decisions associated with model implementation and validation of model outputs		C2	-	-	1	Mid Term, Final Exam	
CO3	Ability to <b>identify</b> a particular environmental problem and <b>apply</b> an appropriate modeling framework		C3	-	-	4,6	Assignment, Report, Mid Term, Final Exam	
CO4	Ability to <b>analyze</b> results of environmental models and co- relate them with physical phenomena		C4	-	-	4,6	Assignment, Report, Mid Term, Final Exam	
	WP= Washington Accord CompleEngineering Activities/ CA= ComProfile/ KP= Knowledge Profile*Level of Bloom's Taxonomy: <u>C1-</u> <u>C2-</u> RememberUnderstand			K= Washin <u>C5</u>	ngton .	Accord	Knowledge	
	(T – Test, PR – Project, Q – Quiz, Presentation, R –Report, F – Final	M – Mie Exam)	d Term Ex					
	CHING AND LEARNING STRAT	EGY			L			
	ning and Learning Activities		Eng	agement (H	10urs)			
•	Lecture Practical/ Tutorial/ Studio Student – Centered Learning				24 0			
Self- D	Pirected Learning Non-face-to-face learning Revision of the previous lecture at Preparation for Mid Quiz				2 3			
•	Preparation for Final Quiz		4 4					
Formal	Assessment Continuous Assessment					+ 1		
•	Communuous Assessiment					1		

•	Mid Quiz					1					
•	Final Qui	Z		1							
		Tot	al		6	50					
TEACH	TEACHING METHODOLOGY										
Lectures	Lectures, Software Demonstrations										
COUR	COURSE SCHEDULE										
Week	Lecture	Topics t	to be Covered			Assessment					
		•Basic	Components and	processe	s, and internal dynami	ics					
1	1	of a w	vater supply system	m							
1	1	•Model	ing concept, A qu	ick overv	view of the features,						
					t steps in WaterGEMS						
	-	Building	a Network and Pe	erforming	a Steady-State	Assignment,					
2	2		in WaterGEMS	2	,	Report, Test, Mi					
3	3		rations of extend	ed period	simulation	Quiz					
4	4		management, Re								
5	5		ted fire flow anal								
6	6		uality analysis	2							
7	7		dependent dema	nds							
8	8	Mid Qui									
9	9	Environr	nental Noise Mo	delling a	nd its application I						
10	10	Environr	nental Noise Mo	delling an	d its application II						
11	11			, Hands (	on Meteorological Data	ì					
11	11	Analysis				Assignment,					
12	12	Refined	Model introducti	on, overv	view and data input for	Report, Final Qu					
12	12	AERMO									
13	13		ate systems and r								
			nding puff and	plume mo	odels						
14	14	Final Qu									
	SMENT S			1							
(	Componer	nts	Grading		CO	Bloom's					
						Taxonomy           C2, C3, C4					
	Continuous Assessment40%CO1, CO2, CO3, CO4										
(Class A	(Class Assessment/Report/										
Assignment)											
Mid (	Mid Quiz+ Final Quiz60%CO1, CO2, CO3, CO4Total Marks100%										
,											
REFERENCE BOOKS											
1. A	Step-by-S	tep Guide	to EPANET 2.0	Simulatio	ons – Robert Pitt, Shirle	y Clark					
					A. Aziz, 1 st ed., Hafiz B						
			art Tutorial	-							

3. WaterGEMS Quick Start Tutorial

4. SoundPLAN User's manual

AERMOD Quick Reference Guide – USEPA
 AERMOD Tech Guide – Lakes Environmental

COURSE INFORMATION
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Course Code: EWCE 435

Course Title: Air Pollution and Control

PRE-REQUISITE

CHEM-103 (Fundamentals of Chemistry), EWCE-105 (Environmental Chemistry)

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

In this course students will learn about the causes of air pollution and measures for air pollution control, which will help them design air pollution abatement system in their professional life.

Credit Hour: 2.0

Contact Hour: 2.0

# OBJECTIVE

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

## COURSE CONTENT

Formations of earth crusts and changes that occur on the earth's surface. Rocks and minerals: identification of rocks and minerals, common rock forming minerals, physical properties of minerals, mineraloids rocks, types of rocks, cycle of rock change, earthquake and seismicity of Bangladesh, geology of Bangladesh. Structural geology: faults, types of faults, fold and fold type, domes, basins, erosional process, quantitative analysis of erosional landforms. Fluvial processes in Geomorphology: channel development, channel widening, valley shape, stream terraces, alluvial flood plains, deltas and alluvial fans, fluvial deposits, coastal deposits, glacial deposits, lacustrine deposits, Aeolian deposit, river basin, channel morphology, channel patterns and the river basin, geology and geomorphology of rivers of Bangladesh.

	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome												
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: To assess the air							,					
	quality scenario and												
	impacts of air												
	pollutants on human												
2	health and society												
2	CO2: To understand the												
	principles of air quality monitoring and			N									
	abatement systems												
3	CO3: To understand air												
-	pollution control												
	regulations to ensure		.7										
	sustainable		$\checkmark$										
	management of public												
	health and safety												
COUR	SE OUTCOMES & GEN	ERI	C SK	ILLS	5						-		
No	Course Outcome	Corresponding	PŌs	Bloom's		CP		CA		KP			Assessment Methods
													7
CO1	To assess the air quality	7		C4		1,6				2		C	lass Test,

	acomonia	and improved of						Final Exam		
		and impacts of ants on human						Fillal Exalli		
	health and									
CO2		derstand the								
002		of air quality	-					Class Test,		
	monitorin		2	C3	1,5		4	Mid-term,		
	abatemen							Final Exam		
CO3		derstand air								
	pollution	control						A set of the class		
		is to ensure	6	<b>C</b> 2	15		1	Assignment, Class		
	sustainabl	e management	0	C2	1,5		1	Test, Mid Term, Final Exam		
		c health and						Milu Terini, Finai Exam		
-	safety									
								Problem Solving; EA=		
				nplex Ac	tivities;	WK= Wasl	hington A	Accord Knowledge		
		P= Knowledge								
	*Level of C1 –	Bloom's Taxon		C3- C	14	05	00			
	Remembe	c2 – The contract of the contr		Apply A	24 -	C5 · Evolu	- C6 ate Crea			
	Kemembe	i Onderstan	u 1	appiy P	maryze	Lvaiu				
	(T-Test. P	R – Project, O –	- Ouiz.	M – Mid	Term Ex	xam. Asg –	- Assignt	nent, Pr – Presentation,		
		t, F – Final Exar					1 1001811			
TEAC		D LEARNING		TEGY						
Teach	ning and Le	arning Activitie	s			Engagement (Hours)				
	o-face Lea									
	Lecture	0				28				
•	Practical/ T	utorial/ Studio								
		Centered Learnin	σ							
	irected Lea		8							
•		to-face learning	T			5				
•		of the previous	-	at home		12				
•		on for final exam						30		
Formal	Assessme		limatio	11				50		
								2		
,		s Assessment						2 3		
b)	Final Exam	ination						5		
		Total						80		
TEACH	ING METH	IODOLOGY								
Lecture	and Discuss	ion, Problem-Ba	sed Me	thod						
	SE SCHED									
Week	Lecture	Topics to be (	Covere	d				Assessment		
	01	Introduction								
1	02	Definition, co	mpone	effects of	air					
	02	pollution								
	03	Sources, clas	ssificat	effect	cts of air CT 1					
2		pollutants					~ 1			
-	04	Air pollution r	quality s	tandard &						
		Emission stan			. 1 1 1	lama				
3	05	Pollution India	$\frac{\cos, Ma}{mn^{1}}$	athematic	cal proble	iems				
	06	Mathematical			ffaata	of criteria				
4	07	pollutants	ources,	and e	nects 0	of criteria Mid Exam				
		ponutants								

		Formatio	n cources en	d effects of criter	ia
	08	pollutant		a effects of cifier	14
	09			d effects of criter	ia
5	09	pollutant	s (cont.)		
	10	Air quali	ty scenario in Ba	ngladesh	
6	11	Air quali	ty scenario in Ba	angladesh (cont.)	
0	12	Atmosph	eric properties, I	Lapse rate and stabili	ty
	13	Atmosph	eric stability and	l plume behavior	
7	14	Mathema stability	tical problems	related to atmospher	ic
	15	Atmosph	eric diffusion the	eories	
	16	Point sou	rce Gaussian plu	ıme model	
0	17		tical problems i plume model	related to point sour	се
9	18		tical problems 1 plume model (c	related to point sour ont.)	ce CT 2
	19		rce Gaussian plu		
10	20	Mathema		elated to line source	_
11	21	Air pollu	tion control: Nat	tural process &	
11	22		ing process		_
	22		neasures for Indu		
12	23 24		neasures for Veh		CT 3
	24		problems and an	lafysis	_
13	25		change pattern		
	20			sible air pollutants	
14	27		erall mathematic of the total syllab		_
ACCECC	SMENT ST			bus	
				CO	Plaam's Taxonomy
-	Componen		Grading	СО	Bloom's Taxonomy
	ous Assessi				
	signments/				
	ctive Class		C2, C3, C4		
Participa	ition)				
	Final Exar		C2, C3, C4		
	Total Mark	KS			
REFER	ENCE BO	OKS			
			David Cooper a	$nd \in C$ Alley 3rd E	d

 Air Pollution Control - C. David Cooper and F. C. Alley, 3rd Ed.
 Environmental Pollution and Control - J. Jeffrey Peirce, Ruth F. Weiner and P. Aarne Vesilind, 4th Ed.

3. Fundamentals of Air Pollution - Daniel Vallero.

COU	RSE INFORMATION												
-	se Code: EWCE 436								Cre	dit H	our: 1.	5	
Cour	se Title: Treatment Plant De	sign	Sess	ional					Cor	ntact	Hour:	3.0	
PRE-	REQUISITE												
	CE-331 (Water Supply Engin	eerin	g), l	EWCE-	333	(Wa	stewa	ter l	Engin	eerin	ng and	Sanita	tion)
	RICULUM STRUCTURE												
	ome Based Education (OBE)												
	OPSIS/ RATIONALE												
	ents will learn about the p												
	ewater. They will learn de	signi	ing	the tre	atme	ent p	olants	, W	hich	will	be he	lpful	in their
	essional life.												
OBJ	ECTIVE												
	• To learn about t					ses f	or su	rfac	e and	gro	und w	ater to	make it
	suitable for drink												
	• To learn about th												
COU	• To learn the desig	gn ba	ISIC a	and trea	tme	nt sc	heme	s of	the tr	eatm	ent pla	ints.	
COURSE CONTENT Detail design of an effluent treatment plant (ETP) to mitigate the adverse effects of untreated waste													
Detail design of an effluent treatment plant (ETP) to mitigate the adverse effects of untreated waste such as garment, leather and other industrial activities.													
SKILL MAPPING (CO – PO MAPPING)													
SKILL MAPPING (CO – PO MAPPING)       No     Course Outcome       PROGRAM OUTCOMES (POs)													
110	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to formulate	1	2	5	•	5		,	0	/	10	11	12
-	the treatment processes												
	specific to surface water,			1									
	ground water and												
	wastewater.												
2	CO2: Be able to design the												
	materials and chemical												
	dosing for treatment required			v									
GOV	in the treatment plants	<b>D</b> IC	~~~~										
COU	RSE OUTCOMES & GENE	RIC	SKI	ILLS				-					
		ω	)										
		din		s Iy*								ent Is	
N	Course Outcome	Corresponding	S	om's onomy*	٩		A		Ь			essment ethods	
No	Course Outcome	esp	POs		Ъ	5	Ũ		$\mathbf{X}$			sess leth	
		OTIO		$T_{ax}$								Ass M	
		Ŭ										7	
COL	Be able to formulate the		-+			-+		+					
	treatment processes specif	io											
	to surface water, groun		2	C4	1	,3	-		3,4		Re	eport, V	Viva
	water and wastewater												
CO2		ne											
	materials and chemic	<u>_1</u>	,	C5	1	_			5		۸		<u>Oui-</u>
	dosing for treatment required 3 C5 1,5 - 5 Assignment, Quiz												
	in the treatment plants												
	*Level of Bloom's Taxonon	y:											
	<u>C1 -</u> <u>C2 -</u>		<u>C3</u>	_	C	4 -	<u>(</u>	C5 -	<u>.</u>	<u>C</u> (	<u>5 -</u>		
	Remember Understand	<u> </u>	<u>Ap</u>	<u>oly</u>	A	nalyz	ze ]	Eval	luate	<u>C</u> 1	eate		

(CP – Complex Problems, CA – Complex Activities, KP – Knowledge Profile, T – T Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – R								
F	inal Exam, V	iva - V)		· · · · · · · · · · · · · · · · · · ·				
		LEARNING STRATE						
		ning Activities	Engagement	t (Hours)				
	-face Learnin	0						
· · ·		ours/week x 10 weeks)		10				
· · ·		(1 hr/week X10 weeks)		10				
c)	•	sis and calculation	(0.75	7.5				
	hr/week X 1	0 weeks)						
Guided b)	Learning Report Writi	ng (2 hours/week x 10	weeks)	20				
	dent Learnin							
•	Preparation	for tests and examinati	on	07				
Assessn								
-	Quiz			02				
b) V			10	01 2.5				
-		nance (0.25 hr/week X	10	2.3				
V	weeks)							
		Total		60				
	NG METHO							
		n, Problem Based Met	hod					
	SE SCHEDU							
Week 1	Lecture 01	Topics to be Cover Introduction	ed	Assessment				
_		Introduction						
2	02	BOD Calculations	mhar Dasian					
3	03	Screen and Grit Char	C C	Report/ Mid Term Exam				
3 4	03 04	Screen and Grit Char Primary Sedimentati	on Tank Design	Report/ Mid Term Exam				
3 4 5	03 04 05	Screen and Grit Chan Primary Sedimentati Waste Stabilization I	on Tank Design	Report/ Mid Term Exam				
3 4 5 6	03 04 05 06	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz	on Tank Design Pond Design	Report/ Mid Term Exam				
3 4 5 6 7	03 04 05 06 07	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro	on Tank Design Pond Design Decess Theory	Report/ Mid Term Exam				
3 4 5 6 7 8	03 04 05 06 07 8	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro	on Tank Design Pond Design Decess Theory Decess Design	Report/ Mid Term Exam				
3 4 5 6 7 8 9	03 04 05 06 07 8 9	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Aerated Lagoon Des	on Tank Design Pond Design Decess Theory Decess Design	Report/ Mid Term Exam				
3 4 5 6 7 8 9 10	03 04 05 06 07 8 9 10	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Aerated Lagoon Des Septic Tank Design	on Tank Design Pond Design Decess Theory Decess Design ign					
3 4 5 6 7 8 9 10 11	03 04 05 06 07 8 9 10 11	Screen and Grit Char Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Aerated Lagoon Des Septic Tank Design Surface Water Treat	on Tank Design Pond Design Decess Theory Decess Design ign ment Theory	Report/ Mid Term Exam				
$     \begin{array}{r}       3 \\       4 \\       5 \\       6 \\       7 \\       8 \\       9 \\       10 \\       11 \\       12 \\       \end{array} $	03 04 05 06 07 8 9 10 11 12	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Aerated Lagoon Des Septic Tank Design Surface Water Treath Surface Water Treath	on Tank Design Pond Design Decess Theory Decess Design ign ment Theory					
$ \begin{array}{r} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ \end{array} $	03 04 05 06 07 8 9 10 11 12 13	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Aerated Lagoon Des Septic Tank Design Surface Water Treath Surface Water Treath Sludge Handling	on Tank Design Pond Design Decess Theory Decess Design ign ment Theory					
$     \begin{array}{r}       3 \\       4 \\       5 \\       6 \\       7 \\       8 \\       9 \\       10 \\       11 \\       12 \\       \end{array} $	03 04 05 06 07 8 9 10 11 12	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Aerated Lagoon Des Septic Tank Design Surface Water Treath Surface Water Treath	on Tank Design Pond Design Decess Theory Decess Design ign ment Theory					
$ \begin{array}{r} 3 \\ 4 \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ \end{array} $	03 04 05 06 07 8 9 10 11 12 13	Screen and Grit Char Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Aerated Lagoon Des Septic Tank Design Surface Water Treath Surface Water Treath Sludge Handling Final Quiz	on Tank Design Pond Design Decess Theory Decess Design ign ment Theory					
3 4 5 6 7 8 9 10 11 12 13 14 ASSESS	03 04 05 06 07 8 9 10 11 12 13 14 MENT STRA Components	Screen and Grit Char         Primary Sedimentati         Waste Stabilization I         Mid Quiz         Activated Sludge Pro         Septic Tank Design         Surface Water Treath         Sludge Handling         Final Quiz         ATEGY         Grading	on Tank Design Pond Design Decess Theory Decess Design ign ment Theory					
3 4 5 6 7 8 9 10 11 12 13 14 ASSESS Continuo	03 04 05 06 07 8 9 10 11 12 13 14 MENT STRA Components us Assessment	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Surface Water Treath Surface Water Treath Surface Water Treath Sludge Handling Final Quiz ATEGY Grading nt 30%	on Tank Design Pond Design Decess Theory Decess Design ign ment Theory ment Design	Report/ Final Exam				
3 4 5 6 7 8 9 10 11 12 13 14 ASSESS Continuo	03 04 05 06 07 8 9 10 11 12 13 14 MENT STRA Components	Screen and Grit Chan Primary Sedimentati Waste Stabilization I Mid Quiz Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Activated Sludge Pro Surface Water Treath Surface Water Treath Surface Water Treath Sludge Handling Final Quiz ATEGY Grading nt 30%	on Tank Design Pond Design Decess Theory Decess Design ign ment Theory ment Design CO	Report/ Final Exam				

	Total Marks	100%									
REI	REFERENCE BOOKS										
1.	1. An Applied Guide to Water and Effluent Treatment Plant Design – Sean Moran, 1st Edition,										
	2018, Elsevier										
2.	2. Water Treatment Plant Design – American Waste Water Association, 4th Ed. 2004, McGraw										
	Hill Publications										
3.	Integrated design and Op	peration of wa	ter Treatment Facilities	– Susumu Kawamura, 2nd Ed.							
	2000, John Wiley and So	ons									

COU	COURSE INFORMATION												
	se Code: EWCE 437									it Ho		3.0	
	se Title: Industrial Waste and Was	tewater	Treat	ment					Cont	act H	our: 1	3.0	
	REQUISITE												
	M 103, EWCE-261 (Fluid Mech				l (Wa	ater S	Supp	ly E	ngine	ering	),		
	E-333 (Waste Water Engineering	and Sar	nitatior	1)									
	RICULUM STRUCTURE												
	ome Based Education (OBE)												
	OPSIS/ RATIONALE			1	1 1		•		1				
	s course students will be present												
	cteristics, treatment and managem												
	astewater disposal. Knowledge g	gained 1	trom t	his co	ourse	W1ll	be t	ised	in lat	er se	meste	ers a	nd
-	ssional life.												
	CTIVE	•	· . 1 /			1			4				
	learn about the characteristics of												
	learn about the problems associat	ted with	i poor	mana	geme	ent of	indu	ıstria	l was	te an	d		
	stewater.	1	c ·	1	. • •			1					1
	learn about the laws and regu	ulations	for 1	indus	trial	waste	e an	d wa	astew	ater t	reatm	ient	and
	posal. RSE CONTENT												
	view of industrial wastewater and p	rohlam	0.0000	aintac	Invith	it I d		and r	20110	tions	forin	duct	riol
	water and waste treatment, Over												
	ems of major industries and the												
	tries (gasoline kerosene treatment)												
	processing, dairy, drug and phar												
dispo	sal of industrial waste sludge.			0						•			
	L MAPPING (CO – PO MAPPIN	/											
No	Course Outcome	PROC							-	-			
		1	2	3	4	5	6	7	8	9	10	11	12
1	Be able to <b>understand</b> the												
	industrial manufacturing												
process and generation of													
	waste and wastewater.												
2	Be able to <b>assess</b> the adverse							,					
	effect of waste and wastewater												
	in terms of economic, public												

	health, environment and sustainability.												
3	Be able to <b>analyze</b> waste- water data and related treatment options to <b>design</b> efficient and cost effective ETP with appropriate consideration for public health and safety			$\checkmark$									
COUI	RSE OUTCOMES & GENERIC	SKILLS	5	I	<u> </u>			<u> </u>	11				
No	Course Outcome	Corresponding POs	Bloom's Taxonomv*		CP	CA	KP	Assessment	Methods				
CO1	Be able to understand the industrial manufacturing process and generation of waste and wastewater.	1	C2	,	-	-	3	Class Test, M term, Fina Exam					
CO2	Be able to <b>assess</b> the adverse effect of waste and wastewater in terms of economic, public health, environment and sustainability.	7	C2	,	1	-	1	Class Test, Mic term, Final Exam					
CO3	Be able to <b>analyze</b> waste- water data and related treatment options to <b>design</b> efficient and cost effective ETP with appropriate consideration for public health and safety	3	C4		5	2	5	Class Test, Mid- term, Group Assignment Final Exam					
Itor public health and safety       Itor public health and safety         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1 – Remember C2 – Understand C3- Apply C4 – Analyze         C5 - Evaluate       C6 – Create         (T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation,         R –Report, F – Final Exam)													
	CHING AND LEARNING STR	ATEGY	7										
-	ching and Learning Activities			Eng	gagem	ent (Hours	)						
Face-1	to-face Learning Lecture (3 hours/week × 14 we	eeks)					42						
•	Directed Learning Non-face-to-face learning Revision of the previous lectur Preparation for final examinati	ne				24 11 20							
Forma	al Assessment Continuous Assessment						20						
L													

•	Final Exa	amination	3			
		Total	120	)		
		HODOLOGY				
		sion, Problem Based Method				
	SE SCHEI					
Week	Lecture	Topics to be C		Assessment		
	1	Introduction to Industrial Waste a	nd Wastewater treatment			
1	2	Waste water estimation				
	3	Collection and transportation of In Industrial Waste Treatment I	ndustrial sewage			
	4					
2	5					
	6	Treatment and problems associate	ed with industrial water			
	7	Industrial Waste Treatment II				
3	8	Overview of waste reduction tech	niques in industries	Class Test		
	9	Manufacturing Process: Pulp and	Paper Industry			
	10	Manufacturing Process: Tannery	Industry			
4	11	Pulp and Paper Industry waste				
	12	Pulp and Paper Industry waste trea	atment I			
	13	Tannery Waste				
5	14	atment II				
	15	ustry	Group Assignment			
	16	Tannery Waste Treatment I				
6	17	Dairy Industry waste				
	18	Dairy Industry waste treatment				
	19	Tannery Waste Treatment II		Mid-Term Exam		
7	20	Manufacturing Process: Oil Refin	ery			
	21	Oil Refinery waste				
0	22	Manufacturing Process: Textile M	1111 Industry			
8	23	Textile Mill Industry waste				
	24	Oil Refinery waste treatment	· <b>T</b>			
0	25	Textile Mill Industry waste treatm				
9	26	Textile Mill Industry waste treatm				
	27 28	Manufacturing Process: Petroleun				
10		Manufacturing Process: Pharmace		Class Test		
10	29	Pharmaceutical Industry waste		Class Test		
	<u> </u>	Petroleum Industry waste	otmont I			
11		Pharmaceutical Industry waste tre				
11	32	Pharmaceutical Industry waste tree				
	33 34	Petroleum Industry waste treatme Manufacturing Process: Sugar Mi				
12	<u> </u>		n muusu y			
12		Sugar Mill Industry waste I	nt II			
	36 37	Petroleum Industry waste treatme				
12		Sugar Mill Industry waste treatme Sugar Mill Industry waste treatme	Class Test			
13	38	Class Test				
39 Manufacturing Process: Corn Starch Industry						
14	40	Corn Starch Industry waste				

	41	Corn Starch	n Industry waste treat	ment I	
	42	Corn Starch	n Industry waste treat	ment II	
ASSESS	SMENT S	TRATEGY			
	Compone	ents	Grading	СО	<b>Bloom's Taxonomy</b>
Continuous Assessment (Class assignments/ CT/ Mid Ferm/ Active Class Participation)			40%	CO1, CO3	C2
Final Exam			60%	CO1, CO2, CO3	C4
	Total Ma	rks	100%		
	ENCE D	OOVG			

## **REFERENCE BOOKS**

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

COURSE INFORMATION													
Cours	se Code: EWCE 438								Cre	dit H	our:	1.5	
Cours	se Title: Building Service Sessiona	al							Cor	ntact	Hour	:: 3.0	)
	REQUISITE												
	E-331 (Water Supply Engineering	g), E	WCE	E-333	s (Wa	iste W	ater	Eng	ineer	ing a	nd S	anita	tion)
	RICULUM STRUCTURE												
Outcome Based Education (OBE)													
SYNOPSIS/ RATIONALE													
Students will learn to design different services to be provided in a building, like water supply													
system, wastewater and storm drainage system, water storage system, rainwater harvesting system,													
which will be helpful in their professional life.													
OBJECTIVE													
a)	a) To learn about the major facilities/ services required for better living in buildings, especially												
	in high rise buildings.												
b)	To design the necessary building	ng s	ervic	es -	wate	r supp	oly s	syste	m, w	vaste	wate	er an	d storm
	drainage system and water stora	ge s	ysten	1.									
c)	To design alternative water supp	ly s	ysten	n – ra	in w	ater ha	arve	sting	•				
COU	RSE CONTENT												
	ing design - water supply (hot w												
	ngs, Rainwater Harvesting- plan												
	res, design of rainwater harvesting	g filt	ters, r	naint	enan	ce and	l mo	nitor	ring c	of rai	nwate	er ha	rvesting
system													
	SKILL MAPPING (CO – PO MAPPING)         No       Course Outcome         PROGRAM OUTCOMES (POs)												
No	Course Outcome	PR			1	1		<u>`</u>	í	0	10		10
1		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be proficient to analyze and												
	design the water supply,												

wastewater and storm water drainage system       Image and storm water drainage system       Image and storm water drainage system         2       CO2: Be able to design underground and overhead water storage tanks       Image and storm water storage tanks       Image and storm water storage tanks         3       CO3: Be able to design rain water harvesting system       Image and storm water water and storm water harvesting system       Image and storm water water and storm water         Mo       COURSE OUTCOMES & GENERIC SKILLS       Image and storm water water and storm water and storm wat				
underground and overhead water     N       storage tanks     N       3     CO3: Be able to design rain water harvesting system       √       COURSE OUTCOMES & GENERIC SKILLS       No       Course Outcome				
underground and overhead water     Image: storage tanks       3     CO3: Be able to design rain water harvesting system       √       Image: COURSE OUTCOMES & GENERIC SKILLS       No       Course Outcome				
3     CO3: Be able to design rain water harvesting system       √       COURSE OUTCOMES & GENERIC SKILLS       No       Course Outcome				
harvesting system     √       COURSE OUTCOMES & GENERIC SKILLS       No       Course Outcome				
COURSE OUTCOMES & GENERIC SKILLS       No     Course Outcome				
No Course Outcome				
No Course Outcome				
anding s s s s s s s s s s s s s s s s s s s				
ent s s s s s s s s s s s s s s s s s s s				
Correspo POs Bloom' Taxonon CP CP Assessm Methods				
Metheway Makay Metheway Metheway Metheway Metheway Metheway Makaway Metheway Metheway Metheway Metheway Metheway Metheway Makaway Metheway				
CO1 Be proficient to analyze and design the water supply, waster 2.2 C4 Report	Viva			
water and storm water 2,3 C4 3,5 3,4 Qu				
drainage system	112			
CO2 Be able to design underground	<b>x</b> <i>x</i> :			
and overhead water storage 3 C5 3 5 Report,				
tanks Qu	IZ			
CO3 Be able to design rain water 2 C5 2 5 Report,	Viva,			
harvesting system 3 C5 3 5 Qu				
*Level of Bloom's Taxonomy:				
<u>C1-</u> <u>C2-</u> <u>C3-</u> <u>C4-</u> <u>C5-</u> <u>C6-</u>				
Remember Understand Apply Analyze Evaluate Create				
(CP – Complex Problems, CA – Complex Activities, KP – Knowledge Profile, T – T	est, PR			
– Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R –	Report,			
F – Final Exam, Viva - V)				
TEACHING AND LEARNING STRATEGY				
Teaching and Learning Activities         Engagement (Hours)				
Face-to-face Learning				
Lecture (3 hours/week $\times$ 12 weeks) 36				
Guided Learning				
Tutorial/Assignments (1 hours/week $\times$ 12 weeks) 12				
Self- Directed Learning				
a. Non-face-to-face learning 1				
b. Revision of the previous lecture at home 2				
c. Preparation for final examination 3				
Formal Assessment				
a. Continuous Assessment 2.5				
b. Final Examination/Quiz and Viva 2				
1				
Total 60				

TEACHING METHODOLOGY										
Lecture a	nd Discus	sion, Prol	olem Based Met	hod						
COURS	SE SCHED	ULE								
Week			Topics	s to be Covered		Assessment				
1	01	Introduct	ion to Plumbing	g design						
2	02	Water sug		and cold water) design of n	nulti-					
3	03	Water su	-	and cold water) design of n	nulti-					
4	04		erage design of multi-storied buildings							
5	05	Sewerage	werage design of multi-storied buildings (cont.)							
6	6 06 Assessment (Viva)									
7 07 Assessment (Mid Quiz)										
808Introduction to Rainwater HarvestingQuiz, Report										
9 09 Planning and design of rainwater and ground water storage structures										
10	10									
11	11		f rainwater harv							
12	12	Maintena system.	nce and moni	toring of rainwater harve	esting					
13	13	2	ent (Viva)							
14	14	Assessme	ent (Final Quiz)							
	MENT ST	1		I						
	omponen		Grading	CO	B	loom's Taxonomy				
	uous Asse		30%	CO1, CO2, CO3		C4 C5				
Č,	nment/Tes		30%			C4, C5				
Term/ Active Class Participation)										
1	Quiz	-,	70%	CO1, CO2, CO3		C4, C5				
Г	Total Mark	S	100%			,				
(CO = Course Outcome, C = Cognitive Domain, P = Psychomotor Domain, A = Affective Domain)										
REFERI	ENCE BO	OKS		· · · · · · · · · · · · · · · · · · ·						
	-	-	-	V. Chadderton, 6th Ed.						

2. Building Services Handbook – Roger Greeno, 7th Ed, Fred Hall

COURSE INFORMATION														
Cour	cse Code: EWCE 439							C	Credit	t Hoı	ır: 2	2.0		
Cour	se Title: Natural Resources and R	enewab	ole I	Energy	7			0	Conta	ct H	our: 2	2.0		
PRE	-REQUISITE													
None	2													
CUR	RICULUM STRUCTURE													
	come Based Education (OBE)													
SYN	OPSIS/ RATIONALE													
In th	his course students will learn ab	out nati	ural	l resou	irces,	rene	ewabl	le en	ergy	, ene	ergy e	fficie	ency	
whic	which will be helpful in their professional life in designing energy efficient engineering													
solut	solutions.													
OBJ	OBJECTIVE													
• To	• To understand the importance of natural resources conservation and management.													
• To	• To learn about the use of energy in various emerging technologies.													
<ul> <li>To learn about the importance of using renewable energy.</li> </ul>														
COURSE CONTENT														
Class	sification and sources, extraction,	depleti	on.	protec	ction	and r	nana	geme	nt of	fnati	ural r	esour	ces.	
	view, history, mainstream techno													
	energy, biomass and bio fuel, geothermal energy, commercialization, growth of renewable, economic trends, hydroelectricity, development of renewable energy and emerging technologies of													
	economic trends, hydroelectricity, development of renewable energy and emerging technologies of renewable energy.													
SKII	SKILL MAPPING (CO – PO MAPPING)													
No	Course Outcome     PROGRAM OUTCOMES (POs)													
		1	2	3	4	5	6	7	8	9	10	11	12	
1	Able to gain knowledge about													
	various natural resources.													
2	Able to <b>understand</b> the				1									
	importance of using renewable	,												
	energy.													
	Able to <b>understand</b> and <b>apply</b>													
	the concept of sustainable							,						
	development in the use of energy													
	in various emerging technologies.													
	JRSE OUTCOMES & GENERIC	SKILL	S			1				1	1			
000									T					
		ling		$\mathbf{y}^{s}_{*}$								ent Is		
		ond s		, ц				-				ods		
No	Course Outcome	spor POs		onc	Ę	2	i	CA		Ž		etho		
		Irre		Bloom' Taxonom								Assessme Method		
		Corresponding POs		Ē										
CO1	Able to goin the second stars at second						-		+			<b>T</b>	act	
CO1	Able to <b>gain</b> knowledge about various natural resources.			$C^{2}$		1				1		ass T		
	various natural resources.	1		C2		1		_	· ·	1		id-tei al Ex		
CO2	Able to <b>understand</b> the		_						+			ass T		
	importance of using renewable			C2		1		_		1		id-tei	-	
	energy.			C2		L	—		- 1		1		al Ex	
CO3							+							
	<b>apply</b> the concept of sustainable	· /		C3		1		_			Class Test, Mid-term,			
L	PPJ are concept of sustainable	l	, 0.5 1					1111	u-iCI	,				

ei te	evelopment in nergy in variou chnologies.	is emerging				6	Group Assignment Final Exam	
E P: *]	ngineering Activit rofile/ KP= Know Level of Bloom's		ctivities;	WK= Wasl	nington Ac	cord Kr	nowledge	
()		ject, Q – Quiz, M – N		•				
		RNING STRATEG	Y					
	ing and Learning			ement (Hou	irs)			
	-face Learning		0:0					
	÷	week $\times$ 14 weeks)			28			
Self- Di	rected Learning							
•	Non-face-to-face	learning			5			
•	Revision of the p	e e			12			
	home							
					30			
Prepar	ation for final exa	mination						
	Assessment							
•	Continuous Asse	ssment			2			
•	Final Examinatio	n			3			
	Total				80			
TEACHI	NG METHODOL							
		blem Based Method						
	SE SCHEDULE							
Week	Lecture	Topi	cs to be (	Covered		A	ssessment	
1	1	Introduction to Na						
1	2	Classification and	sources c	f natural re	sources			
	2	Extraction, dep	letion,	protection	n and			
2	3	management of na						
2	4	Extraction, deplet						
	4	management of na						
3	5	Overview, history			ologies		Class Test	
3	6	Wind power				(	lass Test	
4	7	Hydropower and h						
4	8	Hydropower and h	ydroelect	tricity II				
5	9	Solar energy I						
	10	Solar energy II				Group Assignment		
6	11	Biomass and bio f						
	12	Biomass and bio f						
7	13	Geothermal energy					-Term Exam	
8	<u>14</u> 15	Geothermal energy Commercialization						
	1	L Commercialization	and oro	with of renev	wanie			

		energy			
	16	Economic trends			
9	17	Wind power development I			
9	18	Wind power development II			
10	19	Photovoltaic development I			
10	20	Photovoltaic development II			
11	21	Photovoltaic power stations I			
22		Photovoltaic power stations II			
12	12     23     Bio fuel development I				
12   24   Bio fuel development II		Bio fuel development II			
· · · · · · · · · · · · · · · · · · ·		Geothermal development I	Class Test		
		Geothermal development II	Class Test		
14	27	Emerging technologies of renewable energy I			
14	14   28   Emerging technologies of renewable energy II				

### ASSESSMENT STRATEGY

Components	Grading	CO	Bloom's
			Taxonomy
Continuous Assessment		CO1, CO2	C2
(Class assignments/ CT/ Mid	40%		
Term/ Active Class	40%		
Participation)			
Final Exam	60%	CO1, CO2, CO3	C2, C3
Total Marks	100%		

## **REFERENCE BOOKS**

1. Managing Our Natural Resources - William G. Camp, Thomas B. Daugherty, 4th Ed, Thomson Learning

2. Introduction to Renewable Energy - Vaughn C. Nelson, CRC Press

3. Renewable Energy - Bent Sorensen, 3rd Ed, Elsevier Inc.

4. Renewable Energy Systems: Advanced Conversion Technologies and Applications - Fang Lin Luo, Ye Hong, CRC Press

5. Sustainable Energy Solutions for Climate Change - Mark Diesendorf, Routledge, New York

COURSE INFORMATION							
Course Code: GEEM 445	Credit Hour: 2.0						
Course Title: Engineering Ethics and Professional Practices Contact Hour: 2.0							
PRE-REQUISITE	PRE-REQUISITE						
None							
CURRICULUM STRUCTURE							
Outcome Based Education (OBE)							
SYNOPSIS/ 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 how to prepare contact							
documents and development project proposals.							
OBJECTIVE							

- 1. To have a clear idea about different aspects of a project and comprehend the basics of professional communication.
- 2. To understand the code of Ethics for engineers and other related issues in the engineering profession.
- 3. To gain knowledge on DPP (Development Project Proposals) and develop skills on public procurement of goods, works & service as per PPA and PPR.

## COURSE CONTENT

An introduction to the code of ethics for engineer, relative importance of ethical issues in engineering and other professions, important vocabularies in ethics, scope, dilemma, impacts and related ethical issues in engineering profession, ethics in the workplace, fairness (personal and social), code of ethics of IEB (The Institution of Engineers, Bangladesh) and reputed engineering societies and case studies. Project: characteristics, life cycle, types of contracts and estimates.

Project Proposals: preparation of various project and technical proposals according to planning commission's guidelines. PPA & PPR: salient features, principles of public procurement, methods and processing of procurement for goods and related services, works, physical services and their use, procurement of intellectual and professional services, e-government procurement, various schedules including standard tender documents, claims, disputes and arbitration procedure.

	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome PROGRAM OUTCOMES (POs)												
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1: Able to ascertain the essential elements		7										
	required at different	•	$\checkmark$										
	phases of a project.												
2	CO2: Able to learn and understand code of ethics												
	for engineers and will be												
	ability to take an ethical			7									
	decision after critical												
	analysis of the situation.												
3	CO3: Able to understand												
	DPP and make												
	procurement of goods,												
	works and services				•								
	according to PPA & PPR.												
COL	ITR. IRSE OUTCOMES & GEN	VFF		и	S							1	
No	Course Outcome				<i>N</i>								
			ы Б										
			Idir	÷	÷,						ц		
			por	Ś	Ë.						me	sp	
			res	om	onc						ess	ho	
			Corresponding POs	Bloom's	1 aX	CP		CA		KP	Assessment	Met	
CO1	Able to ascertain the					-		-					<b>.</b>
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				$C_2, C_3, C_4$				
Total		100%						
REFERE	NCE BOO	JKS						

- 1. A Manual of Ethics by Dr Jadunath Sinha
- 2. Ethics by William K Frankena

3. Engineering ethics: concepts and cases, second edition by Charle E. Haris Jr., Michael S. Pritchard, and Michael Rabins.

4. Philos Harris, Charles E. The Good Engineer: Giving Virtue its Due in Engineering Ethics. Sci Eng. Ethics (2008) 14:153–164

5. IEB code of Ethics, IEB, Bangladesh

6. NSPE code of Ethics

7. Project Management - Planning and Control by Albert Lester.

8. The Process of Management by William H. Newman.

9. Project Management by S Chowdhury

10.Business correspondence and Report Writing- A practical approach to business and technical communication by R C Sharma and Krisna Mohan

11.PPR 2008

12.DPP preparation guide book published by planning commission

COURSE INFORMATION								
Course Code: EWCE 461	Credit Hour: 3.0							
Course Title: River Engineering and Flood Management	Contact Hour: 3.0							
PRE-REQUISITE								
EWCE- 363(Engineering Hydrology), EWCE-361(Open Channel Channe	nel Hydraulics)							
CURRICULUM STRUCTURE								
Outcome Based Education (OBE)								

SYNOPSIS/ RATIONALE

In this course students will be presented with the basics of river engineering and morphological processes including sediment transport. Aggradation and degradation, basics of scouring process dredging and navigation processes. The students will be able to estimate scour depth and e familiar with the design considerations of river training and bank protection works. The students will also be able to understand the fundamental principles of floods, evaluate a range of flood management methods, encompassing both structural and non-structural measures and develop practical skills in flood risk assessment and mitigation.

OBJECTIVE

- 1. Demonstrate the understanding of the basics of river engineering and the morphological processes related to rivers.
- 2. Distinguish different types of sediment and understanding of the sediment movement, aggradation, and degradation.
- 3. Categorize the basics of scouring process and estimate the scour depth.
- 4. Familiar with river training and bank protective works and explain basic dredging processes and the navigation process.
- 5. Apply knowledge of flood processes and management strategies to analyze and assess flood risk.
- 6. Design comprehensive flood management plans integrating interdisciplinary perspectives

### COURSE CONTENT

Behavior of alluvial rivers, river channel pattern and fluvial processes, aggradations and degradation, local scours, river training and bank protection works, navigation and dredging of sediment movement in river channels, bed form and flow regimes. Case studies.

Flood and its causes, flood processes in rural and urban areas, methods of flood management: structural and non-structural measures such as reservoirs, levees and flood walls, channel improvement, interior drainage, floodways, land management, flood proofing, flood zoning, flood hazard mapping, flood forecasting and warning flood risk and damage.

SKIL	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome	PROGRAM OUTCOMES (POs)											
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to explain the relationships of river planforms with the river Morphological												
2	parametersCO2: Be proficient in calculating and estimating sediment distribution and sediment load of a river												

3	CO3: Be able to						
5	apply different						
	engineering perceptions						
	to estimating the scour						
4	depth. CO4: Be familiar with						
4	different bank						
	protection and river						
	training work and $$						
	understand the						
	dredging and						
5	navigation processes						
	CO5: Apply knowledge of flood processes and						
	management strategies to	r					
	analyze and assess flood	$\checkmark$					
	risk.						
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	CO6: Apply knowledge of						
	flood processes and management strategies to						
	analyze and assess flood		$\checkmark$				
	risk.		v				
No	RSE OUTCOMES & GENERI Course Outcome	<u>C SKIL</u>					
110	Course Outcome	ng	~ *				It
		s	n' s my	•		•	ner ods
		Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods
		orre	Bl Tax				Ass M
		0					
CO1							
	relationships of river	1	C2	1		1	Class Test,
	planforms with the river Morphological parameters						Final Exam,
	Be proficient in calculating						
	and estimating sediment	2.2	<b>C</b> 2			2	Class Test,
	distribution and sediment	2,3	C2			3	Mid-term, Final Exam
	load of a river						i mui Linum
CO3	11 5						
	different engineering perceptions to estimating	3	C3, C4	1		3,5	Class Test, Final Exam,
	the scour depth.						i mui L/min,
CO4							
	bank protection and river						Class Test,
	training work and	1,2	C3, C4	1		3	Final Exam,
	understand the dredging and navigation processes						
C05	Apply knowledge of flood						Class Test,
	processes and management		C3, C4	1		3	Mid-term,
	µ	I	1		I		7

	rategies to ood risk.	analyze and assess						Final Exam				
pı st	rocesses	wledge of flood and management analyze and assess		C4	1,6		3,5	Class Test, Final Exam,				
]	Engineerin Profile/ KF	g Āctivities/ CA= C P= Knowledge Profi Bloom's Taxonomy:	complex le					oblem Solving; EA= cord Knowledge				
	C1 – Remember	C2 – Understand	C3- Apply	C4 – Analyz	æ	C5 - Evalua	te	C6 – Create				
]	Report, F -	R – Project, Q – Qui - Final Exam)	z, M – N	lid Term		Asg – As	ssignme	nt, Pr – Presentation, R –				
		ND LEARNING ST	RATEG	Y								
		earning Activities		Enga	agement	(Hours)						
Face-t	o-face Lea	rning										
	Lecture						42					
	Practical	/ Tutorial / Studio					-					
		Centered Learning					-					
Self- D	irected Le	•										
•		e-to-face learning					25					
•	Revision	of the previous 1	ecture a	ıt								
	home						21					
•		on for final examin	ation	21								
	l Assessme											
,		is Assessment		8								
b)	Final Exa	nination		3								
		Total		120								
		HODOLOGY	10 11 1		M. 41 1	D11	D. 13	K-d1				
		sion, Co-operative a	nd Collat	orative	vlethod,	Problem	Based N	letnod				
	SE SCHE	Topics to be Cove	ared					Assessment				
TTCCK		Introduction to riv		eering a	nd its			123723311UIIU				
	01	importance–Globa	•	•		ctive						
		Explanations on										
1	02	on planforms, sedi										
		types										
	03	River planforms	and	their	relation	ships						
	03	with Morphologic										
	04			acteristic of a river and CT1								
		their interrelations	hips									
2	05	Hydraulic geomet		cteristic	of a rive	er and						
		their interrelations										
	06	Sediment characte			iment							
3	07	movement, Initiati			iment							
3	07	Sediment chara	cteristic	s, sed								

		movement, Initiation of motion	
		Sediment distribution–suspended load and bed	
	08	load	
		Sediment load computation – suspended load	
	09	and bed load with examples, Case studies	
	07	from local rivers	
		Regimes of flow, bed forms, grain roughness	
	10	and form roughness	
		Regimes of flow, bed forms, grain roughness	
4	11	and form roughness	
	10	Aggradation and degradation–Lane 's equation	
	12	and assessment of river equilibrium	
	13	Aggradation and degradation–Lane 's equation	
	15	and Assessment of river equilibrium	
		River scour, processes, factors affecting scour	
5	14	and relationships with hydraulic and	
5		morphological parameters	
		River scour, processes, factors affecting scour	
	15	and relationships with hydraulic	
		and morphological parameters	
	16	Assessment of scour depth, live bed and clear	
		water scour, complex pier, abutment scour	
	17	Introduction to river training and bank protection works–groynes, guide bank,	
6	17	revetments and ripraps	Mid Term Exam
0		Design considerations of river training and bank	
		protection works – groynes, guide bank,	
	18	revetments and ripraps, case studies from local	
		rivers	
		Design considerations of river training and bank	
		Protection works-groynes, guide bank,	
	19	revetments and ripraps, case studies from local	
		rivers	
7		Navigation – importance,	
	20	classification, Morphological issues, navigation	
		lock, maintenance, and management issues	
	0.1	Dredging-importance, capital dredging, design,	
	21	Maintenance and management issues, case	
	22	studies from local rivers Introduction to flood and its causes	
8	<u>22</u> 23	Flood processes in rural areas	CT2
0	23	Flood processes in urban areas	C12
	25	Introduction to methods of flood management	
9	26	Structural measure: reservoirs	
-	27	Structural measure: reservoirs	
	28	Structural measure: levees	
10	29	Structural measure: floodwalls	
	30	Structural measure: channel improvement	
11	31	Structural measure: interior drainage	
11	32	Structural measure: floodways	

		1											
	33	Non-structural me		U									
	34	Non-structural me	asure: flood p	roofing									
12	35	Non-structural me	asure: flood zo	oning		CT3							
	36	Non-structural me	asure: flood ha	azard mapping									
	37	Nonstructural r	neasure: floo	od forecasting									
12	57	and warning		-									
13	38	Flood risk											
	39	Flood risk	ood risk										
	40	Flood damage											
14	41	Flood hazard											
	42	Review class											
ASSESS	SMENT S	TRATEGY											
	Comp	oonents	Grading	СО		Bloom's Taxonomy							
Continuo	ous Assess	sment				×							
(Class as	ssignment	s/ CT/ Mid Term/	100/	CO1, CO2, C	03.								
	Class Partie		40%	CO4, CO5		C2, C3, C4							
		r · · · · ·											
	Final	Exam		CO1, CO2, C	03.								
			60%	CO4, CO5	-	C2, C3, C4							
	Total	Marks	100%	,									
REFER	ENCE B	OOKS		•									

1. Principles of River Engineering – Chang

2. Principles of River Engineering- Garg

3. Mechanics of Sediment Transport and Alluvial River Problems – Garde and Ranga Raju

4. Sediment Transport Technology (Water & Sediment Dynamics) – Daryl B. Simons & Fuat

Sentirk

COUI	RSE INFORMATION												
	e Code: EWCE 462								Cre	edit	Hour:	1.	5
Cours	e Title: Computer Application	ons i	n Wa	ter ar	nd En	viron	mer	ntal	Co	ntac	t Hou	r: 3.	0
	eering												
	REQUISITE												
	E-261 (Fluid Mechanics), E	WC]	E-36	1 (Op	en C	hanne	el Hy	ydra	ulic	s), E	EWCE	2-33	1
	er Supply Engineering)												
	RICULUM STRUCTURE												
	ome Based Education (OBE) OPSIS/ RATIONALE	)											
	ourse will provide students	with	the l	now	ledge	to ef	fect	ivel	V 116	e co	mnute	r nr	ogram to
	ze difficult hydraulic cond												
	sional and two-dimension												
	mentals of building and cali												
	aster planning, operational a												
OBJE	CTIVE												
	update and improve studen												
	learn how to evaluate and					•	-		•				
	learn how to use program s							ltipl	e cu	lver	ts, bri	dge	
	deling, lateral structures and					•							
	calculate flows and head lo	osses	usin	g fiel	d dat	a, fac	tors	, coi	ntrol	ls an	d othe	er pa	rameters
	design distribution systems. RSE CONTENT												
	principles of modeling 1D	and	1D/2	Driv	or flo		otor	du	ino	flor	u mo	dalir	ra(1D)
	l interpretation, calibration												
	lling movement and fate												
	oution systems/ Basic hydra									11111	i uiii	inting	5 water
	L MAPPING (CO – PO MA					erug	<u> </u>						
No	Course Outcome			AM	OUT	COM	ES (	PO	s)				
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to explain												
	the basic principles of												
	modeling 1D and 1D/2D	v											
	river flow												
2	CO2: Be able to solve												
	numerical approximation												
	equations of open												
2	channel flow												
3	CO3: Be able to design a river model												
4	CO4: Be proficient to												
	design a water												
	distribution model for												
	different practical												
COLU	applications		CVT										
000	RSE OUTCOMES & GENE	KIU	SKI	LLS	T								
		ad											
		in.											
		р		×								Jt	
No	Course Outcome	puoc		s mv*								nent	st
No	Course Outcome	espond		om's onomv*								essment	hods
No	Course Outcome	Corresponding	SO	Bloom's Taxonomv*	(	CP		CA		KP		Assessment	<b>Aethods</b>

001	<b>.</b>						T	1	1			
CO1	Be able t	-										
		rinciple		1	C2	-	_	2	Assignment/Test			
	modeling		1D/2D	1	02			2	, Quiz			
	river flow											
CO2	Be able	e to	solve									
	numerical								A			
	approxim	ation		2	C3	-	-	2	Assignment/Test			
	equations		open						, Quiz			
	channel fl	ow										
CO3	Be able to	design	a river	25	05			25	Assignment/Test,			
	model	e		3, 5	C5	-	-	2,5	Quiz			
CO4	Be profici	ent to de	esign a									
	water dist			3, 5	C5	1	_	2,5	Assignment,			
	for diffe		actical	1		2,5	Quiz, Presentation					
	application				D 11	<b>a</b> 1 · · ·			D 11			
			n Accord	l Compl	ex Problen	n Solving/	CP=0	Comple	ex Problem			
	Solving;						<b>11</b> 7-	.1				
			vities/ C	A= Con	nplex Activ	vities; wK	= was	sningto	n Accord			
	Knowled		wladaa	Drofile								
	Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy:											
	C1-	Diooin	C2-	ioniy.	<u>C3-</u>	C4-		<u>C5-</u>	<u>C6-</u>			
	Remem	her	Unders	tand	<u>Apply</u>	<u>Analyz</u>	'e	Evalua				
	Kenten		<u>Unders</u>		<u>Appiy</u>	<u>Anaryz</u>	<u>.c</u>		<u>ate create</u>			
	(T – Test	. PR – P	roiect. C	) – Ouiz	M – Mid	Term Exa	m. As	g = Ass	signment, Pr –			
	Presentat					1 01111 2010	,	8 1 100				
TEA	CHING A											
	hing and L			1	gagement (	Hours)						
Activ		C		C		,						
Face-te	o-face Lea	rning										
•	Lecture	-					24					
•	Practical	[/] Tutoria	l/ Studio	,	8							
•	Student -											
	Learning											
Self-T	Directed Le	arning										
	Non-face	•	learning				12					
			-	,			3					
•	Revision	-	levious				5					
	lecture at		1				10					
•	Preparati		nal				10					
	examinat			_								
Forma	l Assessme											
•	Continuo						1					
•	Final Exa		n				2					
	To						60					
TEACH	IING MET	HODOL	.OGY									
	s, Software		nstrations	8								
	SE SCHE											
Week	Lecture						A	Assessr	nent			
1	1	Introd	luction to	o hydroc	lynamic m	odeling						
		Definiti	on an	d eva	nples, revi	ew of mas	s					
2					l energy e		~	Ass	signement/Test			
					ic models							
3	3		ations an									
<b> </b>					ic models	and their						
							1	1 0	a an am ant / L'act			
4	4	applica	ations an	d limita	tions (Cor	nt.)		Ass	signement/Test			

5	5	Different hydrodynamic models and their	
Ũ	5	applications and limitations (Cont.)	
6	6	Mid Quiz	
		Understanding the movement of	
7	7	drinking water constituents within	
		distribution systems	Assign amont/Test
		Understanding the movement of drinking	Assignement/Test
8	8	water constituents within distribution	
		systems (Cont.)	
9	9	Introduction to modeling of water	
9	9	distribution systems	
10	10	Optimizing operations of tanks and pumps	
11	11	Optimizing operations of tanks and Pumps	Assignement/Test
11	11	(Cont.)	C C
10	10	Optimizing operations of tanks and Pumps	
12	12	(Cont.)	
13	13	Final Quiz	
14	14	Presentation	

# ASSESSMENT STRATEGY

Components Grading CO				
35%	CO1, CO2, CO3, CO4	C2, C3, C5		
50%	CO1, CO2, CO3, CO4	C2, C3, C5		
15%	CO4	C5		
100%				
	35% 50% 15%	35%         CO1, CO2, CO3, CO4           50%         CO1, CO2, CO3, CO4           15%         CO4		

### 1 Hadreyl's Madellines An Interdentions Drive in las

1. Hydraulic Modelling: An Introduction: Principles, Methods and Applications, Pavel

2. Novak, Vincent Guinot, Alan Jeffrey, Diminic E. Reeve.

3. Computer Modelling of Water Distribution Systems, James P. Cooper. User Manual and application guide of the related software.

COURSE INFORMATION	
Course Code: EWCE 463	Credit Hour: 3.0
Course Title: Irrigation and Drainage Engineering	Contact Hour: 3.0
PRE-REQUISITE	

EWCE363(Hydrology), EWCE-361(Open Channel Hydraulics)

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

In this course students will be presented with the irrigation principles and practices, crop and irrigation water requirement, irrigation scheduling, irrigation water quality, irrigation pumps, drainage criteria and design, irrigation and drainage structures and irrigation water management. Knowledge gained from this course will be useful in professional life.

### OBJECTIVE

- 1. To gain knowledge on irrigation and drainage principles and practices.
- 2. To become skilled in determining irrigation water requirements and irrigation scheduling.
- 3. To be able to design surface and subsurface drainage systems.
- 4. To be familiar with irrigation and drainage structures, irrigation pumps and their design criteria.

## COURSE CONTENT

Importance of irrigation, soil water physics, crop/irrigation water requirements and scheduling of irrigation methods and design, sources and quality of irrigation water, soil and water salinity,

irrigation and drainage structures, irrigation pumps, drainage criteria, steady state drainage system, surface/subsurface drainages systems design, irrigation water management, Irrigation projects in Bangladesh.

	Bangladesh. IAPPING (CO – PO MAPP	ING	)					_					
No	Course Outcome		, OGRA	AM (	OUT	COM	IES (	PO	3)				
1.0		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to estimate the irrigation water requirement of any crop considering the Crop's characteristics, soil and climatic data and perform irrigation scheduling		√				0				10		
2	CO2: Be expert in identifying/preliminari ly selecting/ designing irrigation and drainage structures, flow measurement devices and irrigation pumps for efficient operation and management of irrigation and drainage projects. CO3: Be able to <b>apply</b> engineering perceptions to improve the management of irrigation		√ √										
4	and irrigation efficiency CO4: Be proficient in assessing the drainage requirement of any crop and to design the necessary surface/subsurface drainage system.	D4: Be proficient in sessing the drainage quirement of any crop d to design the cessary rface/subsurface											
	E OUTCOMES & GENERI	C SK	ILLS				-			1	1		
No	Course Outcom	Corresponding	PÒs	Bloom's Taxonomv*	(House	CF	CA	KP		Assessment	MCHIORS		
CO1	Be able to <b>estimate</b> the water requirement of considering the Crop's characteristics, climatic data and perform scheduling		2	C2, C3				1	Class Test, Mid Term, Final Exam,		erm,		
CO2	Be expert in <b>identifying</b> / <b>preliminarily</b> <b>designing</b> irrigation and structures, flow mean devices and irrigation p efficient operation	2,2	3	C2, C4				1, 2,5	N	/lid-t	Test, erm, Exam		

			1		1							
		ent of irrigation	and									
<u> </u>	drainage p											
CO3		to <b>apply</b> engine							Close Test			
	perception	ns to improve ent of irrigatior	the		C3	1		3	Class Test,			
			n and						Final Exam			
<u> </u>		efficiency	~ 41									
CO4		cient in assessin			<b>C</b> 2							
		requirement of an			C2,			1,2,5	Class Test, Final Exam			
	and to	design the new bsurface drainage s	cessary		C4				Final Exam			
		hington Accord Co		Prohlom	Solvin		Com	nlay Dec	hlam			
	Solving; E		inplex i	robiem	Solving	g/ CF-	Com	piex Fic	oblem			
		ng Activities/ CA= (	Comple	v Activi	itios W	$\mathbf{k} = \mathbf{W}$	ochina	ton Ac	oord			
	Knowledg		compie		uics, w	IX- W	isiiii	sion Act	.010			
		,e P= Knowledge Prof	ile									
		Bloom's Taxonomy										
	C1 –		C3-	C4 –	-	C	5 -		C6 –			
	Remembe			y Anal			valuat	e	Create			
	Ttemenioe		· ·pp·	j i ina	<i>1j20</i>	2	araaa	.0	cieute			
	(T-Test, P	R – Project, Q – Qu	iz, M –	Mid Te	rm Exa	m, Asg	g - As	signme	nt, Pr –			
		on, R – Report, F – F				, L	,	0	,			
TEACH		LEARNING STRA		,								
Teaching	g and Learn	ing Activities	Eng	agement	t (Hours	5)						
	ace Learnii	<u> </u>	U	0		/						
	ecture	8				42						
		torial / Studio				-						
		red Learning				_						
		<u> </u>										
	cted Learni	-				0						
		face learning				9						
		he previous lecture				10						
	home					18						
• P1	reparation	for final				46	)					
ex	amination											
Formal As	ssessment											
c) Co	ntinuous As	ssessment	2									
d) Fin	al Examina	tion	3									
	Tot	a1				120	)					
TFACHING	G METHOL						-					
		, Co-operative and C	ollabor	ative Me	thod P	roblem	Base	d Metho	d			
	SCHEDUL		onabor		uiou, 11		Dasco		u			
Week	Lecture	Topics to be Cove	ered					As	sessment			
Week		Introduction to Irr		and its	imports	nce_		1 1.5	sessment			
	01	global and Bangla				litee						
		History and dev				00 611	face					
1	02	water and groundy										
1	02	intensity	vater, e	10ps, cit	opping	pattern	and					
		Soil physics in rel	ation to	irrigati	on and	draina	σe					
	03	Soil and water rela			on and	aranna	ь~,					
		Soil moisture mea			ot and i	ndiract						
	04	methods	surenite	-uneo	er and h	nunect						
		Soil water suction	Tensic	metera	Soil							
2	05	characteristic curv				nσ			CT1			
<u>ک</u>	05	capacity	es anu	moistul	c noiuli	ng						
		Soil-plant-water re	lation	shins Fr	vaporat	ion						
	06	Transpiration and				,						
3	07	Crop water require				affect	ing					
	07	stop water require		<u> </u>	1 401013	, unicel	8					

		CWR	
	08	CWR-measurement and estimation, CROPWAT	
	09	Irrigation water requirement (IWR) and effective rainfall	
	10	Example problems on CWR and IWR	
		Irrigation water requirement (IWR) of rice,	
4	11	Seepage and percolation loss and land preparation requirement	
	12	Irrigation Efficiency, concepts and classification	
	13	Conveyance loss measurement–Ponding Method with examples	
5	14	Irrigation scheduling–concepts, methods and analysis	
	15	Irrigation scheduling–analysis with examples	
	16	Irrigation methods, classification, advantage and disadvantages	
6	17	Design of surface and subsurface irrigation with examples	
	18	Design of surface and subsurface irrigation with examples	
	19	Design of surface and subsurface irrigation with examples	Mid Term Exam
7	20	Irrigation water quality and quality standards	
	21	Soil and water salinity, remedial measures and	
	21	Leaching requirement with examples	
	22	Irrigation and drainage structures, types and purposes	
8	23	Irrigation and drainage structures –	CT2
		design Considerations and examples	012
	24	Flow measurement structures with examples Design of irrigation and drainage canals – erodible	
	25	and lined canal design considerations	
9	26	Design of irrigation and drainage canals-best	
,	20	hydraulic section with examples	
	27	Design of irrigation and drainage canals–Regime theory with examples	
	28	Irrigation pumps, classification, components and operation	
10	29	Pump characteristic curves, BOP and efficiency with examples	
	30	Pump in series and parallel, pump selection	
	30	Irrigation management, concepts and importance	
11	32	Irrigation management – improving irrigation efficiency, water saving techniques in	
		rice irrigation	
	33	Irrigation management –people 's participation	
	34	Drainage of agricultural land-concepts,	
10		definitions and importance	
12	35	Drainage of agricultural land– surface and	CT3
	36	subsurface systems Surface drainage systems –deign considerations	
		Subsurface drainage systems – deign considerations	
10	37	of Steady state design	
13	38	Surface drainage systems–deign examples	
	39	Subsurface drainage systems –deign examples	
14	40	Subsurface drainage systems –deign examples	

	41		rainage systems of Bangladesh nd future potentials of major ar							
	42		rainage systems of Bangladesh and future potentials of major							
ASSESSMENT STRATEGY										
Components         Grading         CO         Bloom's Taxonomy										
Continuous (Class assig CT/ Mid Te Class Partic	erm/ Active	40%	CO1, CO2, CO3, CO4	C2, C3, C4						
Final	Exam	60%	CO1, CO2, CO3, CO4	C2, C3, C4						
Total	Marks	100%								
REFEREN	ICE BOOK	S								
1. Irrigatio	on Engineeri	ing and Hydrauli	c Structures– Garg							
2. Irrigatio	on Principles	s and Practices-V	aughn, E.Hansen, OrsonW.Ist	raelsen						

Irrigation Principles and Practices–Vaughn, E.Hansen, OrsonW.Israelsen
 Introductory Irrigation Engineering–B.C.Punmia
 Drainage Principles and Applications –ILRI

COURSE INFORMATION	
Course Code: EWCE 464	Credit Hour: 1.5
Course Title: Advanced Applications of GIS and RS	Contact Hour: 3.0
PRE-REQUISITE	
EWCE-103 (Surveying), EWCE-104 (Practical Surveying),	, EWCE-206 (GIS in
Environmental and Water Resources Engineering)	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ RATIONALE	
This course will impart cutting-edge knowledge and practical-base	d skills among the students
through rigorous theory, practical work and hands-on training fo	cused on key and applied
aspects of GIS and remote sensing.	
OBJECTIVE	
1. To introduce students with newer approaches on data	sciences, analytics, big
geospatial data.	
2. To include advanced application of GIS, its management and ir	nplementation.
3. To understand the basic remote sensing technology and sate	
climatic variables etc.).	
4. To impart knowledge and hands on training on latest GIS and F	RS software.
COURSE CONTENT	
Introduction to raster data, introduction to surface data: TIN, DE	M. spatial analyst, model
builder, 3D Analyst, geo statistical analyst.	, ., ., .,
Introduction to Remote Sensing data/satellite images, browsing S	Satellite data from USGS
website, study of satellite image annotation (information) - LA	
sources, image enhancement, image classification (supervised, uns	
soil, water and vegetation indices, remote sensing in hydro	
(monitoring of flood, drought and storms), remote sensing an hydro	
(earthquake/landslide), introduction to image processing softwa	
SKILL MAPPING (CO – PO MAPPING)	
NoCourse OutcomePROGRAM OUTCOMES (POs)	
192	

		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Ability to <b>recognize</b> the advance tools of Geographic Information Systems (GIS)		2	5				,	0		10		12
2	CO2: Ability to <b>produce</b> contour maps, DEM from spot height geographic data using visualization concepts such as color theory and symbolization and GIS tools					$\checkmark$							
3	CO3: Ability to analyze geospatial problems and/or research questions with the help of basic GIS analysis tools					V							
4	CO4: Be able to <b>apply</b> remote sensing for primary purposes like digitizing, geoprocessing, map preparation, change detection, mobile application with Google map survey, satellite image processing												
COUR	SE OUTCOMES & GEN	IERIC	SKI	LLS					T				
No	Course Outcome	Corresponding	FOS	Bloom's Taxonomv*	finonom	CP		CA		KP		Assessment	Methods
CO1	Ability to <b>recognize</b> the advance tools of Geographic Information Systems (GIS)	1		C1		-		-		1	M, F		, F
CO2	Ability to <b>produce</b> contour maps, DEM from spot height geographic data using visualization concepts such as color theory and symbolization and GIS tools	5		C3		-		-		1		T,	М
CO3	Ability to <b>analyze</b> geospatial problems and/or research questions with the help of basic GIS analysis		5	C2, C	24	-		-		4,6		T, N	ſ, F

CO4       Be able to <b>apply</b> remote sensing for primary purposes like digitizing, geoprocessing, map preparation, change detection, mobile application with Google map survey, satellite image processing       2, 5       C3       -       -       4,6       PR, F         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge       WK= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile       *       *       C5-       C6-         Remember       Understand       Apply       Analyze       Evaluate       Create         (T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr Presentation, R - Report, F - Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)       8         Face-to-face Learning       -       -         •       Lecture       24         •       Practical/Tutorial/Studio       8         •       Student - Centered Learning       -         •       Non-face-to-face learning       12         •       Non-face-to-face learning       3	2					
remote sensing for primary purposes like digitizing, geoprocessing, map preparation, change 2, 5       C3       -       -       4,6       PR, F         detection, mobile application with Google map survey, satellite image processing       2,5       C3       -       -       4,6       PR, F         WP=Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge       WR=Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile       *       *       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       <	2					
digitizing,       geoprocessing, map       preparation, change       2, 5       C3       -       -       4,6       PR, F         detection,       mobile       application       with       -       -       4,6       PR, F         detection,       mobile       application       with       -       -       4,6       PR, F         detection,       mobile       application       with       -       -       4,6       PR, F         detection,       mobile       image       -       -       -       4,6       PR, F         detection,       mobile       image       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       <	2					
geoprocessing, map preparation, change detection, mobile application with Google map survey, satellite image2, 5C34,6PR, FWP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: $C1-$ $C2-$ $C2-$ $C3-$ $C4-$ $C5-$ $C6-$ Remember $C1-$ $C2-$ $C3-$ $C4-$ $C5-$ $C6-$ Remember $C1-$ $C2-$ $C3-$ $C4-$ $C5-$ $C6-$ Remember $C1-$ $C2-$ $C3-$ $C4-$ $C5-$ $C4-$ $C5-$ $C6-$ Remember $C1-$ $C2-$ $C3-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ $C5-$ $C4-$ 	2					
preparation, change       2, 5       C3       -       -       4,6       PR, F         detection, mobile       application       with       -       -       4,6       PR, F         application       with       Google map survey, satellite       image       -       -       4,6       PR, F         weight of the strength of the streng of the strength of the strengthof the stre	2					
detection, mobile application with Google map survey, satellite image processing       Image       Image         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1-       C2-       C3-       C4-       C5-       C6-         Remember       Understand       Apply       Analyze       Evaluate       Create         (T - Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr Presentation, R –Report, F – Final Exam)       Engagement (Hours)         Teaching and Learning Activities       Engagement (Hours)         Face-to-face Learning       24         • Practical/ Tutorial/ Studio       8         • Student – Centered Learning          Self- Directed Learning	2					
applicationwith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith Googlewith 	_					
Google map survey, satellite image processing       Image processing       Image processing         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1-       C2-       C3-       C4-       C5-       C6-         Remember       Understand       Apply       Analyze       Evaluate       Create         (T - Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr       Presentation, R –Report, F – Final Exam)       Engagement (Hours)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)         Face-to-face Learning       24         • Practical/ Tutorial/ Studio       8         • Student – Centered Learning          Self- Directed Learning       12	_					
satellite       image       image       image         processing       WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1-       C2-         C2-       C3-         Remember       Understand         Apply       Analyze         Evaluate       Create         (T - Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr         Presentation, R –Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Image:       Engagement (Hours)         Face-to-face Learning       24         Practical/Tutorial/Studio       8         Student – Centered Learning          Self-Directed Learning          Non-face-to-face learning	_					
processingImage: Construct of Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1-C2-C3-C4-C5-C6-RememberUnderstandApplyAnalyzeEvaluateCreate(T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr Presentation, R - Report, F - Final Exam)Engagement (Hours)TEACHING AND LEARNING STRATEGYEngagement (Hours)Face-to-face Learning • Lecture24Practical/ Tutorial/ Studio • Student - Centered Learning • Non-face-to-face learning8• Non-face-to-face learning	_					
WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy: <u>C1-</u> <u>C2-</u> <u>C3-</u> <u>C4-</u> <u>C4-</u> <u>C5-</u> <u>Remember</u> <u>Understand</u> <u>Apply</u> <u>Analyze</u> Evaluate <u>Create</u> (T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr         Presentation, R –Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities         Engagement (Hours)         Face-to-face Learning         •       Lecture         24         •       Practical/ Tutorial/ Studio         •       Student – Centered Learning         •       Non-face-to-face learning         •       Non-face to-face learning	_					
Solving; EA=       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/KP= Knowledge Profile       *Level of Bloom's Taxonomy:         C1-       C2-       C3-       C4-         Knowledge       Vinderstand       Apply       Analyze       Evaluate       Create         Image: C1-       C2-       C3-       C4-       C5-       C6-         Remember       Understand       Apply       Analyze       Evaluate       Create         Image: C1-       C2-       C3-       C4-       C5-       C6-         Remember       Understand       Apply       Analyze       Evaluate       Create         Image: C1-       C2-       C3-       C4-       C5-       C6-         Remember       Understand       Apply       Analyze       Evaluate       Create         Image: C1-       Final Exam       Teaching and Learning Activities       Engagement (Hours)       Face-to-face Learning       Engagement (Hours)         Face-to-face Learning       Image: C1-       24       8       Student – Centered Learning          Self- Directed Learning       Image: C1-       Image: C1-       12       Image: C1-       Image: C1-         Self- Directed Learning	_					
Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: 	_					
KnowledgeProfile/ KP= Knowledge Profile*Level of Bloom's Taxonomy:C1-C2-C3-C4-C5-C6-RememberUnderstandApplyAnalyzeEvaluateCreate(T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr Presentation, R -Report, F - Final Exam)TEACHING AND LEARNING STRATEGYTeaching and Learning ActivitiesEngagement (Hours)Face-to-face Learning• Lecture24• Practical/ Tutorial/ Studio8• Student - Centered LearningSelf- Directed Learning• Non-face-to-face learning12	_					
Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy:  $\underline{C1}$ $\underline{C2}$ - $\underline{C3}$ - $\underline{C4}$ - $\underline{C5}$ - $\underline{C6}$ -RememberUnderstandApplyAnalyzeEvaluateCreate(T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr Presentation, R - Report, F - Final Exam)Asg - Assignment, PrTEACHING AND LEARNING STRATEGYTeaching and Learning ActivitiesEngagement (Hours)Face-to-face Learning24Practical/ Tutorial/ Studio8Student - Centered LearningSelf- Directed Learning12	_					
*Level of Bloom's Taxonomy: $C1$ - $C2$ - $C3$ - $C4$ - $C5$ - $C6$ -RememberUnderstandApplyAnalyzeEvaluateCreate $(T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, PrPresentation, R - Report, F - Final Exam)Asg - Assignment, PrTEACHING AND LEARNING STRATEGYTeaching and Learning ActivitiesEngagement (Hours)Face-to-face LearningEngagement (Hours)Face-to-face Learning24• Practical/Tutorial/Studio8• Student - Centered LearningSelf-Directed Learning12$	_					
$\begin{tabular}{ c c c c c c c } \hline C1-&C2-&C3-&C4-&C5-&C6-\\ \hline Remember&Understand&Apply&Analyze&Evaluate&Created \\ \hline (T-Test, PR-Project, Q-Quiz, M-Mid Term Exam, Asg-Assignment, Presentation, R-Report, F-Final Exam) \\ \hline TEACHING AND LEARNING STRATEGY \\\hline \hline Teaching and Learning Activities&Engagement (Hours) \\ \hline Face-to-face Learning&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&$	_					
RememberUnderstandApplyAnalyzeEvaluateCreate(T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr Presentation, R - Report, F - Final Exam)Asg - Assignment, PrTEACHING AND LEARNING STRATEGYTeaching and Learning ActivitiesEngagement (Hours)Face-to-face LearningEngagement (Hours)Face-to-face Learning24Practical/Tutorial/Studio8Student - Centered LearningSelf-Directed Learning12	_					
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Presentation, R – Report, F – Final Exam)TEACHING AND LEARNING STRATEGYTeaching and Learning ActivitiesEngagement (Hours)Face-to-face LearningEngagement (Hours)Face-to-face Learning24• Lecture24• Practical/ Tutorial/ Studio8• Student – Centered LearningSelf- Directed Learning12	_					
Teaching and Learning ActivitiesEngagement (Hours)Face-to-face Learning24• Lecture24• Practical/ Tutorial/ Studio8• Student – Centered LearningSelf- Directed Learning12						
Face-to-face Learning24• Lecture24• Practical/Tutorial/Studio8• Student - Centered LearningSelf-Directed Learning• Non-face-to-face learning12						
<ul> <li>Lecture</li> <li>Practical/Tutorial/Studio</li> <li>Student - Centered Learning</li> <li>Self-Directed Learning</li> <li>Non-face-to-face learning</li> <li>12</li> </ul>						
<ul> <li>Practical/Tutorial/Studio</li> <li>Student - Centered Learning</li> <li>Self-Directed Learning</li> <li>Non-face-to-face learning</li> <li>12</li> </ul>						
Student – Centered Learning –     Self- Directed Learning 12						
Self- Directed Learning12						
Non-face-to-face learning     12						
•						
• Revision of the previous lecture at nome 5						
• Preparation for final examination 10	10					
Formal Assessment						
Continuous Assessment						
• Final Examination 2						
Total 60						
TEACHING METHODOLOGY						
Lectures, Software Demonstrations						
COURSE SCHEDULE						
Week         Lecture         Topics to be Covered         Assessment						
1 Introduction to Raster data, Raster						
analysis						
2 DEM, Generating Contour and						
DEM from spot heights						
Introduction to Advanced GIS Test, Mid Quiz						
3 3 Tools, Watershed delineation using						
Hydrology tool						
4 4 Spatial Analyst						
5 5 Geo statistical Analyst						
6 6 Mid Quiz						
7 7 3D Analyst						
8 8 Model Builder Project Test Final Quiz						

11	11				
12	12	Image Classification	n (Supervised)		
13	13	Morphological char satellite images			
14	14	Final Quiz, Project	submission		
ASSESS	SMENT S				
Cor	nponents	Grading	C	20	Bloom's Taxonomy
		40%	CO1, CO2	C1, C2, C3, C4	
Mid (	Quiz+ Fina Quiz	d 60%	CO1, CO2	, CO3, CO4	C1, C2, C3, C4
Tot	al Marks	100%			
REFER	ENCE B	OOKS			
2. Ma	anuals dev lvanced Re	sing and GIS, Basude eloped by ESRI. emote Sensing and G		al developed by C	EGIS, USFS and

COURSE INFORMATION												
Course Code: EWCE 465								Cre	dit H	our:	3.0	
Course Title: Design of Hydrau	lic Stru	ctu	res					Con	tact	Hour	: 3.0	
PRE-REQUISITE												
Nil												
CURRICULUM STRUCTUR	E											
Outcome Based Education (OF	BE)											
SYNOPSIS/RATIONALE												
In this course students will lea	arn to c	lesi	gn w	veir, 1	barra	ge, d	am a	is we	ll as	coas	tal st	ructure
such as sea wall, groynes so of	n which	n w	ill be	e help	oful i	n the	ir pro	ofessi	ional	life i	in de	signing
different type of hydraulic stru	ctures.											
OBJECTIVE												
1. To gain knowledg												
2. To know the design details of inland as well as coastal structures.												
COURSE CONTENT												
Hydraulic structures – charact												
including failure phenomenon,										, barı	rages	, weirs,
spillways, energy dissipators, a				ment	, seav	vall,	breal	cwate	ers.			
SKILL MAPPING (CO – PO			/									
No Course Outcome	PROG							-		-		
	1	2	3	4	5	6	7	8	9	10	11	12
1 CO1: To understand												
the basic principles												
and analysis of both												
static and dynamic												
water loads, failure characteristics and												
characteristics and details of different												
types of hydraulics												
structures												
2 CO2: To know the	2											

3	structures	inalysi es c tures. y basi tions c drauli	s of c of c		√										
No	RSE OUTCOME Course	25 & (	JENERIC	) SK	ILLS	1									
110	-	Corresponding POs	Bloom's Taxonomy*	CP		CA			UN	N		Assessment Methods			
COI	To understand the basic principles and analysis of both static and dynamic water loads, failure characteristics and details of different types of hydraulics structures	1	C2		1,3					1				Test, Exam	
CO2	To know the basic principles and concepts of analysis and design of different types of hydraulic structures	1	C2							3		ľ	Mid-t	Test, erm, ∃xam	
CO3	To apply basic design calculations of different hydraulic structures		C3		1,3					4,5	;			ment, st, Final ım	
	WP= Washingt														
		ofile/ k m's Ta C2 –	XP= Knov axonomy:	vled C3	ge Proi	file C4 —		ities;	(	C5 -		C	C6 –		
	Remember	Under	stand	Aţ	oply A	Anal	yze		]	Evalu	ate		Crea	te	
	(T-Test, PR – F Presentation, R	–Řep	ort, F – Fi	inal	Exam)		rm E	Exam	ı, A	sg – A	Assig	nmen	t, Pr-	-	
	CHING AND L			RA7	TEGY	<b>F</b> er			4 /11	() ()					
	Teaching and Learning Activities Face-to-face Learning							men	ι (Η	ours)					
	a) Lecture							42							
	Practical/ Tuto	rial/ S	tudio								-				
c)	Student - Cent	ered L	earning							-	-				

Salf Di	irected Lea	ming		
		-		9
		to-face learning		18
b)		of the previous lecture at		
	home			46
c)	Preparatio	n for the final examination		
Formal	Assessmen	it		
c) (	Continuous	Assessment		2
d) H	Final Exam	ination		3
		Total		120
TFACHI	NG METH	ODOLOGY		
		on, Problem-Based Method		
	SE SCHED			
Week		Topics to be Covered		Assessment
1	01	Introduction		Assessment
1	01	Principles of design of hyd	raulic structures	-
	02	Types of hydraulic structur		-
2	03	Theories of seepage	05	
2	04	Bligh's theory		Assignment/ CT1
	05			
3	00			
5	07	Percentage of pressure and Diversion head works		
	08	Protection works for surfac	and sub surface	-
	09	flow	e and sub-surface	
4	10	Theory of Weir		
4	10	-		
	11 12	Design of weir Design of weir		-
5	12			-
5	13	Theory of Barrage		_
	14	Design of Barrage		
6		Theory of dam		_
6	16 17	Design of dam		Assignment/ CT2
	17	Design of dam		
7	18	Theory and design of spilly		
/		Theory and design of energy	gy dissipaters	_
	20 21	Introduction to reservoirs	22	Mid Term Exam/
8	21 22	Capacity of Reservoir stora		
0	22	Basics of cross drainage we		Project
	23	Design of cross drainage w		_
9	24	Reviewing of abovementio Introduction to coastal strue		
9			clules	_
	26 27	Structure types		_
10	27	Structure types Design criteria of coastal st	ruoturoc	-
10				_
	29	Design criteria of coastal st		-
11	30 31	Material used in coastal str		
11		Material used in coastal str		
	32	Introduction to marine Env		
12	33	Deterioration due to marine		
12	34	Deterioration due to marine		-
	35 36	Repair of coastal structures		
12		Rehabilitation of coastal structure		
13	37	Planning of coastal structur		
	38	Theory of shore protection		
1.4	39	Theory of shore protection		
14	40	Design considerations of sh		
	41	Design considerations of sh		8
	42	Review of coastal structure	8	

ASSESSMENT STRATEG	Y		
Components	Grading	СО	Bloom's Taxonomy
Continuous Assessment (Class assignments/ CT/ Mid Term/ Active Class Participation)	40%	CO1, CO2, CO3	C2, C3
Final Exam	60%	CO1, CO2, CO3	C2, C3
Total Marks	100%		
<b>REFERENCE BOOKS</b>			
1. Hydraulic Structures by	Garg (Tex	tt)	
2. Irrigation and Water Po	ver Engine	eering by Punmia (Text)	
3. Irrigation and Water Re	sources En	gineering by Asawa	
4. Theory and Design of Ir	rigation St	ructure by Varshney	
5. Dam and Appurtenant H	lydraulic S	tructure by Ljubomir Ta	nchew

COURSE INFORMATION         Course Code: EWCE 466       Credit Hour: 1.5         Course Title: Hydraulic Structure Design Sessional       Contact Hour: 1.5         Course Title: Hydraulic Structure Design Sessional       Contact Hour: 1.5         COURSTE         EWCE - 261 (Fluid Mechanics), EWCE - 363 (Engineering Hydrology), EWCE - 213(Structure Analysis I), CE - 385 (Design of Concrete Structures I), EWCE - 343 (Geotechnical Engineering)       EWCE - 343 (Geotechnical Engineering)         CURRICULUM STRUCTURE         Outcome Based Education (OBE)         SYNOPSIS/RATIONALE         In this course students will learn to design a regulator as well as guide bank which will be helpful in their professional life in designing hydraulic structures.         OBJECTIVE         1. To gain knowledge on the basics of hydrological, hydraulic and structural design requirements of a hydraulic structure.         2. To understand the basic design principle of hydraulic structure and guide bank.         3. To become skilled at the design and design requirements, basic techniques of hydrologic design, detail hydraulic design of a small hydraulic structure (3 vent regulator) and design of the structural design of a small hydraulic structure (3 vent regulator) and design of the structural design of a regulator and stability analysis, design of guide bank.         No       Cou	COUD	SE INFORMATION												
Course Title: Hydraulic Structure Design Sessional       Contact Hour: 3.0         PRE-REQUISITE       EWCE - 261 (Fluid Mechanics), EWCE - 363 (Engineering Hydrology), EWCE - 213(Structure Analysis I), CE - 385 (Design of Concrete Structures I), EWCE - 343 (Geotechnical Engineering). I: Foundation Engineering), EWCE - 361 (Open Channel Hydraulics), EWCE - 471 (Coastal Engineering)         CURRICULUM STRUCTURE       Outcome Based Education (OBE)         SYNOPSIS/RATIONALE       In this course students will learn to design a regulator as well as guide bank which will be helpful in their professional life in designing hydraulic structures.         OBJECTIVE										Cro	dit H	our	15	
PRE-REQUISITE         PRE-REQUISITE         EWCE - 261 (Fluid Mechanics), EWCE - 363 (Engineering Hydrology), EWCE - 213(Structure Analysis I), CE - 385 (Design of Concrete Structures I), EWCE - 343 (Geotechnical Engineering)         EWCE - 361 (Open Channel Hydraulics), EWCE - 471 (Coastal Engineering)         CURRICULUM STRUCTURE         Outcome Based Education (OBE)         SYNOPSIS/ RATIONALE         In this course students will learn to design a regulator as well as guide bank which will be helpful in their professional life in designing hydraulic structures.         OBJECTIVE         1. To gain knowledge on the basics of hydrological, hydraulic and structural design requirements of a hydraulic structure.         2. To understand the basic design principle of hydraulic structure and guide bank.         3. To become skilled at the design and construction of different hydraulic structures.         COURSE CONTENT         Introduction to hydraulic structure design of a small hydraulic structure (3 vent regulator) and design of the structural design of a regulator and stability analysis, design of guide bank.         SKILL MAPPING (CO – PO MAPPING)         No       Course Outcome         PROGRAM OUTCOMES (POs)         1 1 2 3 4 5 6 7 8 9 10 11 12         Be able to understand the basic <td></td> <td></td> <td>o Do</td> <td>aian</td> <td>Saca</td> <td>onal</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>			o Do	aian	Saca	onal								
EWCE - 261 (Fluid Mechanics), EWCE - 363 (Engineering Hydrology), EWCE - 213(Structure Analysis I), CE - 385 (Design of Concrete Structures I), EWCE - 343 (Geotechnical Engineering-II: Foundation Engineering), EWCE - 361 (Open Channel Hydraulics), EWCE - 471 (Coastal Engineering)         CURRICULUM STRUCTURE         Outcome Based Education (OBE)         SYNOPSIS/ RATIONALE         In this course students will learn to design a regulator as well as guide bank which will be helpful in their professional life in designing hydraulic structures.         OBJECTIVE         1. To gain knowledge on the basics of hydrological, hydraulic and structural design requirements of a hydraulic structure.         2. To understand the basic design principle of hydraulic structure and guide bank.         3. To become skilled at the design and construction of different hydraulic structures.         COURSE CONTENT         Introduction to hydraulic structure design and design requirements, basic techniques of hydrologic design of the structural design of a small hydraulic structure (3 vent regulator) and design of the structural elements of a regulator and stability analysis, design of guide bank.         SKILL MAPPING (CO – PO MAPPING)         No       Course Outcome         PROGRAM OUTCOMES (POs)         1       A d 5 6 7 8 9 10 11 12         Be able to understand the basic         A d 5 6 7 8 9 10 1			e De	sign	96991	onai				COL		noui	. 5.0	
Analysis I), CE - 385 (Design of Concrete Structures I), EWCE - 343 (Geotechnical Engineering-II: Foundation Engineering), EWCE - 361 (Open Channel Hydraulics), EWCE - 471 (Coastal Engineering) CURRICULUM STRUCTURE Outcome Based Education (OBE) SYNOPSIS/RATIONALE In this course students will learn to design a regulator as well as guide bank which will be helpful in their professional life in designing hydraulic structures. OBJECTIVE 1. To gain knowledge on the basics of hydrological, hydraulic and structural design requirements of a hydraulic structure. 2. To understand the basic design principle of hydraulic structure and guide bank. 3. To become skilled at the design and construction of different hydraulic structures. COURSE CONTENT Introduction to hydraulic structure design and design requirements, basic techniques of hydrologic design, detail hydraulic design of a small hydraulic structure (3 vent regulator) and design of the structural elements of a regulator and stability analysis, design of guide bank. SKILL MAPPING (CO - PO MAPPING) No Course Outcome PROGRAM OUTCOMES (POs) 1 2 3 4 5 6 7 8 9 10 11 12 Be able to understand the basic of a stability analysis, design of guide bank. 1 requirements of hydrological, hydraulic structure, and stability analysis, design of guide bank. 2 parameters for a catchment area and hydraulic structure.			EWC	ר <u>סי</u>	63 (T	Ingin	oorin	α Uv	drolo	(m)	EWC	<u>ר די</u>	13(5)	ruoturo
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No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	Cb	< (	CA	KP	Assessment Methods
COI	Be able to understand the basic requirements of hydrological, hydraulic and structural design of a hydraulic structure.	1	C2	1		_	3	Lab report, Mid Quiz
CO2	Be able to estimate hydrological parameters for a catchment area and hydraulic parameters of the structure.	1	C2, C3	1		_	3, 5	Lab report, Mid Quiz
CO3	Be able to compute design loads, pressures and analyze stability of a hydraulic structure.	3	C3	1, 7		_	3, 5, 6	Lab report, Final Quiz
	EA= Engineering Ac Knowledge Profile/ KP= Kr *Level of Bloom	ctivities nowled m's Ta	s/ CA=	Complex Act file y:	ivities;	WK=	Washington	
	Remember	C2 – Unders		C3- Apply	I	·	C5 - Evaluate	
	(T – Test, PR – Presentation, R				i Term	Exam,	, Asg – Assig	gnment, Pr –
	CHING AND LE	ARNI	NG ST			I		
Teach	ing and Learnin	g Activ	vities			Eng	agement (He	ours)
Face-to	o-face Learning Lecture (3 hour	s/week	$x \times 12$	weeks)			3	6

Self- D	irected Le		-				2		
•			face learning				3		
•			the previous lect	ture at home					
	ration for	-	Z				5		
Forma	Assessme			11					
•	Lab repo Quiz	rts		3					
_	Quil								
			Total				60		
			DOLOGY						
Lecture a	and Discus	sion	, Problem Based	Method					
COUR	SE SCHE	DUI	[.E.						
	Lecture			oics to be Covered			Assessment		
1	1	In		Design of a Regulator	r				
1	1	(H	ydrologic Desig	gn Part 1)					
2	2	De	esign of a Regul	ator (Hydrologic Des	sign Par	rt 2)			
3	3	De	esign of a Regul	ator (Hydraulic Desi	gn 1)		Lab Paparta		
4	4			ator (Design of Stilli mination of Floor Th			Lab Reports		
5	5			ator (Design of floor l loose protection)	thickne	ess			
6	6			ator (Design of floor ad loose protection)	thickne	ess			
7		M	id Quiz				Quiz		
8	7			of a 3-vent Regulato onsoon Condition)	r: 1. Bo	Х			
9	8	Sta W	•	of a 3-vent Regulato	r: 2. Wi	ng			
10	9		ructural Design Apron	of a 3-vent Regulato	r: 3. De	sign	Lab Danasta		
11	10		ructural Design etaining Wall	of a 3-vent Regulato	r: 4.		Lab Reports		
12	11	De	esign of Guide E	Bank					
13	12	De	esign of Guide E	Bank (continued)					
14	13	Fi	nal Quiz			Quiz			
ASSESS	SSESSMENT STRATEGY								
	nponents		Grading	CO		]	Bloom's Taxonomy		
	ntinuous								
	sessment		40%	CO1, CO2, CO3			C2, C3		
	ports/ Acti								
	articipatio Quiz	11)	60%	CO1, CO2, CO3	3		C2, C3		
Quiz         00%         CO1, CO2, CO3           Total Marks         100%					$\mathbb{C}^{2},\mathbb{C}^{3}$				

**REFERENCE BOOKS** 

 1. Irrigation Engineering & Hydraulic Structures - Santosh Kumar Garg

 2. Principles of River Engineering – Garg

	RSE INFORMATION												
	Code: EWCE 467								Cr	edit	Hour	• 3	3.0
	Title: Integrated Water Reso	uroo	c Mo	<b>n</b> 000	mont						t Hou		
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	E363(Hydrology)												
	RICULUM STRUCTURE												
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	2. To enhance student 's												
	3. To provide an underst												
	including policies, stra												
	4. To be familiar with m												nd
	regulations governing										0		
	5. To foster an understan					xities	s surr	oun	ding	g wa	ter		
	governance, water rig	•			-				-				
	perspectives, basin-wi											wat	er
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COUF	RSE CONTENT												
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	ation, Implementing IWRM												
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Basin- develo implic Integrat SKILI No	management and sustainabl wide management and p opment issues in co-riparian co tations, Development and co ted basin management. C MAPPING (CO – PO MA Course Outcome	e dev water count difica	velop sha ries, ation	ment aring Wate of in	: con : W r ma terna	cepts ater nagen ationa	s and reso ment al lav	cha ourc inte v, B	llen es ervei enef	ges, man ntior	Case agem	stuc	lies. and
Basin- develo implic Integrat SKILI	management and sustainabl wide management and opment issues in co-riparian of cations, Development and co ted basin management. <u>MAPPING (CO – PO MA</u> Course Outcome CO1: Be able to <b>explain</b>	e dev water count difica PPIN PR(	velop sha ries, ation <u>G</u> OGR	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No	<ul> <li>management and sustainable</li> <li>wide management and work</li> <li>popment issues in co-riparian of control of the second sec</li></ul>	e dev water count difica PPIN PR(	velop sha ries, ation <u>G</u> OGR	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No	management and sustainable wide management and work opment issues in co-riparian of ations, Development and co ted basin management. <u>MAPPING (CO – PO MA</u> Course Outcome CO1: Be able to <b>explain</b> the basic Principles and practice of IWRM	e dev water count dific: PPIN PR( 1	velop sha ries, ation <u>G</u> OGR	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No	<ul> <li>management and sustainable</li> <li>wide management and popment issues in co-riparian control to the second seco</li></ul>	e dev water count dific: PPIN PR( 1	velop sha ries, ation <u>G</u> OGR	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No	<ul> <li>management and sustainable</li> <li>wide management and work</li> <li>ppment issues in co-riparian content issues in co-riparian conten</li></ul>	e dev water count dific: PPIN PR( 1	shatries, ation G) OGR	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No	<ul> <li>management and sustainable</li> <li>wide management and work</li> <li>popment issues in co-riparian of the constructions, Development and constructions</li> <li>CO1: Be able to explain the basic Principles and practice of IWRM</li> <li>CO2: Be able to apply engineering perceptions to explain policies,</li> </ul>	e dev water count dific: PPIN PR( 1	velop sha ries, ation <u>G</u> OGR	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No	<ul> <li>management and sustainable</li> <li>wide management and supprent issues in co-riparian of the particular products of the particular product of the particular</li></ul>	e dev water count dific: PPIN PR( 1	shatries, ation G) OGR	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No	management and sustainable wide management and work opment issues in co-riparian of ations, Development and co- ted basin management. <u>CMAPPING (CO – PO MAT</u> Course Outcome CO1: Be able to <b>explain</b> the basic Principles and practice of IWRM CO2: Be able to <b>apply</b> engineering perceptions to explain policies, strategies and institutional	e dev water count dific: PPIN PR( 1	shatries, ation	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No 1	<ul> <li>management and sustainable</li> <li>wide management and support issues in co-riparian content issues in co-riparian content issues in co-riparian content issues in co-riparian content issues in management.</li> <li><u>AAPPING (CO – PO MAI</u> Course Outcome</li> <li>CO1: Be able to <b>explain</b> the basic Principles and practice of IWRM</li> <li>CO2: Be able to <b>apply</b> engineering perceptions to explain policies, strategies and institutional arrangements for IWRM</li> </ul>	e dev water count dific: <u>PPIN</u> <u>PR</u> 1	shatries, ation	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No	<ul> <li>management and sustainable</li> <li>wide management and support issues in co-riparian content is content in content in content is content in content in content in content in content is content in con</li></ul>	e dev water count dific: <u>PPIN</u> <u>P</u> R <u>1</u> √	shatries, ation	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No 1	management and sustainable wide management and work opment issues in co-riparian of cations, Development and co- ted basin management. <b>CMAPPING (CO – PO MA)</b> Course Outcome CO1: Be able to <b>explain</b> the basic Principles and practice of IWRM CO2: Be able to <b>apply</b> engineering perceptions to explain policies, strategies and institutional arrangements for IWRM CO3: Be able to apply analytical skills to	e dev water count dific: <u>PPIN</u> <u>PR</u> ( 1	shatries, ation	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No 1	<ul> <li>management and sustainable</li> <li>wide management and work oppent issues in co-riparian oppent issues in co-riparian oppent issues in co-riparian oppent issues in co-riparian oppertended basin management.</li> <li><u>MAPPING (CO – PO MA</u></li> <li>Course Outcome</li> <li>CO1: Be able to explain the basic Principles and practice of IWRM</li> <li>CO2: Be able to apply engineering perceptions to explain policies, strategies and institutional arrangements for IWRM</li> <li>CO3: Be able to apply analytical skills to evaluate and assess</li> </ul>	e dev water count dific: PPIN PR( 1 √	shatries, ation	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No 1	management and sustainable wide management and work opment issues in co-riparian of ations, Development and co- ted basin management. <u>MAPPING (CO – PO MA</u> Course Outcome CO1: Be able to <b>explain</b> the basic Principles and practice of IWRM CO2: Be able to <b>apply</b> engineering perceptions to explain policies, strategies and institutional arrangements for IWRM CO3: Be able to apply analytical skills to evaluate and assess various aspects of water	e dev water count dific: <u>PPIN</u> <u>PR</u> 1	shatries, ation	ment aring Wate of in AM	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No 1	management and sustainable wide management and work opment issues in co-riparian of ations, Development and co- ted basin management. <u>CMAPPING (CO – PO MA)</u> Course Outcome CO1: Be able to <b>explain</b> the basic Principles and practice of IWRM CO2: Be able to <b>apply</b> engineering perceptions to explain policies, strategies and institutional arrangements for IWRM CO3: Be able to apply analytical skills to evaluate and assess various aspects of water resources management,	e dev water count dific: <u>PPIN</u> <u>PR0</u> 1	shatries, ation	ment aring Wate of in AM 0 3	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No 1	management and sustainable wide management and work opment issues in co-riparian of ations, Development and co- ted basin management. <u>MAPPING (CO – PO MA</u> Course Outcome CO1: Be able to <b>explain</b> the basic Principles and practice of IWRM CO2: Be able to <b>apply</b> engineering perceptions to explain policies, strategies and institutional arrangements for IWRM CO3: Be able to apply analytical skills to evaluate and assess various aspects of water	e dev water count dific: <u>PPIN</u> <u>PR</u> 1	shatries, ation	ment aring Wate of in AM 0 3	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional
Basin- develo implic Integrat SKILI No 1	management and sustainable wide management and work opment issues in co-riparian of ations, Development and co- ted basin management. <u>CMAPPING (CO – PO MA)</u> Course Outcome CO1: Be able to <b>explain</b> the basic Principles and practice of IWRM CO2: Be able to <b>apply</b> engineering perceptions to explain policies, strategies and institutional arrangements for IWRM CO3: Be able to apply analytical skills to evaluate and assess various aspects of water resources management, including in-stream flow	e dev water count dific: <u>PPIN</u> <u>1</u> √	shatries, ation	ment aring Wate of in AM 0 3	: con : W r ma terna	cepts ater nagen itiona	s and resc ment al lav <u>IES (</u>	cha ourc inte v, B	llen es erver enef	ges, man ntior ïts o	Case agem is and f	stuc	lies. and ional

	flow scenarios, to propose sustainable solutions for water resource challenges.											
4	CO4: To develop critical thinking and problem- solving abilities in addressing complex water management issues, including water conflicts, water rights, and basin- wise management approaches, while considering socio- economic, environmental, and political factors	$\checkmark$		V								
5	CO5: To impart the concepts of sustainable development in water management, sustainability indices and SDG goals											
COUR	SE OUTCOMES & GENERIC	SKILL	S			1	_					
No	Course Outcome	Corresponding	5	Bloom's	Taxonomy*	CP		CA	КР	1	Assessment	Methods
CO1	Be able to <b>explain</b> the basic Principles and practice of IWRM			(	22	1			1,	3	Fi	s Test, nal am,
CO2	Be able to <b>apply</b> engineering perceptions to explain policies, strategies and institutional arrangements for IWRM	2		(	23	1, 3			4,	7	Fi	s Test, nal am
CO3	Be able to apply analytical skills to evaluate and assess various aspects of water resources management, including in-stream flow assessment, water allocation strategies, and analysis of flood and low-flow scenarios, to propose sustainable solutions for water resource challenges.	2,3	3	(	C4	1, 3			1,	5	Fi	s Test, nal am
CO4	To develop critical thinking and problem-solving abilities in addressing complex water management issues, including water conflicts, water rights, and basin-wise management approaches, while considering socio-economic, environmental, and political	2,4	4									

	factors							
CO5	To impar sustainabl water sustainabi goals	t the concepts of e development in management, lity indices and SDG	7	C1, C2			1,4	Final Exam
	Solving; Engineer Knowled Profile/ k *Level o: C1 –	ing Activities/ CA= Con ge CP= Knowledge Profile f Bloom's Taxonomy: C2 - C	nplex Ac	etivities; V 24 –	WK=V	Washir C5 -	ngton A C6	ccord
	(T-Test, 1	er Understand A PR – Project, Q – Quiz, M ion, R –Report, F – Fina	M – Mid	Term Ex				
TEAC	CHING AN	D LEARNING STRATI	EGY					
Teach	ing and Le	arning Activities	E	Engageme	ent (He	ours)		
	o-face Lear					-	-	
	Lecture					42		
	Practical /	Tutorial / Studio				-		
	Student-C	entred Learning				-		
Self- D	irected Lea	rning						
•		to-face learning				9		
•		of the previous lectur	e at					
	home	L				18		
•	Preparatio	n for final examination				46		
Formal	Assessmer							
		Assessment				2		
	Final Exam					3		
						120		
		Total				120		
		IODOLOGY	11 a h a ma t in	ua Matha	J Ducl	lam D	and M	مذاء مرا
	SE SCHED	ion, Co-operative and Col	naboran	ve Metho	u, Prot	blem B	ased M	etnoa
Week	Lecture						Accor	sment
WCCK	01	Introduction to IWRM					10000	
1	02	IWRM Concept						
	03	IWRM Principles						
	04	Impacts of fragmented	approad	ch			С	Γ1
2	05	Importance of integrati						
	06	Implementing IWRM						
	07	Implementing IWRM						
3	08	Planning fundamentals	and pro	ocesses				
	09	Multi-criteria analysis						
4	10	Multi-criteria analysis		-1				
4	11	Functions of water reso						
	12	Introduction to Deman Demand Management	u mana	gement				
		Water management and	d sustair	nable		Ν	Aid Ter	m Exam
5	14	development	- Sustall					
	15	Sustainable developme						
	16	Sustainable developme target	ent goal:	6 and its				
6	17	Water management and						
	1	development: Concept	sanu Ch	anenges				

	1				
	18			t and sustainable	
				cepts and challenges	
	19		e studies		
7	20		e studies		
	21		iew class		
	22	Intro	oduction and or	verview of WRS	
8	23			ilability of water	
	24			ilability of water	CT2
	25			stream flow assessment	
9	26			am flow assessment	
-	27		rk out exam ssment	ples of in-stream flow	
	28		er allocation		
	29			v flow analysis	
10	2)			s of flood flow and low	
	30		analysis	s of flood flow and low	
	31	Wat	er rights in terr	ns of IWRM	
11	32	Wat	er rights: Econ	omic view	
	33			cy and Productivity	
	34	Gro	undwater dema	and and use	
12	35	Gro	undwater resou	irces management	
	36	Basi	in wise River N	Ianagement	
	37	Bas	in wise River N	Ianagement	
13	38	Wat	er Governance		CT3
	39	Stak	ceholder partici	pation in IWRM	
	40	Wat	er Use and Con	nflicts	
14	41	Con	flict Resolution	n Tools	
	42	Rev	iew class		
ASSESS	MENT ST	RAT	EGY		
Compon	ents		Grading	СО	Bloom's
-			C		Taxonomy
Continuo	us Assessr	nent		CO1, CO2, CO3, CO4	
	signments/				
	n/ Active (		40%		
Participat					
<b>^</b>	nal Exam		60%	CO1, CO2, CO3, CO4	C1, C2, C3, C4
To	tal Marks		100%		
REFERI	ENCE BO	OKS			ł
				Water Resources: I ssues and	Strategies. Longman
	tific and T				c c
				ement and Environmental Er	ngineering. Chapman
and H		,	e		
		~			1 77 1.1 77

- 3. Feachem, R, McGarry, M.and Mara, D (1977). Water, Wastes and Health in Hot Climates. Wiley.
- 4. The World Bank, Washington, D.C (2000) Water Resources Management, A World Bank Policy Paper, Global Water Partnership.
- 5. UN-ESCAP (1996). Integrated Water Resources Management, TAC Background Papers No.4, Global Water Partnership Technical Advisory Committee, Sweden.

6. Morgan, P. (1990). Rural Water Supplyand Sanitation. McMillan.

COUR	RSE INFORMATION												
	e Code: EWCE 468								Cre	dit F	Hour:	1.	5
	e Title: Water Modelli	ng Se	ssin	nal							Hou		
	REQUISITE		5510	mai					00	inuor	1100	1. 5.	0
	E 206 (GIS in Environ	menta	l an	d W	ater	Reso	urce	s Eng	vinee	ring	EW	VCE	464
	nced GIS and RS Sess				uter i	1050	uree	5 12112	511100	,iiiig,	, ц,		101
	RICULUM STRUCTU		/										
	me Based Education (												
SYNO	PSIS/ RATIONALE	,											
This c	ourse will develop a q	uanti	tativ	ve ap	proa	ch to	und	ersta	nd, e	estim	ate,	and	predict
	ferent components of										-		•
	CTIVE	2			<u> </u>								
	1. Modeling of the	e foll	owi	ng p	roce	sses	will	be d	liscu	ssed	in t	his c	course:
	interception, sn												
	flow, overland r	unoff	, str	eam	flow	, sed	imer	nt ero	osion	and	depo	ositio	on, and
	transport of cont	amin	ants	in st	trean	ıs.							
	2. The course di												
	hydrologic proce	esses	and	limit	atior	ns an	d uno	certa	inty a	assoc	iated	l wit	h each.
	RSE CONTENT												
	ologic modeling over												
	ation, model interpreta												
	ling overview, grid						iyme	etry	inter	pola	tion,	bo	undary
	tions, 2D flow simulat				essin	g.							
No	L MAPPING (CO – PC Course Outcome	PRC					MES	(DO	c)				
INO	Course Outcome	1 PRC	2	3	4	5	MES 6	7	s) 8	9	10	11	12
1	CO1: Able to	1	2	5	4	5	0	/	0	9	10	11	12
1	understand how and												
	where a given model	•											
	can be used, and will												
	be prepared to												
	address water												
	quantity (e.g. floods,												
	droughts, climate												
	change impacts etc.)												
	using hydrologic												
2	modelling software. CO2: Able to												
2	perform bathymetry												
	interpolation and		,	,									
	generate curve												
	number grid for												
	various hydrologic												
	model.	<u>.</u>											
3	CO3: Able to												
	develop hydrologic												
	and hydrodynamic												
1	model along with			N									
	model along with												
	calibration and												

No Course Outcome							
		ങ					
		Corresponding POs	×*				nt
		por	Bloom's Taxonomy*				Assessment Methods
		res	omo				ess tho
		DÕ Õ	Blo Tax	CP	CA	KP	Ass Met
CO1 Able to understan	nd how			•	-		
and where a given							
can be used, and	will be						
prepared to address	ss water						Test, Quiz,
quantity (e.g.			C2	-	-	1	Assignment
droughts, climate impacts	cnange						e
etc.) using hyd	drologic						
modelling softwa							
	perform						
bathymetry inter	polation		C4,				Test, Quiz,
and generate curve			C5	-	-	2	Assignment
grid for various hy model.	aroiogic						-
	develop						
hydrologic	and						0
hydrodynamic	model	3	C5	1	-	5	Quiz, Presentation
along with calibrat	tion and						riesentation
evaluation.							
WP= Washington							
Solving; EA= Eng Washington Acco			es/ CA=	= Comj	plex Ac	tivities;	WK=
Profile/ KP= Knov							
*Level of Bloom'							
C1 – C2		C3			C5 -		6 –
Remember Ur	nderstan	d Ap	ply A	nalyze	Evalı	iate C	reate
(T-Test, PR – Pro	iect O	Ouiz M	Mid	Torm I	Evom /		signment Pr
Presentation, R –						nsg – As	signment, 11 –
TEACHING AND LEA							
Teaching and Learning				gagem	ent (Ho	ours)	
Face-to-face Learning							
• Lecture						22	
Practical/ Tutorial/	Studio					11	
Student – Centered	l Learnii	ng					
Guided Learning							
Tutorial/ Assignments						6	
Self-Directed Learning	• •	1				0	
Independent Lean	-					8	
Learning + Prepa	ration fo	or Quiz					
Formal Assessment a) Continuous Assess	mont					3	
b) Quiz	sment					5	
c) Presentation						5	
Total						60	
TEACHING METHODOL	OG						
Lecture and Discussion, Pr		Based Me	thod				
				-			
COURSE SCHEDULE							

Week	Lecture	Topics to	be Covered			Assessment
1	01	Introduction				
2	02	Creating HEC-Geol	SCS Curve HMS	Number Gr	id using	g Assignment/Test
3	03	Specificati	S: Model C	-		
4	04	Developin and Auto-	g a HEC-HI - calibration of	MS Model f Model)	(Manua	l Assignment/Test
5	05		g a HEC-HI Calibration, V		(Manua	1
6	06	Developin hydrograp	g a HEC-HMS h	S Model (Ro	outing a	
7	07	Developin		IEC-HMS 7)	Mode	l Assignment/Test
8	08	Sensitivity	v analysis			
9		Mid Quiz				
10	09	Introduction grids	on into grid ge	eneration for	flexible	Assignment/Test
11	10	Introductio	on on bathyme	etry interpola	tion	
12	11	Set-up of l this model	nydrodynamic	model and r	running	Assignment/Test
13	12	Introductio	on on post pro	cessing.		
14		Final Quiz	and Presentat	tion		
ASSESS	SMENT ST	RATEGY				
	Componer		Grading	CO	-	Bloom's Taxonomy
	ous Assess		50%	CO1, CO2,	CO3	C2, C4, C5
		Mid Term/				
Active C Presenta	(lass Partic	ipation/				
riesenta				<b>GO1 GO</b>	<u></u>	
	Quiz		50%	CO1, CO2,	03	C2, C4, C5
	Total Mar ENCE BC		100%			
			of Large Wat	ershed Hydr	ology V	ijay P. Singh, Donald
	K. Frevert		or Large Wat	ersneu rryur	ology, v	ijay i . Singh, Dollaid
-			ic Modeling U	sing GIS, B	axter E.	Vieux.
	Lab Manua		0 -	Č ,	-	

Course Code: EWCE 469       Credit Hour: 2.0         Course Title: Mathematical Modelling in Water Resources       Contact Hour: 2.0         PRE-REQUISITE       Contact Hour: 2.0         MATH 101 (Differential and Integral Calculus), EWCE 205 (Numerical Methods), CSE 278 (Computer Programming and Computation Sessional)       CURRICULUM STRUCTURE         Outcome Based Education (OBE)       SYNOPSIS/RATIONALE       This course is an introduction to mathematical modeling to use elementary functions to investigate and analyze real-world data, applied problems and questions, supported by the use of appropriate technology, and on effective communication of quantitative Concepts and results.         OBJECTIVE       1. To model situations from a variety of settings in generalized mathematical forms.         2. To express and manipulate mathematical information, concepts, and thoughts in verbal, numeric, graphical and symbolic form while solving a variety of problems.         3. To solve multiple-step problems through different modes of reasoning.         4. To properly use appropriate technology in the evaluation and analysis.         COURSE CONTENT         Concepts of mathematical modeling, differential equations and solution techniques: method of characteristics, finite difference and finite element methods, consistency, stability and convergence of numerical schemes, schematization and boundary conditions, calibration and validation, practical application in modeling river flow, groundwater flow, coastal water and advection-dispersion processes.         SKLL MAPPING (CO – PO MAPPING)       I       I       I	COUR	SE FORMATION												
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CO1	variety solving includin algebrai linear ar non-line	strategies g geometric and c techniques ad	1, 2	C3, C4	1, 2	_	2	Assg/T, M,F	
CO2	develop	nputational tools to mathematical and evaluate their	5	C5, C6	1, 2, 3	_		<b>∆</b> as <b>≈</b> /T	
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	Pr - Pr	est, PR – Project, Q esentation, R – Repo	ort, F – F	inal Exa		n Exan	n, Asg	– Assignment,	
		ND LEARNING ST	RATEG	1					
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	rected Le	-					05		
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	home	c c 1 ;					18		
•	Preparati	on for final examina	ation				10		
Formal	Assessme								
•		us Assessment					02		
•	Final Exa	mination					03		
		Total					80		
		HODOLOGY	1 1 4	1					
		ssion, Problem Base	a Metho	d					
	SE SCHEI								
Week	Lect	Topics to be Cov	vered				Asses	ssment	
1	ure 1	An Introduction t	o Math-	motical					
1	1	Modeling	lo maine	matical					
	2	Modeling Scales	and Rep	resentat	ion				
2	3	Classification of					CT/ A	Assignment/	
	4 Stages of modeling							Exam	
3	3 5 Building Models: System								
	6	natical e	quation	5:					
		Equations from the							

		literature			
4	7		ions: Dimensionless f	orm	
•	8		ions: Asymptotic beh		
5	9		ions: Numerical Meth		CT/ Assignment/
5	10		ions: Numerical Meth		Final Exam
6	10		ions: Numerical Meth		
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	12	schemes,	convergence of nu	mencai	
7	13	,	n and boundary cond	itions	
/	13	Model calibrat		nuons.	
8	14	Sensitivity and			Mid Term/
0	15				Assignment/ Final
9	10	Modelling mo		noturo	Exam
9	17		sumptions, Model Str	ucture	
10			odel parameters		
10	19	Comparison o		Decision	
	20	Using mode	ls: Predictions, E	Jecision	
11	21	Support	antion in moduling di		
11	21	Practical appli	cation in modeling riv		
	22			odeling	
12	23	groundwater f			
12	25		ication of modeling	coastal	
	24	water			
10	24		ection-dispersion pro		CT/ Assignment/
13	25	Mathematical	U	ods to	Final Exam
	26	analyze big da		1 (	
	26	Mathematical	modelling metho	ods to	
1.4	27	analyze big da			
14	27	Project Submi			
ACCEC	28	Project Submi	ssion		
		TRATEGY	L C O		• 75
Compo		Grading	СО	Bloon	n's Taxonomy
Continu					
Assessn	nent				
(Class					
assignm		40%	CO1, CO2		C3,C4,C5,C6
CT/ Mie		1070	001,002		03,01,05,00
Active (					
Particip	ation)				
Final	Exam	60%	CO1, CO2		C3,C4,C5,C6
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	RENCE B				
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			cal Modelling Glenn		1
			cal Modeling, Edward		ier.
3. Ma	athematica	al Modeling and S	imulation, Kai Velter	۱.	

3. Mathematical Modeling and Simulation, Kai Velten.

COURSE INFORMATION	
Course Code: EWCE 471	Credit Hour: 3.0
Course Title: Coastal Engineering	Contact Hour: 3.0
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	

### SYNOPSIS/ RATIONALE

In this course students will be able to learn the basics of coast and coastal features; deltas and estuaries; tide; wave; storm surge; tsunami; port, dock and harbour; wave forces on coastal structures; coastal sedimentation processes. After this course, they will become skilled at designing and constructing different types of shore protection works, enhancing their skills of designing coastal structures in professional life.

#### OBJECTIVE

- 1. To understand characteristics of tides, theory behind tidal analysis and prediction, tidal flow measurement
- 2. To understand and apply the principles of coastal processes, sediment transport, deltas and delta management plan, estuary and estuarine control
- 3. To be skilled at fundamental concepts in designing shore protection works.

### COURSE CONTENT

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

SKIL	L MAPPING (CO – PO MA	APP	ING	)									
No	Course Outcome	P	ROC	GRAN	ΛOL		OME	S (PC	Ds)				
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Understand the coastal and estuarine processes, including the formation of coastal features, deltas, and estuaries and analyze the key factors influencing coastal zone dynamics. CO2: Analyze tides and currents, including the measurement of tidal flows and understand the forces of waves and tides and their impact on the design of apactal and												
	the design of coastal and harbor structures.												
3	CO3: <b>Apply</b> knowledge of wave characteristics and forces to design coastal and harbor structures and the ability to incorporate considerations such as tidal flow, wave impact, and coastal water level fluctuations in the design process.	$\checkmark$											
4	CO4: <b>Analyze</b> and assess coastal hazards, including storm surges, tsunamis, and basin oscillations.		$\checkmark$										
5	CO5: <b>Apply</b> engineering principles to address												

	erosion, sedimentation, and other challenges in coastal areas, ensuring sustainable and effective solutions and proficiency in the design and planning of shore protection works.	SKILLS					
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods
CO1	<b>Understand</b> the coastal and estuarine processes, including the formation of coastal features, deltas, and estuaries and <b>analyze</b> the key factors influencing coastal zone dynamics.	1	C2,C4	1	_	1	Pop Quiz, Final Exam
CO2	Analyze tides and currents, including the measurement of tidal flows and understand the forces of waves and tides and their impact on the design of coastal and harbor structures.	1	C2,C4	1	_	1	Class Test, Mid-Term, Final Exam
CO3	<b>Apply</b> knowledge of wave characteristics and forces to design coastal and harbor structures and the ability to incorporate considerations such as tidal flow, wave impact, and coastal water level fluctuations in the design process.	1	C3	1	_	1	Mid-Term, Final Exam
CO4	<b>Analyze</b> and assess coastal hazards, including storm surges, tsunamis, and basin oscillations.	2	C4	1	_	1	Class Test, Mid-Term, Final Exam
CO5	<b>Apply</b> engineering principles to address erosion, sedimentation, and other challenges in coastal areas, ensuring sustainable and effective solutions and proficiency in the design and planning of shore protection works.	3	C3	1	_	1 , 5	Class Test, Final Exam
	WP= Washington Accord Con Solving; EA= Engineering Activities/ CA= C Knowledge Profile/ KP= Knowledge Profi	Complex		-			

	*Level of B	loom's Taxonomy:						
			C5 - C6 -					
	Remember			Create				
		R – Project, Q – Quiz, M		Asg – Assignment, Pr				
		<u>on, R –Report, F – Final I</u> LEARNING STRATEGY						
		ing Activities						
	o-face Learnin	0	Engagement (Ho	juis)				
		g s/week × 14 weeks)		42				
Self- D	irected Learni							
•	Non-face-to-	face learning		09				
•	Revision of t	he previous lecture at		18				
	home							
•	Preparation f	for final examination		46				
Formal	Assessment							
•	Continuous A			02				
•	Final Examin	nation		03				
	]	Fotal		120				
TEACH	ING METHO							
Lecture	and Discussio	n, Problem Based Method	1					
	SE SCHEDU							
Week	Lecture	<b>Topics to be Covered</b>		Assessment				
1	1	Definitions and nomenc						
		zones, Typical beach pro						
	2	Coastal diversity, human						
			coastal					
	3	Factors influencing						
2		morphology and process	ses					
2	3	morphology and process Tides and coastal proc	ses cesses: Terms and					
2		morphology and process Tides and coastal proc Definitions, Characteris	ses cesses: Terms and					
2	4	morphology and process Tides and coastal proc Definitions, Characteris chart	cesses: Terms and atics of tides, Tide					
2		morphology and process Tides and coastal proc Definitions, Characteris chart Theory behind tidal anal	ses cesses: Terms and stics of tides, Tide ysis and prediction,					
2	4	morphology and process Tides and coastal proc Definitions, Characteris chart Theory behind tidal anal Methods of tidal analysi	ses cesses: Terms and tics of tides, Tide ysis and prediction, s and prediction	CT/ Assignment/				
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	<u>14</u> 15			basts, delta morphol				
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6		16   Delta management plan   Mid Ter						
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	21			essment and repor	ting of			
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8	22			and Sediment Dyna	mics of			
			l Inlets					
	23			e Ecosystem				
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	26			astal Modelling				
	27			Types, port tern	ns, site			
			tion, feature					
10	28			g and Layout				
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	35		n type of arm			Final Exam		
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13	37	Desi	•	1	works:			
				pose, applicability				
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	ENCE BO		100 /0					
	rensen, R.M		Basic Co	astal Engineering	Red Editio	on. Springer, 324pp.		
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Coastal Engineering-2 by R Silverster.
 Shore Protection Manual, U.S. Army Coastal Engineering Research Center.

6. Estuary and Coastline Hydrodynamics, A.T. Ippen (ed.): McGraw-Hill Book Co., Inc., 1966.

COURS	SE INFORMATION												
	Code: EWCE 475									dit He		2.0	
	Title: Urban Hydrology	7							Cor	ntact I	Hour: 2	2.0	
	EQUISITE												
	63 (Hydrology)	_											
	CULUM STRUCTURE												
	ne Based Education (OB	SE)											
	PSIS/ RATIONALE			1 1		.1					1		
This course will provide a detailed knowledge of the main processes in urban areas during													
rain events, design storms, losses, inlet systems, hydraulic calculus and CSO problems, and the tools to develop a project of a sewer system emphasizing the hydrologic and hydraulic													
behavio		or a se	wei	r syst	em e	empn	asizi	ng th	e ny	arolo	gic and	a nyara	unc
OBJEC													
	Introduce the concept of	Urba	n Di	rainad	te ar	d the	ohie	ective	NC 90	sociat	ed to t	he drain	age
	system	UIUa		lamaz	se ai		, obje		<i>is</i> as	sociat			lage
	Introduce the main desig	on crit	eria	used	in d	raina	ge sy	vstem	IS.				
	Description of the differ									nts.			
	SE CONTENT		<u> </u>						-				
Hydrole	ogic cycle in urban envi	ironme	ent,	Urba	niza	tion	and S	Storn	iwat	er Ru	noff, R	ainfall	and
	Analysis for Designing												
	ater Detention for Quar												nent
	es for Urban Stormwater				ol, U	Jrbar	stor	mwa	ter (	Comp	uter M	odels.	
	MAPPING (CO – PO N			,	011	TGO			<u></u>				
No	Course Outcome		1	RAM		1	1	<u> </u>	- <u> </u>		10	11	1
		1	2	2 3	4	5	6	7	8	9	10	11	1 2
1	CO1: Understand												
1	the natural factors												
	that regulate	v											
	hydrologic processes												
	in urban areas.												
2	CO2: Estimate and												
	regulate the use of												
	surface water and												
	groundwater												
3	resources.		7										
3	CO3: Analyze recent models on		V										
	urban storm water												
	management and												
	sustainable urban												
	drainage.												
COURS	SE OUTCOMES & GE	NERI	CS	KILL	S								
No	Course Outcome		Τ	ρn					T				
				ling		*					t		
				Corresponding POs	1	Faxonomy*					Assessment	Q	
				esp		ino Ino					uss boy	nor	
				Corre		Taxonoi	Ь		۲ I	Ч	Assessm	Indu	
				ΩĂ	È	άË	CP	C	ر ا	KP	A	Ň	
CO1	Understand the m	atural	T	1		C2	1		_T				
	factors that re	gulate		1		C2			_	1, 3	As	ssg/T, F	

	hydrologic processes in										
	hydrologic processes in urban areas.										
	urbuit areas.										
CO2	Estimate and regulate the										
	use of surface water and	2	C2	2	—						
	groundwater resources.					1, 4	T, M, F				
CO3	Analyze recent models on										
	urban stormwater										
	management and sustainable	2	C4	4 1	4 1	4 1	1	1		1 2	Assg/T, F
	urban drainage.					1, 3					
	WD-Washington Assaud Co	malar D	mahlam	Salvin	$\sim / CD$	Comm	lay Duchlam				
	WP= Washington Accord Co Solving; EA=	mplex P	roblem	501V1n	g/ CP:	= Comp	lex Problem				
	Engineering Activities/ CA=	Comple	x Activi	ities [.] W	VK - W	Jashing	ton Accord				
	Knowledge	compie		nies, w	- IX- V	asining					
	Profile/ KP= Knowledge Pro	file									
	*Level of Bloom's Taxonom										
	C1 – C2 – C3- Apply		C5 -								
	Remember Understand	Analy	ze	Eva	luate	C	Create				
		0 · 16	10.17	n -							
	(T – Test, PR – Project, Q – Q			Ferm E	xam, A	Asg – A	ssignment, Pr –				
	Presentation, R – Report, F – HING AND LEARNING STRA		am)								
		AIEUI		Engo	aomon	t (Hour	(a)				
	ing and Learning Activities -face Learning			Eliga	gemen	it (110ui	5)				
• Le	0			28							
_	actical/ Tutorial/ Studio										
• 50	Ident – Centered Learning										
Calf D											
	rected Learning					05					
•	Non-face-to-face learning		-	10							
	Revision of the previous lecture		e	32							
	Preparation for final examination	n				52					
Formal	Assessment										
•	Continuous Assessment			02							
•	Final Examination			03							
	Total			80							
	NG METHODOLOGY										
	and Discussion, Problem Based	Method									
	SE SCHEDULE				-	•					
Week	LectureTopics to be Control1Introduction: Hyperbolic		cal Cuc	10		Asses	sment				
1	1Introduction: Hy2Rainfall-runoff										
2	3 Rainfall-runoff	0									
-	4 Unit hydrogra	0	heory a		ban						
	hydrology appli	<b>•</b>				~.	· · · · ·				
3	5 Unit hydrogra		heory	and urł	ban		/ Assignment/				
	hydrology appli		5				Final Exam				
	6 Flood frequenc		luction	to							
	frequency analy	-			<u>y</u>						
	applications.										
4	7 Flood frequenc	y: Introd	luction	to							
	frequency analysis and urban hydrology										

2	6	Sustainable approaches:	urban drainage: small, medium, large.	design	Final Exam
	6		small, medium, large.	dagiar	CT/ Assignment/
10 2	-		U	acoign	CT/ Assignment/
13 2	5	Sustainable	urban drainage:	design	
		models			
2	4		iroan drainage: catchm	ent	
	4		Irhan drainage: catchm	ent	
		models	-		
12 2	5		irban drainage: catchm	ent	
12 2	3			ent	
		control techn			
2	2		U	uice	
2	2	Sustainable	urban drainage: So	urce	
2	2			urce	
	-				
		control techn	iques		
2	-				
11 2	1			uice	
11 2	1			urce	
11 2	1	Sustainable	urban drainage: So	urce	
11 2	1	Sustainable	urban drainage: So	urce	
11 2	1			urce	
11 1 2	1			urce	
	1	Stormwater 1			
11 1 1	1				
11 1 2	1			urce	
11 2	1	Sustainable	urban drainage: So	urce	
11 2	1	Sustainable	urban drainage: So	urce	
11 2	1	Sustainable	urban drainage: So	urce	
11 2	1	Sustainable	urban drainage: So	urce	
11 2	1			urce	
2	-				
		control techn	iques		
2	2			urce	
2	2	Sustainable	urban drainage: So	urce	
2	2		U	uice	
			U		
12 2	3			ant	
12 2	3	Sustainable u	ırban drainage: catchm	ent	
12 2	5		irban drainage: catchm	ent	
12 2	5		aroan aramage. cateinn	-111	
			e		
		models			
	<del>.  </del>				
	4		ade an alas in the state of the	a	
2	1		rhan drainaga, astahm	ant	
2	4	Sustainable	ırban drainage: catchm	ent	
	4		noan dramage: catchm	UIII	
			0		
		models			
12 2	-		1 1 1	1 .	
13 2	5	Sustainable	urban drainage.	design	
1.5 2	5		U	uesign	
		annroachee	•	-	CT/ Assignment/
2	6			design	
2	0		0	uesign	Final Exam
			0	Ŭ	
		approaches:	small, medium, large.		
14 2	7				
			rban Hydrology		
2	8	Review of U	rban Hydrology		
			I Dall Hydrology		
ASSESSME	NT STRAT	FGY			
HODEODIME	NISIKA	EGI		1	
Component	e	Crading	CO	Bloom's	Taxonomy
Component	S	Grading	CO	<u>BI00</u> m's	s Taxonomy
				1	•
Continuous					
Assessment					
(Class assign	ments/	400/	CO1 $CO2$ $CO2$		C2 C4
•		40%	CO1, CO2, CO3		C2, C4
CT/ Mid Ter	m/ Active		, - ,		,
CI/ Mild Ter	III/ ACTIVE				
Close Doution	nation)				
Class Partici	pation)				
	. /				
Final E	lxam		CO1, CO2, CO3		C2, C4
i mai E	mann	60%	CO1, CO2, CO3		$C_{2}, C_{4}$
		00%			
Total M	Iarka	100%			
Total N	Tarks	100%			
REFERENC				•	

5. Kiran Tota-Maharaj. Permeable Pavements for Urban Stormwater Runoff

6. Enhancement and Reuse. VDM Verlag Dr. Müller, 2011.

7. Martin P. Wanielista, Yousef A. Yousef. Stormwater Management. New York: Wiley-Interscience, 1992

COU	JRSE INFORMATION												
Cou	rse Code: EWCE 479								Cre	edit H	Iour:	2.0	
Cou	rse Title: Groundwater H	ydrolo	gy						Co	ntact	Hour:	2.0	
	-REQUISITE	<u> </u>	0.										
Non													
CUF	RRICULUM STRUCTUF	RE											
	come Based Education (O												
SYN	OPSIS/ RATIONALE												
its o and influ grou intru coas	is course students will be ccurrence, physical prop well hydraulics, groundw lences, water mining and indwater pollution and c usion in aquifers, groundw tal structures in professio ECTIVE	erties ater re land s ontam vater r	and sour subsi inan nana	prind ce ev denc t tra	ciples aluat e. At nspor	s of g tion, fter tl rt, re	groun groun his c char	ndwa ndwa ourse ge oi	ter n iter le they f gro	nover evels y will oundy	ment, and er l have vater,	ground vironm experti saline	water iental se on water
1.		sics o	f gro	ound	wate	in i	hvdr	ologi	c cv	cle a	nd its	occurr	ence.
2.	physical properties and principles of groundwater movement, groundwater and well hydraulics.												
	sical properties and princ	• 1	C	1						•,		· 1	<u>C1</u>
prop intru aqui	, hydraulics of pumping a verties, groundwater-surfa usion, groundwater minin fer systems. LL MAPPING (CO – PO	ice wa g and	ter i land	ntera l sub	ctior	is, gr	ound	lwate	r pol	llutio	n and	saline	water
No	Course Outcome				OUT		<b>JES</b>	(PO)	3				
110	Course Outcome	1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: <b>Understand</b> the basics of groundwater in hydrologic cycle and its occurrence, physical properties and principles of groundwater movement, groundwater and well hydraulics.												
2	CO2: <b>Apply</b> knowledge regarding groundwater resource evaluation, pollution and contaminant transport, recharge of groundwater, saline water intrusion in aquifers, groundwater management JRSE OUTCOMES & G		$\checkmark$										

No	Course (	Dutcome								
			Corresponding POs	*/				nt		
			noq	Bloom's Taxonomy*				Assessment Methods		
			orres )s	noo xon	•	-	•	Assessm Methods		
			Corr POs	Bland	CP	CA	KP	As Mo		
CO1		nd the basics of								
	-	ter in hydrologic d its occurrence,								
	•	properties and	1	C2	1	_	5	CT/ Assign		
	principles	of groundwater						ment-1		
	movement well hydra	t, groundwater and								
CO2	•	nowledge regarding								
002	groundwa									
		n, pollution and								
	contamina	ant transport, of groundwater,	2	C3	1	_	3, 5	Mid Term/ Assign		
	saline w						-,-	ment-2		
	aquifers,	groundwater								
	managem	ent ashington Accord Com	nlay Dro	hlom So	luing/	CD - C	omnla	Droblom		
	WP = Wa Solving;		plex Pro	blem So	orving/ v	CP=C	ompies	A Problem		
	Engineer	ring Activities/ CA= Co	omplex A	Activitie	s; WK=	= Was	hingtor	n Accord		
	Knowled Profile/ I	lge KP= Knowledge Profil	0							
		f Bloom's Taxonomy:	C							
		2 – C3- Apply					C			
	Rememb	ber Understand	Analyze		Evalua	te	Cre	ate		
		t, PR – Project, Q – Qu			n Exam	, Asg -	– Assig	nment, Pr –		
ТЕАСИ		tion, R –Report, F – Fi LEARNING STRATI		n)						
		ning Activities		Engagement (Hours)						
	Face Lear				0		,			
		eek x 14 weeks)		28						
	Learning					1	0			
	Directed Le	ents (2 hours/week x 5 arning	weeks)				0			
		o-face learning				2	22			
• F	Revision of	the previous lecture at	home			1	5			
		for final examination								
Assessn	nent Ious Assess	ment					2			
	amination	mont					3			
TEACUT		Total		80						
		ODOLOGY on, Co-operative and C	ollabora	tive Me	thod P	roblen	n Raser	Learning		
(PBL)										
	E SCHEDU									
Week	Lectur e	Topics to be Cover	ed			As	sessme	ent		
1	1         Introduction to Groundwater Engineering         CT/ Assignment/									

	2		n hydrologic cycle a	nd its	Final Exam
	-	occurrence			
2	3	Groundwater in occurrence	n hydrologic cycle a	ind its	
	4	Physical prop movement	perties of ground	dwater	
3	5		perties of ground	dwater	
	6		oundwater movement		
4	7		oundwater movement		
-	8		d well hydraulics		Mid Term/
5	9				Assignment/ Final
5	10		d well hydraulics		Exam
			d well hydraulics		
6	11		d well hydraulics		
	12		source evaluation		
7	13		source evaluation		
	14	Groundwater influences	level sand environ	mental	
8	15	Groundwater influences	level sand environ	mental	Mid Term/
	16	Groundwater influences	level sand environ	mental	Assignment/ Final Exam
9	17		nd land subsidence		
	18		nd land subsidence		
10	19		ollution and contamination	ant	
-		transport			
	20		ollution and contamination	ant	
		transport			
11	21	Recharge of gro	undwater		
	22	Recharge of gro			
12	23	Recharge of gro			
	24	<u> </u>	rusion in aquifers		CT/ Assignment/
13	25		rusion in aquifers		Final Exam
	26	Groundwater ma			
14	27	Groundwater ma	*		
	28	Groundwater ma			
ASSESSI	MENT STR		~		
Compone	ents	Grading	СО	Bloom	's Taxonomy
Continuo					¥
Assessme	ent (Class				
assignme	nts/ CT/	40%	CO1, CO2		C2, C3
Mid Tern	n/ Active				
Class Par	ticipation)				
Fin	al Exam	60%	CO1, CO2		C2, C3
-	al Marks	100%			
	ENCE BOC			n	
		Hydrology" by – F	Rushton		
		Engineering" by –			
<i>2</i> . OI	and material	Submeeting by	- 544		

COU	URSE INFORMATION												
Cou	rse Code: EWCE 477								Cre	dit H	Iour:	2.0	
Cou	rse Title: Climatology								Co	ntact	Hour	r: 2.0	
PRE	-REQUISITE												
PHY	7 129												
	RRICULUM STRUCTUR												
	come Based Education (OI	BE)											
1	NOPSIS/ RATIONALE												
	course is aimed at provid									l pro	ocess	ses u	nderlying
	ospheric and weather phen	omei	na, in	clud	ing th	e cli	mate	syste	em.				
	ECTIVE												
	To provide students with a												
	Describe where energy con									•			•
	Students will be able to i												
	become familiar with the	tem	poral	and	spat	ial re	epres	entat	ion o	of es	senti	al cli	mate and
	meteorological variables												
	4. Meteorology topics include energy balance, moisture and cloud development in the												
	atmosphere, atmospheric dynamics, small- and large-scale circulations, storms and												
	cyclones, and weather forecasting.												
	5. Climatology topics include the interaction between the atmosphere and oceans over long												
	time periods, climate classification, and the potential for climatic change.												
	URSE CONTENT			_				-					
	ponents and structure of												
	(temperature and air pressure), The earth-atmosphere energy balance, atmospheric and ocean												
	circulation, interaction of ocean and atmospheric processes, climatic zones and classification, climate models, climate variability and climate change, anthropogenic effects on climate-												
-	nhouse warming, ozone	laye	r dej	pletio	on ar	nd se	ea le	vel	chan	ges,	extre	eme	events of
	gladesh.		DINK	71									
No	LL MAPPING (CO – PO Course Outcome				OUT	CON	IES (		\				
110	Course Outcome	1	2	3	4	5	6	103	8	9	10	11	12
1	CO1: Be able	-		-	-	-	-		-	-			
	to <b>learn</b> the definition												
	and characteristics of												
	climate components as												
	well as the radiation												
	balance, atmospheric												
	and ocean circulation,												
	and interaction of												
	ocean and atmospheric												
	processes												
2	CO2: Be able to				1		1		1				
	understand the												
	temporal and spatial												
	variation of earth's												
	climate with respect to												
	human activities												
COI	URSE OUTCOMES & GE	NER	IC S	KILI	LS								
No	Course Outcome												
			60										
			din		*						Jt		
			NON		s my						nei	s	
	1		sst		ло П						SSI	00	
	s s s s s s s s s s s s s s s s s s s												
			OIT	OS	loo axo	م.	V	م	1		sse	leth	
CO1	Be able to learn the defi		L Corresponding	PUS	D Bloom's D Taxonomy*		CA	КÞ	1		Assessment	Methods	ss Test,

	and charac	teristics of clima	te					Final Exam			
	component										
1	balance,	atmospheric an	nd								
		/	nd								
i	interaction	of ocean an	nd								
		c processes.									
		to understand th	-					Class Test,			
		nd spatial variation		C4			1, 2	Mid Term Exam.			
		limate with respe	ct	Ст			1, 2	Final Exam			
	to human a										
	WP= Wash EA=	ington Accord Co	omplex Pro	oblem S	olving	g/ CP= Co	mplex P	roblem Solving;			
		a Activities/CA-	Complex	ac W	K-Wash	ington A	ccord Knowledge				
		= Knowledge Pro		Activiti	cs, w		ington A	ccolu Kliowicuge			
		Bloom's Taxonom									
	C1 –	C2 –	C3-	C4 –		C5 -		C6 –			
	Remember	-		Analy	ze	Evalı	iate	Create			
		Chadristand	· · · PP·J	1 maij		Litur	auto	ciculo			
		R – Project, Q – Q n, R –Report, F –			n Exa	m, Asg –	Assignm	ent, Pr –			
		ND LEARNING S									
		earning Activities		, ,	Er	ngagemen	t (Hours	)			
	to-face Lea					igagemen	t (110uis	)			
I acc i		2 hours/week $\times 1^{\circ}$	( wooke)				28				
	Lecture (	$2 \text{ Hours/ week} \land 1$	+ weeks)				20				
Guide	d Learnin	g			6						
		nents (1 hours/we	$ek \times 6$ we	eks)							
Self-I	Directed Le	arning									
•	Non-face	e-to-face learning					10				
•	Revision	of the previous le	cture at h	ome			11				
•	Preparati	on for the final ex	amination								
	I						20				
Forma	1 Assessme	ent									
e)	Continuou	is Assessment			2						
f)	Final Exar	mination			3						
		Total					80				
		HODOLOGY									
Lecture	and Discus	sion, Problem-Bas	ed Method	1							
	an										
	SE SCHE		1								
		Topics to be Co	vered				Asses	sment			
1	01	Introduction					4				
L	02	Greenhouse effe					4				
2	03	Global warming					4	CT 1			
	04	Climate					4				
3	05	Water vapor in a		nospher	ic coli	umn	4				
	06	Perceptible wate									
4	07	El Niño-Souther		10n (EN	SO)		4				
5	08	La Niña conditio									
5	09	The Atmosphere	e and Clim	nate							
	10	Climate zones					- N	lid Term Exam			
6	11	Climate of Bang									
-	12	Layers of atmos					4				
7	13	Atmospheric cir					4				
1	14   Thermohaline circulation										
8	15	Ozone and Ozo	0.01104			1	CT 2				

	16	Ultraviolet radia	tion			
9		Ozone depletion				
	-	Ozone hole				
10	19	Antarctic ozone	hole and Arctic ozone hole			
	20	Environmental e	ffects of ozone depletion			
11		Air pollution and	l climate			
	22	Influence of met	eorology and topography o	n air		
		pollution				
12		Smog and photo				
	24	Acid Rain and ef		CT 3		
13	25	Hazards of Bang				
	26	Flood and Droug				
14	27	GCM and RCM				
	28	Energy balance of	liagram			
ASSES	SMENT ST					
Compo	nents	Grading	СО	Bloon	n's Taxonomy	
Continu	ous					
Assessn	nent					
(Class a	ssignments/					
CT/ Mic	•	40%	CO1, CO2		C1, C4	
Active (						
Participa						
Fin	al Exam	60%	CO1, CO2	C1, C4		
Tota	al Marks	100%				
REFER	RENCE BO	OKS				

1. Physical Climatology (in greek), H. S. Sahsamanoglou and A. A. Bloutsos, Zitis Publications, Thessaloniki, Greece (1998).

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

COURSE INFORMATION	
Course Code: EWCE 481	Credit Hour: 2.0
Course Title: Climate Change and Disaster Management	Contact Hour: 2.0
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ RATIONALE	
This course aims at supporting the global agenda of managing t	he risks associated to climate
change through increased knowledge and awareness. It explore	s the inter- linkages between
disaster risk management and climate change adaptation and ou	tlines strategies, methods and
tools for integrated climate risk management.	-
OBJECTIVE	
1. To get better understanding of the implications of clin	nate change for disaster risk
management.	-
2. To improve the understanding of the impact of global climate	ate change on weather- related

- 2. To improve the understanding of the impact of global climate change on weather- related hazards, such as floods, heat waves, droughts and storms.
- 3. To get acquainted with challenges for disaster risk management.

COURSE CONTENT

COURS	SE CONTENT													
This cou	urse aims at supporting	g the	glob	al ag	enda	of m	nanag	ging t	he ri	sks a	ssociat	ed to c	limate	
	through increased kno													
	risk management and													
	r integrated climate ris					•					0			
	MAPPING (CO – PO I													
No	Course Outcome	PRO	OGR	AM (	OUT	COM	IES (	(POs)						
		1	2	3	4	5	6	7	8	9	10	11	12	
1	CO1: Ability to													
	understand the													
	causes and effects													
	of climate change to													
	deal with disaster													
	management.													
2	CO2: Ability to													
	explain													
	environmental													
	hazards, risk and		V											
	vulnerability due.													
3	CO3: Ability to													
	explain the principle													
	of resilience,													
	adaptation, $$													
	mitigation and													
	preparedness in													
	response to disasters.													
COURS	E OUTCOMES & GE	NER	IC S	KILI	LS				•					
No	Course Outcome	Corresponding	POs	Bloom's	1 axonomy*	CP		CA	Kb			Assessment Methods		
CO1	Ability to understa	nd												
	climate	ets to ter 1 nd		С	2	1		1	1			Test, Term E nal Exa		
CO2	Ability to expla environmental hazard risk and vulnerabili due to repeat occurrences of climat extreme even disasters.	ls, ity ed 2 tic ts/		С	22	1	]	1,3	2		Class Test, Mid Term Exam, Final Exam			
CO3	Ability to explain t principle of resilient adaptation, mitigation and preparedness response to disasters.	ce, on 4 in		C		lore		1,3	1 D- C		Final Exam			
WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving;EA=Engineering Activities/ CA= Complex Activities; WK= Washington AccordKnowledge Profile/ KP= Knowledge Profile														

	*Level	of Bloom's Taxonomy:				
	C1 –	C2 –	C3-	C4 –	C5 -	C6 –
	Remem	ber Understand	Apply	Analyze	Evaluate	create
		, PR – Project, Q – Quiz			m, Asg – Ass	ignment, Pr –
		ation, $R$ – Report, $F$ – Final Physics of the second se		n)		
		ND LEARNING STRA	IEG I	Engagomo	nt (Hours)	
	o-face Lea	earning Activities		Engageme	III (HOUIS)	
race-t		$2 \text{ hours/week} \times 14 \text{ week}$	eks)		28	
	Lecture		<b>(K</b> 5)		20	
	d Learnin	0			6	
		nents (1 hours/week $\times$	6			
weeks)						
Self-D	Directed Le	-			0	
•		e-to-face learning			9	
•		of the previous lecture	at		18 46	
	home				40	
Eormal	Preparati	on for the final examination	ation			
		is Assessment			2	
	Final Exa				23	
		limitation			5	
		Total			120	
TEACH	ING MET	HODOLOGY				
		sion, Problem-Based Me	ethod			
	SE SCHE					
Week	Lecture	Topics to be Covered	1		Asse	essment
	01	Introduction to	weath	er, clin	mate,	
1		climatic parameters		1 11	1 1	
	02	Introduction to natu		d climate i	nduced	
	03	extreme events, disast Concept on anomalies		ate events		
2		Trend analysis on m			ency of	
_	04	climatic extremes/ disa				
3	05	Concept on hazards, r		vulnerability		
5	06	Relationship between			und risk	CT 1
4	07	Analysis on climate ri				011
	08 09	Case studies on Envir				
5	10	Sensitivity to environ				
	10		causes	and impac		
	11		zards	experience		
6		Bangladesh		-		Mid Term
	12	Dimensions of Disast	er: scale	e, vulnerabili	ty,	
		Disaster trends	1	<u> </u>		
7	13	History of natural natural disasters	disaster	, Classificat	tion of	
	14	Causes and impacts of	fnatura	ldisasters		
		Vulnerability analy			ssment,	
8	15	resource requirement	nt, defin	ning an acc		
0		level of risk				
	16	Risk assessment: nat			f risks	
9	17	Risk perception and n			rick	
7	18	Strategies and policy management	ior integ	grated chimate	5 118K	
10	19	Methods and tools use	ed for in	tegrated clim	ate risk	
			225	<u> </u>		

		management			
		management	sastar loss	s: Environmental con	trol
		hazard resistar			
	20	information,	forecas		ning
		technologies, l			iiiig
				sures: non-structural	and
	21	structural mitig		sures. non structurur	
11				rience and reduction	n of CT 2
11	22		smic ha		
		volcanoes	Shine na	izardis cartifqui	iicos,
			nent		
	23	hazards: lands	nagement lides, aval	for mass mover anches	none
12				or atmospheric haza	ards:
	24	cyclones, storn			
	25	Disaster mana	agement f	or hydrological haza	ards:
13	25	flood, drought		2 6	
15	26	Disaster mana	igement fo	or technological haza	ards:
	20	industrial acci			
	27	Early warning	systems	for disaster prepared	ness
14	-	in Bangladesh			
	28		gement pr	actices in Bangladesh	1
ASSESS	SMENT S	TRATEGY			
Compo	nents		Grading	СО	Bloom's Taxonomy
Continu	ous Assess	sment			
(Class a	ssignment	s/ CT/ Mid	400/	CO1 CO2	<u> </u>
Term/ A	ctive Clas	s Participation)	40%	CO1, CO2	C2
		<b>•</b> •			
	Final E	xam	60%	CO1, CO2, CO3	C2, C3
	Total N	Iarks	100%		
REFER	ENCE B	OOKS			
			Disaster M	anagement. Resilienc	e in Action: Challenges, and
					m, Basundhara Tripathy and
	eherun Ah		2giv		,
			Reduction	& Management: Clin	mate Change And Natural
		Madu Christian		et intuningenient. eni	
	custors by		)		

COURSE INFORMATION													
	rse Code: EWCE 483								Cre	dit H	lour.	2.0	
-	rse Title: Building Service	s								ntact			
	-REQUISITE								00.		1100		
	CE-331 (Water Supply En	noinee	erino	$\overline{\mathbf{D}}$ E	WCF	-333	(W:	aste 1	Wate	r En	oinee	ring	and
	tation)			,, _	II CL		(		i i ace	1 217	5		una
	RRICULUM STRUCTURI	E											
	come Based Education (OF												
	NOPSIS/ RATIONALE												
	course introduces student	ts to n	lum	bing	syste	em –	wate	er sur	pply.	wast	e wa	ter di	rainage.
	storm drainage, house wiring, air conditioning, lift, generator, firefighting etc in a multistoried building. This will help the students to design the services in a building in their												
	professional life.												
	OBJECTIVE												
	1. To learn about the major facilities/ services required for better living in buildings, especially in high rise buildings including plumbing, wiring and other electrical and												
	mechanical installations.												
	and storm drainage system and water storage system. 3. To design rain water harvesting system, firefighting facilities etc.												
	COURSE CONTENT												
-	Introduction to plumbing, water requirements in a building, water supply and distribution in												
	buildings, plumbing of multistoried buildings, design and construction of septic tanks, soak												
	s and subsurface drain field												
	handling unit, generator a												
	water harvesting unit, sola									sum	ation.	5 111 0	unung,
	LL MAPPING (CO – PO I				51111	15, 11		cupe.					
No	Course Outcome				OUT	CON	IES (	(POs)	1				
110		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be skillful to			-	-	-	-	-	-	-			
	estimate water												
	requirement and use												
	for various purposes in												
	different types of												
	building usage.												
2	CO2: Be able to <b>design</b>												
_	plumbing system for												
	water supply, sewage												
	and storm sewage,												
	ventilation, fire-												
	fighting, air												
	conditioning.												
3	CO3: Be proficient to												
5	understand the design												
	basics for lift installation,												
	generator												
4	-												
4	CO4: Be expert in												
	designing rain water												

other electrical and mechanical installations in buildings.											
COURSE OUTCOMES & GENERIC SKILLS											
NoContres OntcomePOsCorrespondingPOs <trr< td=""><td>Assessment Methods</td></trr<>	Assessment Methods										
CO1 Be skillful to       estimate water         requirement and       use for various         purposes in       1         different types       C4         of       building         usage.       1	Class Test, Final Exam										
CO2 Be able to <b>design</b> plumbing system for water supply, sewage and storm sewage, ventilation, fire- fighting, air conditioning.	Mid-term, Final Exam										
	Class Test, Mid- erm, Assignment Final Exam										
CO4 Be expert in designing rain water harvesting system and other electrical and mechanical installations in buildings.       C5       1,3,5       -       5,6	Presentation, Final Exam										
buildings.WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 – Remember C2 – Understand C3- Apply C4 – Analyze C5 - Evaluate C6 – Create(T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R –Report, F – Final Exam)											
TEACHING AND LEARNING STRATEGY											
Teaching and Learning Activities Engagement (Hours)											

Face-to-	-face Learning						
	Lecture (3 hou	$rs/week \times 14$	28				
weeks)			-				
	irected Learning	J					
	Non-face-to-fa		5				
	Revision of the	-	12				
•	lecture at home	-	12				
			30				
•	Preparation for	innai					
<b>F</b> 1	examination						
Formal	Assessment		2				
•	Continuous As		2				
•	Final Examina	tion	3				
	Tatal		80				
TEACIU	Total	NOCY	80				
	NG METHODO						
	SE SCHEDULE	Problem Based Method					
Week	Lecture	Topics to be Covered	Assessment				
1	1	Introduction to plumbing	Assessment				
-	2	Water requirements in a building					
2	3	Water requirements in a building					
2	5	(cont.)					
	4	Water supply and distribution in					
	+	buildings	CT 1				
3	5	Water supply and distribution in					
5	5	buildings (cont.)					
	6	Plumbing of multistoried buildings					
4	7	Design and construction of septic					
-	,	tanks					
	8	Design and construction of soak					
		wells					
5	9	Design and construction of	Mid Exam				
		subsurface drain fields					
	10	Design and construction of septic					
		tanks, soak wells and subsurface					
		drain fields (cont.)					
6	11	House wiring					
	12	House wiring (cont.)					
7	13	Air conditioning (HVAC)					
	14	Air conditioning (HVAC) (cont.)					
8	15	Lift installation					
	16	Lift installation (cont.)	CT 2				
9	17	Air handling unit, generator and other electrical and mechanical	C1 2				
		installations in building					
	18	Air handling unit, generator and					
	10	other electrical and mechanical					
		installations in building (cont.)					
10	19	Rain water harvesting unit					
10	17	ixani watei naivesting unit					

	20	Rain water l	narvesting unit (cont.)					
11	21	Solar panel						
	22	Solar panel	(cont.)	CT 3				
12	23	Fire-fighting						
	24	Fire-fighting	g (cont.)					
13	25	Fire escape						
	26	Fire escape	(cont.)					
14	27	Review of the	he total syllabus					
	28	Review of the	he total syllabus (cont.)					
ASSESS	MENT STRAT	EGY						
Co	mponents	Grading	СО	Bloom's Taxonomy				
Continuous Assessment		100/						
Continuo	us Assessment	40%	CO1, CO2, CO3					
	us Assessment signments/ CT/	40%	CO1, CO2, CO3					
(Class as		40%	CO1, CO2, CO3					
(Class as	signments/ CT/ n/ Active Class	40%	CO1, CO2, CO3					
(Class as Mid Tern	signments/ CT/ n/ Active Class	40%	CO1, CO2, CO3					
(Class as Mid Tern Participat	signments/ CT/ n/ Active Class	40% 60%	CO1, CO2, CO3 CO1, CO2, CO3, CO4	C2, C3, C5				
(Class as Mid Tern Participat	signments/ CT/ n/ Active Class tion)			C2, C3, C5				
(Class as Mid Tern Participat Fin To	signments/ CT/ n/ Active Class tion) nal Exam	60% 100%		C2, C3, C5				
(Class as Mid Tern Participat Fin To <b>REFERI</b> 6. Build	signments/ CT/ n/ Active Class tion) nal Exam tal Marks ENCE BOOKS ling services eng	60% 100% gineering – D		Ed.				

COURSE INFORMATION	
Course Code: EWCE 485	Credit Hour: 2.0
Course Title: Environmental Management System	Contact Hour: 2.0
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ RATIONALE	
This course introduces students to environmental management s	system (EMS) requirements,
standards, implementation steps, tools and techniques. This wil	l help the students to apply
EMS basics and requirement in designing as well as impl	ementing projects in their
professional life.	
OBJECTIVE	
• To make the students understand about requirements and steps	s of EMS
• To familiarize the students with various EMS models	
• To learn about EMS standards, techniques and process tools.	
COURSE CONTENT	
Introduction to Management Systems, Requirements and E	lements of Environmental
Management Systems (EMS), The ISO 14001 EMS Model (Cu	rrent and Proposed to High
Level Structure), Scope and Applicability of ISO 14001 and ISC	0 14004, Purpose, Scope and
Benefits of EMS Standards, EMS Implementation, General R	equirements of ISO 14001,
EMS Tools and Techniques, Housekeeping, Practical application	ns of EM.
SKILL MAPPING (CO – PO MAPPING)	
No         Course Outcome         PROGRAM OUTCOMES (POs)	

		1	2	3	4	5	6	7	8	9	10	11	12	
understand requirements, s and steps of EMS	abo tandaro S.	1									10			
2 CO2: Be able to various EMS mod		e	$\checkmark$											
3 CO3: Be ab understand and the concept sustainable devel in the use of technologies.	apply o opmen EMS	y f t S						$\checkmark$						
COURSE OUTCOME	ES & G	ENERI	C SI	KILL	S			-			-			
No Course Outcome	Corresponding POs	Bloom's Taxonomy*		CP (WP)			CA (EA)		KP (W/K)			Assessment Methods		
CO1 Be able to understand about requirements, standards and steps of EMS.	1	C2		1			_					ss Test, l Exam		
CO2 Be able to <b>use</b> various EMS models	2	C4	1, 3			_			4			Class Test, Assignment, Final Exam		
CO3 Be able to understand and apply the concept of sustainable development in the use of EMS technologies.	7	C3		1, 3			_		1			Final Exam Presentation, Final Exam		
WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 – Remember C2 – Understand C3- Apply C4 – Analyze C5 - Evaluate C6 – Create														
(T – Test, PR – Presentation, R – TEACHING AND L	-Repor	t, F – Fi	nal	Exan	1)	Гerm	Exa	n, As	sg – A	Assig	nmer	nt, Pr	_	

Teachi	ing and Lear	ning Activities	Engagement (Hours)	
	-face Learnir			
		ours/week $\times$ 14	28	
weeks)				
/	irected Learn	ing		
		-face learning	5	
		the previous	12	
	lecture at ho	-		
	Preparation		30	)
	examination			
Formal	Assessment			
•	Continuous	Assessment	2	
•	Final Exami		3	
	I mai Exam	ination		
	Tota	1	80	)
TEACHI	NG METHO			
		n, Problem Based	Method	
COURS	SE SCHEDU			
Week	Lecture	To	pics to be Covered	Assessment
1	1	Introduction to	Management Systems	
	2	Requirements of	of EMS	
2	3	Elements of EM	AS I	
	4	Elements of EM	AS II	
3	5	The ISO 14001	EMS Model I	
	6	The ISO 14001	EMS Model II	
4	7	Scope of ISO 1		
	8	Applicability of		
5	9	Scope of ISO 1		_
	10	Applicability of		
6	11		and Benefits of EMS	CT 1
	12	Standards I	and Densfits of EM	_
	12	Purpose, Sco Standards II	pe and Benefits of EM	5
7	13		and Benefits of EMS	
,	15	Standards III	and Denentis of Livis	
	14		and Benefits of EMS	
		Standards IV		Mid-Term Exam
8	15	EMS Implement		
	16	EMS Implement		
9	17		rements of ISO 14001 I	_
10	18		rements of ISO 14001 II	
10	19	EMS Tools I		4
11	20	EMS Tools II	T	4
11	21	EMS Techniqu		4
10	22	EMS Techniqu		CT 2
12	23	Housekeeping		_
12	24	Housekeeping		-
13	25	Practical applic	ations of EMS I	

	26 Practical applications of EMS II													
14	27 Pi	ractical applications of EMS I												
	28 Pi	ractical applic	ations of EMS II											
	Components	Grading	СО	Bloom's Taxonomy										
Conti	nuous Assessment													
(Class	s assignments/ CT/													
	Ferm/ Active Class	40%	CO1, CO2, CO3,	C2, C3, C4										
Partic	cipation)													
	1													
	Final Exam	60%	CO1, CO2, CO3	C2, C3, C4										
	Total Marks	100%												
REFI	ERENCE BOOKS	5												
1.	Environmental Ma	anagement S	ystems- Christopher She	eldon, Mark Yoxon, 3 rd										
	Edition	-	- *											
2.	Environmental Mar	nagement Star	ndards- Alan S. Morris, Jo	hn Wiley & Sons, Ltd										
		U	-	•										
	Drace		0											

Press

# 5.2. Courses Offered by Department of Science and Humanities

Course Code: CHEM-103	Credit Hour:	3.0
Course Title: Fundamentals of Chemistry	Contact Hour:	3.0

Course Title: Fundamentals of Chemistry PRE-REOUISITE

None

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

## SYNOPSIS/ RATIONALE

To learn the basic concepts of inorganic, organic and physical chemistry

## **OBJECTIVE**

- 1. To define the different parameter and concepts of inorganic chemistry.
- 2. To apply different chemical theory to evaluate structure of molecules.
- 3. To explain the basic concepts of physical chemistry.
- To describe basic reaction mechanism of selective organic reactions. 4.

## COURSE CONTENT

Atomic Structure: Concepts of atomic structure, Different atom models, Quantum theory and electronic configurations, Heisenberg's uncertainty principle

dit Hour:

3.0

**Periodic Table:** Periodic classification of elements, Periodic properties of elements, Properties and uses of noble gases

**Chemical Bonding:** Types and properties, Lewis theory, VBT, MOT, Hybridization and shapes of molecules.

**Introduction to spectroscopic techniques:** Interaction of electromagnetic radiation with matter, atomic spectroscopy, UV-Vis spectroscopy, Beer-Lambert law.

Fundamentals of chromatography: Basic principle, classification.

Acids-Bases/Buffer Solution: Different concepts of acids-bases, Buffer solution, Mechanism of buffer solution, Henderson-Hasselbalch equation, Water chemistry and pH of water Theories of Acid-Base Indicators.

**Solutions:** Solutions and their classification, Unit expressing concentration, Colligative properties and dilute solutions, Raoult's law, Van't Hoff's law of osmotic pressure.

**Thermochemistry:** Laws of thermochemistry, Enthalpy, Hess's law, Heat of formation, Kirchoff's equations, Heat of neutralization, Heat of reaction.

Electrochemistry: Conductors & nonconductors, Difference between electrolytic and metallic conduction, Electrolytic conductance, Factors influencing the conductivity of electrolytes, Kohlrausch Law & conductometric titrations.

Chemical Equilibria: Equilibrium law/constant, Kp and Kc, Homogeneous and heterogeneous equilibrium, Van't Hoff's reaction isotherm, Le Chatelier's principle.

Chemical Kinetics: Order and rate of reaction, Pseudo and zero order reaction, Half-life, Determination and factors affecting the rate of a reaction, First order reaction, Second order reaction, Collision theory, Transition state theory.

SKIL	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome	PR	PROGRAM OUTCOMES (POs)										
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to define/identify the different parameters and fundamental concepts regarding inorganic and												

	physical chemistry,						
	analytical chemistry.						
	CO2: Be able to apply						
	different theories on						
2	chemical bonding and						
Z	hybridization to analyze						
	the structure of						
	molecules.						
	CO3: Be able to						
	explain/illustrate /derive						
	different theories based						
	on colligative						
	properties, chemical	<i>r</i>					
3	equilibrium, chemical	$\checkmark$					
	kinetics,						
	thermochemistry and						
	electrochemistry,						
	spectroscopic						
	techniques.						
	CO4: Solve/Analyze different problems						
4	different problems related to inorganic and						
	physical chemistry						
COU	RSE OUTCOMES & GEN	FRIC SK					
000.				[		1	
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods
CO1	Be able to define/identify the different parameters and fundamental concepts regarding inorganic and physical chemistry, analytical chemistry.	1	C1	-	-	1	Class Test, Final Exam
	Be able to apply					1	
CO2	different theories on	1	C3, C4	-	-	1,2	Class Test, Final Exam,
	the structure of molecules.						Assignment
CO3	equilibrium, chemical	1	C2	_	-	1,2	Assignment, Class Test, Mid Term, Final Exam
	kinetics, thermochemistry and electrochemistry,						

	spectrosco	onic											
	technique												
CO4		dyze different						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
			2				1.0	Class Test,					
	inorganic	related to and physical	2	C4, C5	-	-	1,2	Assignment,					
	chemistry	1.2						Final Exam					
			Complex	x Probler	n Solving/ C	CP= Comp	lex Proble	m Solving; EA=					
		ng Activities/ C.											
		P= Knowledge		-									
		Bloom's Taxon											
	C1 –	C2 –		- C4		C5 -		6 –					
	Remember Understand Apply Analyze Evaluate Create												
				I - Mid T	'erm Exam,	Asg – Ass	ignment, l	Pr – Presentation,					
		t, F – Final Exar											
		ID LEARNING											
		arning Activitie	S	E	ingagement	(Hours)							
Face-t	o-face Lea	rning											
•	Lecture						42						
•	Class Perfe	ormance					-						
Self- D	Directed Lea	arning											
•	Assignme	ents					36						
•	-	of the previou	us lectur	e at			18						
	home	r i r					18						
•		on for final exar	nination										
Forma	1 Assessme		mation										
		s Assessment					2						
0.	Final Exan				3								
11)		iniation					5						
		Total				]	120						
TEACH	ING METH	HODOLOGY					-						
		sion, Co-operat	ive and C	ollabora	tive Metho	d Problem	Based M	ethod					
	SE SCHEL			201140014		a, 11001011	I Dubed IVI	ettiou					
	Lecture		Covered				A	ssessment					
		General introd		n the im	ortance of								
	01	chemistry for				atomic							
1		structure											
	02	Different aton	n models										
	03	Quantum num	bers, Ele	ctronic c	onfiguratio	n							
	04	Hydrogen spe											
	04	principle						CT 1					
2	05	Classification		ents acco	ording to ele	ectronic		CII					
		configurations											
	06	Periodic class											
	07	Periodic prope		elements	Properties	and uses							
_		of noble gases											
3	08	Alkali metals:											
	09		operties, Lewis theory,										
		VBT)	4.01 41	() (07	\								
4	10	Molecular orb											
	11	Molecular orb	ital theor	y (MOT	)								

	12	Hybridization and sh	apes of molecules							
	13	Hybridization and sh			CT-2					
	14	Hybridization and sh								
5			magnetic radiation wit	h						
	15		troscopy-basic principl							
	16	Atomic Spectroscopy		-						
6	17	UV-Vis spectroscop								
	18	UV-Vis spectroscop								
	19	Chromatography bas								
-	20	Chromatography cla								
			f acids-bases, Water ch	emistry						
	21	and pH of water	,	-						
	22		f acids-bases, Water ch	emistry						
7	22	and pH of water		2						
		Buffer solution, Mec	hanism of buffer soluti	ion,						
	23	Henderson-Hasselba								
			Acid-Base Indicators							
	24		e and pressure on solub	oility,						
	24	Validity and limitation	CT-							
			s and dilute solutions, I		3/Mid Term					
	25	law, deviation from Raoult's law, Elevation of								
		boiling point								
9	26	Freezing point depression, Van't Hoff's law of								
-		osmotic pressure	C (1 1 1 ) (							
	27		Thermochemistry: Laws of thermochemistry, Enthalpy							
	20	Enthalpy								
-	28	Hess's law, Kirchoff	loot of							
10	29	Heat of formation, H reaction	leat of							
-	30		on and its mechanism							
			ausch Law, Debye-Huc	kel_						
	31	Onsagar theory								
11	32	Conductometric titra								
-	33	Different types of ce								
			Characteristics of che	mical						
	34		mass action, Equilibriu							
		constant, Units of eq								
12	25	Relation between Kp	& Kc,Van't Hoff's re	action						
	35	isotherm								
	36	Free energy and it	s significance Heteroge	eneous	CT-4					
	50	equilibrium, Le Chat	elier's principle							
Ι Τ	37		ence on the equilibriun	n						
13		constant								
15	38	Phase Diagram of wa								
	39	Pseudo and zero orde								
	40		actors affecting the rate	e of a						
14			reaction							
	41		Second order reaction							
1.007.00	42	Collision theory, Tra	nsition state theory							
		TRATEGY	~ -							
	mponents		CO	ŀ	Bloom's Taxonomy					
Continu	ous Assess	ment 40%	CO1, CO2, CO3,							

(Class assignments/ CT/		CO4	C1, C2, C3, C4, C5							
Mid Term/ Active Class										
Participation)										
Final Exam         60%         CO1, CO2, CO3, CO4         C1, C2, C3, C4, C5										
Total Marks 100%										
REFERENCE BOOKS										
1. Modern Inorganic C	hemistry – S. Z. H	Haider								
2. Concise Inorganic C	hemistry – J. D. I	Lee								
3. Analytical Chemistry- G.D. Christian										
4. Principles of Physical Chemistry – Haque and Nawab										
5. Essentials of Physical Chemistry – Bahl and Tuli										
6. Physical Chemistry	– Atkins									

Course Code: CHEM 104       Credit Hour: 1.5         Course Title: Chemistry Sessional       Contact Hour: 3.0         PRE-REQUISITE       Contact Hour: 3.0         CURRICULUM STRUCTURE       Contact Hour: 3.0         Outcome Based Education (OBE)       SYNOPSIS/RATIONALE         To implement the basic concepts of inorganic and physical chemistry in a laboratory environment.       OBJECTIVE         1. To familiarize the students with experimentation of acid and base neutralization, titration and quantitative analysis of metals etc.       2. To make students proficient in iodimetric and iodometric analysis and complexometric titration etc.         3. To develop students' ability in estimating zinc, ferrous content in water sample by using various ditimetric methods, and UV-Vis spectrophotometric method.         COURSE CONTENT       Quantitative chemical analysis in the field of inorganic and physical chemistry such as:         Acid-base titration, Redox titration, Iodometric and Iodimetric titration. Complexometric titration.         No       Course Outcome         PROGRAM OUTCOMES (POS)         1       COI: Be able to develop students experimentation and base neutralization, titration and the substances, molarity, normality, indicator, equivalent with a substances, molarity, normality, indicator, equivalent here the subalin the different phenomena and perform experimentation regarding iodimetric viano, titration, titration, titration, titration, ti		SE INFORMATION												
PRE-REQUISITE										Cre	dit H	lour:	1.5	
Curse Code: N/A         CURRICULUM STRUCTURE         Outcome Based Education (OBE)         SYNOPSIS/ RATIONALE         To implement the basic concepts of inorganic and physical chemistry in a laboratory environment.         OBJECTIVE         1. To familiarize the students with experimentation of acid and base neutralization, titration and quantitative analysis of metals etc.         2. To make students proficient in iodimetric and iodometric analysis and complexometric titration etc.         3. To develop students' ability in estimating zinc, ferrous content in water sample by using various titrimetric methods, and UV-Vis spectrophotometric method.         QUINTESE CONTENT         Quantitative chemical analysis in the field of inorganic and physical chemistry such as:         Acid-base titration, Redox titration, Iodometric and Iodimetric titration, Complexometric titration.         SKILL MAPPING (CO – PO MAPPING)         No       Course Outcome         PROGRAM OUTCOMES (POs)         1       CO1: Be able to describe the different parameters regarding acid and base neutralization, titration and base neutralization, titration and base neutralization, titration and base neutralization, titration and base neutralization, titration and base neutralization, titration and base neutralization, titration and pariticle was bastances, molarity, normality, indicator, equivalent weights and so on.         2       CO2: Be able to explain the different phenomena and perform experimentation regarding iodimetric witration, UV-Visspectrophotometric method, comple	Course	Title: Chemistry Sessiona	al							Co	ntact	Hour	: 3.0	
CURRICULUM STRUCTURE         Outcome Based Education (OBE)         SYNOPSIX RATIONALE         To implement the basic concepts of inorganic and physical chemistry in a laboratory environment.         OBJECTIVE         1. To familiarize the students with experimentation of acid and base neutralization, titration and quantitative analysis of metals etc.         2. To make students proficient in iodimetric and iodometric analysis and complexometric titration etc.         3. To develop students' ability in estimating zinc, ferrous content in water sample by using various titrimetric methods, and UV-Vis spectrophotometric method.         COURSE CONTENT         Quantitative chemical analysis in the field of inorganic and physical chemistry such as:         Acid-base titration, Redox titration, Iodometric and Iodimetric titration, Complexometric titration.         SKILL MAPPING (CO – PO MAPPING)         No       Course Outcome         PROGRAM OUTCOMES (POs)         1       COI: Be able to describe the different $$ parameters regarding acid and base fact.         and others key words like primary standard substances, molarity, normality, indicator, equivalent weights and so on.         2       CO2: Be able to explain the different phenomena and perform experimentation regarding iodimetric direction regarding iodimetric dire	PRE-R	EQUISITE												
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SYNOPSIS/ RATIONALE         To implement the basic concepts of inorganic and physical chemistry in a laboratory environment.         OBJECTIVE         1. To familiarize the students with experimentation of acid and base neutralization, titration and quantitative analysis of metals etc.         2. To make students proficient in iodimetric and iodometric analysis and complexometric titration etc.         3. To develop students' ability in estimating zinc, ferrous content in water sample by using various titrimetric methods, and UV-Vis spectrophotometric method.         COURSE CONTENT         Quantitative chemical analysis in the field of inorganic and physical chemistry such as:         Acid-base titration, Redox titration, Iodometric and Iodimetric titration. Complexometric titration.         SKILL MAPPING (CO – PO MAPPING)         No       Course Outcome       PROGRAM OUTCOMES (POs)         1       2       3       4       5       6       7       8       9       10       11       12         1       COI: Be able to describe the different parameters regarding acid and base secondary standard substances, molarity, normality, indicator, equivalent weights and so on.       4       4       6       7       8       9       10       11       12         2       COI: Be able to explain the different phenomena and perform experimentation regarding iodimetric and iodometric method, complexometric titration, UV-Viss	CURR	ICULUM STRUCTURE												
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substances, secondary standard substances, molarity, normality, indicator, equivalent weights and so on. $\checkmark$ 2CO2: Be able to explain the different phenomena and perform experimentation regarding iodimetric and iodometric method, complexometric titration, method, etc. $\checkmark$ 3CO3: Be able to measure copper, ferrous content in $\checkmark$ $\checkmark$														
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$\begin{array}{ c c c c c c c } \hline molarity, normality, indicator, equivalent weights and so on. \\ \hline 2 & CO2: Be able to explain the different phenomena and perform experimentation regarding iodimetric  and iodometric method, complexometric titration, UV-Visspectrophotometric method, etc. \\ \hline 3 & CO3: Be able to measure copper, ferrous content in \\ \hline 1 &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  &  $														
indicator, equivalent weights and so on. $\checkmark$ $\checkmark$ 2CO2: Be able to explain the different phenomena and perform experimentation regarding iodimetric $\checkmark$ $\checkmark$ $\checkmark$ $\checkmark$ $\checkmark$ $\downarrow$ $\checkmark$ $\checkmark$ <		· · · · · · · · · · · · · · · · · · ·												
weights and so on. $\checkmark$ $\checkmark$ 2       CO2: Be able to explain the different phenomena and perform experimentation regarding iodimetric $$ $\checkmark$ $\checkmark$ and iodometric method, complexometric titration, UV-Visspectrophotometric method, etc. $\checkmark$ $\checkmark$ $\checkmark$ 3       CO3: Be able to measure copper, ferrous content in $\checkmark$ $\checkmark$ $\checkmark$ $\checkmark$		indicator equivalent												
2       CO2: Be able to explain the different phenomena and perform experimentation regarding iodimetric $$ $$ $$ and iodometric method, complexometric titration, UV-Visspectrophotometric method, etc. $$ $$ $$ 3       CO3: Be able to measure copper, ferrous content in $$ $$ $$														
the different phenomena and perform experimentation regarding iodimetric and iodometric method, complexometric titration, method, etc. $$ $$ 3CO3: Be able to measure copper, ferrous content in $$ $$	2	0												
$ \begin{vmatrix} \text{phenomena and} \\ \text{perform} \\ \text{experimentation} \\ \text{regarding iodimetric} \\ \text{and iodometric method,} \\ \text{complexometric} \\ \text{titration, UV-} \\ \text{Visspectrophotometric} \\ \text{method, etc.} \end{vmatrix} $	2													
$\begin{array}{ c c c c c } \hline & \ & \ & \ & \ & \ & \ & \ & \ & \ &$														
experimentation regarding iodimetric and iodometric method, complexometric titration, UV- Visspectrophotometric method, etc. $$ $$ 3CO3: Be able to measure copper, ferrous content in $$ $$		1												
regardingiodimetric $$ $$ and iodometric method, complexometric titration, method, etc. $$ $$ 3CO3:Beableto measure copper, ferrous content $$		experimentation												
and iodometric method, complexometric titration, WebsiteUV- Visspectrophotometric method, etc.3CO3: Be able to measure copper, ferrous content in														
titration,UV- Visspectrophotometric method, etc.3CO3: Be able to measure copper, ferrous content in														
titration,UV- Visspectrophotometric method, etc.3CO3: Be able to measure copper, ferrous content in		complexometric												
method, etc. $\checkmark$ 3CO3: Be able to measure copper, ferrous content in $\checkmark$														
$\begin{array}{ c c c c c c }\hline 3 & CO3: & Be & able & to \\ measure & copper, \\ ferrous & content & in \\ \hline \end{array}  \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad \qquad$														
$\begin{bmatrix} measure & copper, \\ ferrous & content & in \end{bmatrix} \sqrt{1}$		method, etc.												
ferrous content in $\sqrt{1}$ $\sqrt{1}$	3	CO3: Be able to												
ferrous content in $$ $$		measure copper,	2									,		
water sample by using			N				$\checkmark$					$\checkmark$		
		water sample by using												

COLIR	various titrimetric methods and spectrophotometric methods. SE OUTCOMES & GEN								
COUR	SE OUTCOMES & GEN	EKIC SI	XILLS	1					
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	C	CA	KP	Assessment Methods		
CO1	Be able to describe 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.	1	C1	-	_	1,2	Quiz, Report, Test		
CO2	Be able to explain the different phenomena and perform experimentation regarding iodimetric and iodometric method, complexometric Titration, UV-Vis spectrophotometric method etc.	1,5,10	C2, C3, C4, C5	-	_	1,2	Quiz, Report, Test		
CO3	Be able to measure copper, ferrous content in water sample by using various titrimetric methods, spectrophotometric method.	1,5,10	C3, C4, C5	-	_	1,2	Project, Quiz, Report, Test		
	WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving;EA=Engineering Activities/ CA= Complex Activities; WK= Washington Accord KnowledgeProfile/ KP= Knowledge Profile*Level of Bloom's Taxonomy:C1 -C2 -C3-C4 -C5 -C6 -RememberUnderstandApplyAnalyzeEvaluateCreate								
	(T-Test, PR – Project, Q Presentation, R –Report,	– Quiz,	M – Mi	d Term I					

Teaching and Learning Activities         Engagement (Hours)           Face-to-face Learning         12           • Lecture         12           • Experiment         30           Self-Directed Learning         2           a) Preparation of Lab Reports         2           b) Preparation of Quiz         3           Formal Assessment         10           j) Quiz and viva         1           Total         60           TEACHING METHODOLOGY         Ecture           Lecture         Topics to be Covered           Assessment         10           j) Quiz and viva         1           Total           Cooperative and discussion, Co-operative and Collaborative Method, Project Based Method           COURSE SCHEDULE           Week         Lecture         Topics to be Covered         Assessment           1         01         Introduction         Assessment           2         02         Solution with Standard Oxalic Acid dihydrate (C2H204.2H2 O) Solution.         Assessment           3         03         Solution with Standard Sodium Hydroxide (HCI)         Assignment, Quiz, CO3) Solution.           3         G         Standardization of Calcium (Ca) Content in a Standard Di-Sodium Ethyle	TEAC	CHING AN	ND LEARNING STRATE	GY						
Face-to-face Learning       12         • Lecture       12         • Experiment       30         Self-Directed Learning       2         a) Preparation of Lab Reports       2         b) Preparation of Lab-test       2         c) Preparation of Quiz       3         Formal Assessment       10         j) Quiz and viva       1         Total       60         TEACHING METHODOLOGY       60         Lecture followed by practical experiments and discussion, Co-operative and Collaborative Method, Project Based Method       Courses SCHEDULE         Week       Lecture Topics to be Covered       Assessment         1       01       Introduction         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.       Assessment         1       01       Introduction of Hydrochloric Acid (HCI)       Assessment         3       03       Solution with Standard Sodium Carbonate (Na2 CO3) Solution.       Standardization of Sodium Carbonate (Na2 CO3) Solution         4       04       Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution       Report         5       05       Calcium Chloride dihydrate (CaC2A3.5H2 O) Solution       Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution<					ment (Hours)					
Lecture 12     Experiment 30 Self-Directed Learning 30 Self-Directed Learning 2     Preparation of Lab Reports 2     Preparation of Lab rest 2     C) Preparation of Quiz 3 Formal Assessment 10     J Quiz and viva 1     Total 60 TEACHING METHODOLOGY Lecture followed by practical experiments and discussion, Co-operative and Collaborative Method, Project Based Method COURSE SCHEDULE Week Lecture Topics to be Covered Assessment     1 01 Introduction     Standardization of Sodium Hydroxide (NaOH)     2 02 Solution with Standard Oxalic Acid dihydrate     (C2H2O4.2H2 O) Solution.     Standardization of Hydrochloric Acid (HCl)     Standardization of Claium (Ca) Content in a     Standardization of Claium (Ca) Content in a     Standardization of Claium Carbonate (Na2     CO3) Solution.     Determination of Claium (Ca) Content in a     Standardization of Sodium Ethylene     DiammineTetraAceticAcid (Na2-EDTA) Solution     Standardization of Potassium Dichromate (										
Self-Directed Learning       2         a) Preparation of Lab-test       2         c) Preparation of Quiz       3         Formal Assessment       10         j) Quiz and viva       1         Total         60         Total         Co-operative and Collaborative Method, Project Based Method         Courses Schedultz         Course Schedultz         Method Retrieveloct         Assessment         1       01         Introduction         Standardization of Sodium Hydroxide (NaOH)         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.         2       03       Solution with Standard Sodium Hydroxide (NaOH)         3       03       Solution with Standard Sodium Hydroxide (NaOH)         4       04       Solution with Standard Sodium Carbonate (Na2 CO3) Solution.         5       05       Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution         6       06       ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution         6       06       Standardization of Potassium Dichromate (K2Cr2O7) Solution         7       07       Est			0		12					
Self-Directed Learning       a)       Preparation of Lab Reports       2         b)       Preparation of Quiz       3         Formal Assessment       10       1         j)       Quiz and viva       1         Total       60         TeACHING METHODOLOGY         Lecture       followed by practical experiments and discussion, Co-operative and Collaborative Method, Project Based Method         COURSE SCHEDULE         Week Lecture       Topics to be Covered         1       01       Introduction         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.         2       02       Solution with Standard Sodium Hydroxide (NaOH)         2       02       Solution with Standard Sodium Hydroxide (NaOH)         3       03       Solution.         3       03       Solution         4       04       Solution of Hydrochloric Acid (HCl)         5       05       Calcium Chloride dihydrate (CaC12.2H2 O) Solution         6       06       ThiosulphatePentahydrate (Na2S203.5H2 O) Solution         6       06       Standardization of Potassium Dichromate (K2Cr2O7) Solution         7       07       Estimation of Copper (Cu) Content in a Copper	•	Experimer	nt	30						
a) Preparation of Lab Reports       2         b) Preparation of Lab-test       2         c) Preparation of Quiz       3         Formal Assessment       10         j) Quiz and viva       1         Total         Co-operative and collaborative Method, Project Based Method         Courses SchEDULE         Week Lecture Topics to be Covered         1       01       Introduction         Standardization of Sodium Hydroxide (NaOH)         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.         Calcium Chloride dihydrate (NaOH)         3       03       Solution with Standard Sodium Hydroxide (NaOH)         4       04       Solution with Standard Sodium Hydroxide (Na2CO3) Solution.         5       05       Calcium Chloride dihydrate (CaCl2.2H2 O) Solution         6       06       ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution         6       06       Standardization of Potassium Permanganate (KMnO4 ) Solution with Standard Potassium Dichromate (K2Cr2O7) Solution         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)         8       08       Standardization of Potassium Per										
b) Preparation of Lab-test     2       c) Preparation of Quiz     3       Formal Assessment     10       j) Quiz and viva     1       Total       60       TEACHING METHODOLOGY       Lecture followed by practical experiments and discussion, Co-operative and Collaborative Method, Project Based Method       COURSE SCHEDULE       Week Lecture Topics to be Covered       1     01     Introduction       Standardization of Sodium Hydroxide (NaOH)     2     02       2     02     Solution with Standard Oxalic Acid dihydrate (C2H204.2H2 O) Solution.     Assessment       3     03     Solution with Standard Sodium Hydroxide (NaOH)     Standardization of Hydrochloric Acid (HCl)       3     03     Solution with Standard Sodium Carbonate (Na2 CO3) Solution.     Determination of Calcium (Ca) Content in a       5     05     Determination of Calcium (Ca) Content in a     Assignment, Quiz, Report       6     06     Standardization of Potassium Dichromate (K2Cr2O7) Solution     Assignment, Quiz, Report       7     07     Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)     Standardization of Potassium Permanganate       8     08     (KMnO4) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4.2H2 O) Solution.     Assignment, Quiz, Report					2					
c)     Preparation of Quiz     3       Formal Assessment     10       i)     Continuous Assessment     10       j)     Quiz and viva     1       Total       60       TeACHING METHODOLOGY       Lecture followed by practical experiments and discussion, Co-operative and Collaborative Method, Project Based Method       COURSE SCHEDULE       Week       Lecture Topics to be Covered       4     01     Introduction       5     Standardization of Sodium Hydroxide (NaOH)     Standardization of Hydrochloric Acid (HCl)       3     Solution with Standard Sodium Hydroxide (NaOH) Solution.     Standardization of Hydrochloric Acid (HCl)       4     04     Solution with Standard Sodium Carbonate (Na2 CO3) Solution.     CO3) Solution.       5     05     Determination of Calcium (Ca) Content in a Calcium Chloride dihydrate (CaCl2.2H2 O) Solution       6     06     Standardization of Sodium Ethylene DiammineTetraAceticAcid (Ma2-EDTA) Solution       6     06     Standardization of Sodium Carbonate (Na2-EDTA) Solution       6     06     Standardization of Sodium Carbonate (Na2-EDTA) Solution       7     07     Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (Na2S2O3.5H2 O) Solution       7     07     Estimation of Potassium Permanganate		-	-							
Formal Assessment       10         i)       Continuous Assessment       10         j)       Quiz and viva       1         Total       60         TEACHING METHODOLOGY         Lecture       followed by practical experiments and discussion, Co-operative and Collaborative Method, Project Based Method         COURSE SCHEDULE         Week Lecture Topics to be Covered       Assessment         1       01       Introduction       Assessment         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.       Assessment         3       03       Solution with Standard Sodium Hydroxide (NaOH) Solution.       Assessment         4       04       Solution with Standard Sodium Hydroxide (NaOH) Solution.       Assignment, Quiz, CO3) Solution.         4       04       Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution       Assignment, Quiz, Report         6       06       Standardization of Copper (Cu) Content in a Copper SulphatePentahydrate (CaSO4)       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CaSO4)       Assignment, Quiz, Report         8       08       Ktandardiz		-								
i) Continuous Assessment       10         j) Quiz and viva       1         Total         Total         Total         GO         Teaching METHODOLOGY         Lecture followed by practical experiments and discussion, Co-operative and Collaborative Method, Project Based Method         COURSE SCHEDULE         Week Lecture Topics to be Covered Assessment         1       01       Introduction         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.       Assessment         3       03       Solution with Standard Sodium Hydroxide (NaOH)       Assessment         4       04       Solution with Standard Sodium Hydroxide (NaOH)       Assignment, Quiz, C3) Solution.         4       04       Solution with Standard Sodium Carbonate (Na2 CO3) Solution.       Assignment, Quiz, C3) Solution         5       05       Calcium Chloride dihydrate (Na2S2O3.5H2 O) Solution with Standard Potassium Dichromate (K2Cr2O7 ) Solution       Assignment, Quiz, Report         6       06       ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)       Sulphate (Mohr's Solution with Standard Oxalic Acid di		-								
j)     Quiz and viva     1       Total     60       TeacHING METHODOLOGY       Lecture followed by practical experiments and discussion, Co-operative and Collaborative Method, Project Based Method       COURSE SCHEDULE       Week Lecture Topics to be Covered Assessment       1     01     Introduction       2     02     Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.       3     03     Solution with Standard Sodium Hydroxide (NaOH)       3     03     Solution with Standard Sodium Hydroxide (NaOH)       4     04     Solution with Standard Sodium Carbonate (Na2 CO3) Solution.       5     05     Calcium Chloride dihydrate (CaCl2.2H2 O) Solution       6     06     Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution       6     06     Solution with Standard Potassium Dichromate (K2Cr2O7 ) Solution       7     07     Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)       8     08     (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (CaSU4)       8     08     (KMnO4 ) Solution with Standard Oxalic Acid (Aithydrate (C2 H2 O4 .2H2 O) Solution.					10					
Total       60         Total         Total         Total         Total         Total         Total         Gourses of the product of th	,				1					
TEACHING METHODOLOGY         Lecture       followed       by practical       experiments       and       discussion,       Co-operative       and         Collaborative Method, Project Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introduction       Assessment         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.       Assessment         3       03       Solution with Standard Sodium Hydroxide (NaOH) Solution.       Assessment         4       04       Solution with Standard Sodium Hydroxide (NaOH) Solution.       Assignment, Quiz, CO3) Solution.         5       05       Calcium Chloride dihydrate (CaCl2.2H2 O) Solution       Assignment, Quiz, Report         6       06       ThiosulphatePentahydrate (Na2-EDTA) Solution Solution       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)       Assignment, Quiz, Report         8       08       (KMnO4) Solution with Standard Oxalic Acid dihydrate (C2H2 O4.2H2 O) Solution.       Assignment, Quiz, Report	//									
TEACHING METHODOLOGY         Lecture       followed       by practical experiments and discussion, Co-operative and         Collaborative Method, Project Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introduction       Assessment         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.       Assessment         3       03       Solution with Standard Sodium Hydroxide (NaOH) Solution.       Assessment         4       04       Solution with Standard Sodium Carbonate (Na2 CO3) Solution.       CO3) Solution.         5       05       Calcium Chloride dihydrate (CaCl2.2H2 O) Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution Solution       Assignment, Quiz, Report         6       06       ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution with Standard Potassium Dichromate (K2Cr2O7) Solution       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)       Standardization of Potassium Permanganate         8       08       (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4.2H2 O) Solution.       Sulphate (Mohr's Salt) [FeSO4.(NH4			Total		60					
Lecture       followed       by practical       experiments       and       discussion,       Co-operative       and         Collaborative Method, Project Based Method       Assessment       Assessment         Week       Lecture       Topics to be Covered       Assessment         1       01       Introduction       Assessment         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.       Assessment         3       03       Solution with Standard Sodium Hydroxide (NaOH) Solution.       Assessment         4       04       Solution with Standard Sodium Hydroxide (NaOH) Solution.       Assessment         5       05       Solution with Standard Sodium Carbonate (Na2 CO3) Solution.       CO3) Solution.       Assignment, Quiz, CO3) Solution.         6       06       ThiosulphatePentahydrate (Na2-EDTA) Solution       Assignment, Quiz, Report         6       06       Standardization of Sodium ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution with Standard Potassium Dichromate (K2Cr2O7) Solution       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)       Assignment         8       08       (KMnO4) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4.2H2 O) Solution.       Sulphate (Mohr`s Salt) [FeSO4.(NH4)	TEACH	ING METI		<u> </u>						
Collaborative Method, Project Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introduction       Assessment         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.       C2H2O4.2H2 O) Solution.         3       03       Solution with Standard Sodium Hydroxide (NaOH) Solution.       Standardization of Hydrochloric Acid (HCl) Solution with Standard Sodium Carbonate (Na2 CO3) Solution.         4       04       Solution with Standard Sodium Carbonate (Na2 CO3) Solution.       Determination of Calcium (Ca) Content in a Calcium Chloride dihydrate (CaCl2.2H2 O) Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution       Assignment, Quiz, Report         6       06       Standardization of Copper (Cu) Content in a Copper SulphatePentahydrate (Na2S203.5H2 O) Solution with Standard Potassium Dichromate (K2Cr2O7 ) Solution       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)       Standardization of Potassium Permanganate         8       08       (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4 .2H2 O) Solution.       Sulphate (Mohr's Salt) [FeSO4.(NH4)				ments and discussion.	Co-operative and					
COURSE SCHEDULE           Week         Lecture         Topics to be Covered         Assessment           1         01         Introduction         Assessment           2         02         Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.         COURSE SCHEDULE           3         03         Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.         Standardization of Hydrochloric Acid (HCl)           3         03         Solution with Standard Sodium Hydroxide (NaOH) Solution.         Standardization of Hydrochloric Acid (HCl)           4         04         Solution with Standard Sodium Carbonate (Na2 CO3) Solution.         Determination of Calcium (Ca) Content in a Calcium Chloride dihydrate (CaCl2.2H2 O) Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution         Assignment, Quiz, Report           6         06         ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution with Standard Potassium Dichromate (K2Cr2O7 ) Solution         Report           7         07         Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)         Standardization of Potassium Permanganate           8         08         (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4 .2H2 O) Solution.         Sulphate (Mohr`s Salt) [FeSO4.(NH4)					L					
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2       02       Standardization of Sodium Hydroxide (NaOH)         2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.         3       03       Standardization of Hydrochloric Acid (HCl)         3       03       Solution with Standard Sodium Hydroxide (NaOH) Solution.         4       04       Standardization of Hydrochloric Acid (HCl)         4       04       Standardization of Hydrochloric Acid (HCl)         5       05       Standardization of Calcium (Ca) Content in a Calcium Chloride dihydrate (CaCl2.2H2 O) Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution       Assignment, Quiz, Report         6       06       Standardization of Copper (Cu) Content in a Copper SulphatePentahydrate (Na2S2O3.5H2 O) Solution with Standard Potassium Dichromate (K2Cr2O7 ) Solution       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)         8       08       (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4 .2H2 O) Solution.         8       08       Standardization of Potassium Permanganate (Mohr`s Salt) [FeSO4.(NH4	Week	Lecture			Assessment					
2       02       Solution with Standard Oxalic Acid dihydrate (C2H2O4.2H2 O) Solution.         3       03       Standardization of Hydrochloric Acid (HCl) Solution.         3       03       Solution with Standard Sodium Hydroxide (NaOH) Solution.         4       04       Standardization of Hydrochloric Acid (HCl) Solution with Standard Sodium Carbonate (Na2 CO3) Solution.         5       05       Determination of Calcium (Ca) Content in a Calcium Chloride dihydrate (CaCl2.2H2 O) Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution         6       06       Standardization of Sodium ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution with Standard Potassium Dichromate (K2Cr2O7) Solution         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)         8       08       (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4 .2H2 O) Solution.         8       08       (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4 .2H2 O) Solution.	1	01	Introduction							
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3       03       Standardization of Hydrochloric Acid (HCl) Solution with Standard Sodium Hydroxide (NaOH) Solution.         4       04       Standardization of Hydrochloric Acid (HCl) Solution with Standard Sodium Carbonate (Na2 CO3) Solution.         5       05       Determination of Calcium (Ca) Content in a Calcium Chloride dihydrate (CaCl2.2H2 O) Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution       Assignment, Quiz, Report         6       06       Standardization of Sodium ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution with Standard Potassium Dichromate ( K2Cr2O7 ) Solution       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)         8       08       (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4 .2H2 O) Solution.         8       08       Sulphate (Mohr`s Salt) [FeSO4.(NH4	2	02								
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4       04       Solution with Standard Sodium Carbonate (Na2 CO3) Solution.         5       05       Determination of Calcium (Ca) Content in a Calcium Chloride dihydrate (CaCl2.2H2 O) Solution with Standard Di-Sodium Ethylene DiammineTetraAceticAcid (Na2-EDTA) Solution       Assignment, Quiz, Report         6       06       Standardization of Sodium ThiosulphatePentahydrate (Na2S2O3.5H2 O) Solution with Standard Potassium Dichromate ( K2Cr2O7 ) Solution       Assignment, Quiz, Report         7       07       Estimation of Copper (Cu) Content in a Copper SulphatePentahydrate (CuSO4)         8       08       (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4 .2H2 O) Solution.         8       08       (KMnO4 ) Solution with Standard Oxalic Acid dihydrate (C2 H2 O4 .2H2 O) Solution.										
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	•	00	1							
9 09 )2SO4.6H2O] Solution with Standard Potassium	9	09	_							
Permanganate (KMnO4 )) Solution.										
10 10 Spectroscopic determination of iron (Ii) by	10									
complexing with 1,10-phenanthroline.		-		enanthroline.						
11   11   Practice Lab	11	11	Practice Lab							

12	12	Lab	Test							
13	13	Quiz	Test							
14	14	Viva								
ASSESS	SMENT S	TRAT	TEGY							
Components Grading CO Bloom's Taxonomy										
Continuous Assessment (Assignment/Test/ Mid Term/ Active Class Participation)		/ Mid lass	70%	CO1, CO2, CO3		C1, C2, C3, C4, C5				
Quiz		30%	CO1, CO2, CO3		C1, C2, C3, C4, C5					
To	Total Marks 100%									
REFERENCE BOOKS										
1.	1. G.H. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Vogel's Textbook of Quantitative									

1. G.H. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Vogel's Textbook of Quantitative Chemical Analysis, 5th Edition, Longman Scientific & Technical, 1989

2. G. D. Christian., Analytical Chemistry, 6th Edition, Wiley India Pvt. Limited, 2007

3. A. Jabbar Mian and M. Mahbubul Haque-Practical Chemistry4. Bear and Johnson.

COURSE INFORMATION		
Course Code: PHY 129	Credit Hour:	3.0
Course Title: Waves and Oscillations, Optics, and Structure of	Contact Hour:	3.0
Matter		
PRE-REQUISITE		

N/A

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

This course is the basic physics in the field of waves and oscillations, structure of matter and thermodynamics and hydrodynamics. The course will be emphasized the basic concepts, theories, and solve quantitative problems which can be applicable in a wide spectrum of engineering disciplines.

#### **OBJECTIVE**

- 1. To define the different parameters, concepts, logical and critical thinking with scientific knowledge of waves and oscillations, optics, and structure of matter.
- 2. To explain the basic theories and laws of waves and oscillations, optics, and structure of matter.
- 3. To solve numerical and analytical problems regarding waves and oscillations, optics, and structure of matter.

## **COURSE CONTENT**

Waves and Oscillations: Simple Harmonic Motion (SHM) and its properties, differential equation of a SHM and its solution, total energy and average energy of a body executing SHM, simple pendulum, torsional pendulum, spring-mass system, LC oscillatory circuit, two body oscillation and reduced mass, Composition of SHM, Damped oscillations, and its different condition, forced oscillations and its different condition, resonance, Wave motion : expression for a plane progressive wave, differential equation of wave motion, energy density of wave motion, average kinetic and potential energy of wave motion. Stationary wave.

Optics: Combination of lens, equivalent lens and power, Defects of images and different aberrations, Interference of light, Young's double slit experiment, interference in thin films, Newton's ring, Diffraction of light, Fraunhofer and Fresnel diffraction, diffraction by single slit and double slit, diffraction grating, Fraunhofer diffraction at a circular aperture, resolving power of optical instrument, Polarization of light, Brewster's law, Malus law, polarization by double refraction, Nicole prism, optical activity and polarimeters, Laser: spontaneous and stimulated emission.

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, surface defects, bonds in solids, band theory of between metal, semiconductor and insulator, inter-atomic distances, solids: distinction calculation of cohesive and bonding energy.

SKI	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome	PRO	PROGRAM OUTCOMES (POs)										
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to Define different basic parameters in the field of waves and oscillations, optics, and structure of matter such as												

	periodic motion, simple harmonic motion, undamped oscillations, interference, diffraction, polarization, crystal structure, crystal defects etc.						
2	CO2: Be capable to Explain different basic theories in the field of waves and oscillations, optics, and structure of matter such as the wave motion for different systems along with energy, different formula for interference, diffraction, polarization, the packing factor, Bragg's law, etc.						
3	CO3: Be skilled to Solve quantitative problems in the field of waves and oscillations, optics, and structure of matter such as energy of wave motion, wavelength, interference, diffraction, polarization, packing factor, Miller indices, etc.	V					
No	RSE OUTCOMES & GEN Course Outcome	Corresponding POs	Bloom's Taxonomy*	e 1	CA	KP	Assessment Methods
COI	laws and parameters in the field of waves and oscillations, optics, and structure of matter such as simple harmonic motion, damped oscillations, interference, diffraction, polarization, crystal structure, crystal defects, etc.	1 1 2 1	C1	-	-	1	Class Test, Mid-term, Final Exam
CO2		1 ,	C2	-	-	1	Class Test, Mid-term, Final Exam

motion, interference, diffraction, polarization, Bragg's law, bonding energy, etc.       and structure of problems in the field of waves and oscillations, optics, and structure of matter such as SHM, damped motion, wave 1       C3       -       -       2       Assignment, Class Test, Mid Term, Final Exam         motion, interference, diffraction, polarization, packing factor, Miller       I       C3       -       -       2       Mid Term, Final Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving;       EA       EA       Final Exam         Eq.       WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving;       EA       EC       C6 -         Engineering Activities/ CA= Complex Activities;       WE Washington Accord Knowledge Profile *       Level of Bloom's Taxonomy;       C1 -       C2 -       C5 -       C6 -         Remember       Understand       Apply Analyze       Evaluate       Create       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R - Report, F - Final Exam)       Tacching and Learning       Engagement (Hours)         Activities       Engagement (Hours)       -       -       -       -         Studio       -       -       36       -       -       -         Studio       -       36       -       -												
Bragg's Law, bonding energy, etc.       Image: Solve equanitative problems in the field of waves and oscillations, optics, and structure of matter such as SHM, damped motion, wave motion, interference, diffraction, polarization, packing factor, Miller       Image: Section Complex Problem Solving/ CP= Complex Problem Solving; EA=         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=       WP= Washington Accord Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile         TEACHING AND LEARNING TRATEGY       C3 - C4 - C5 - C6 - Remember       C6 - Understand         TEACHING AND LEARNING STRATEGY       Evaluate       Create         Teaching and Learning Activities       Engagement (Hours) Activities       42         Face-to-face Learning       1       - Studio       - 36         Non-face-to-face       36       36         Icarning       18       - 36         Revision of the previous lecture at home       120         TEACHING METHODOLOGY       120		motion, interference,										
energy, etc.												
CO3       Solve       quantitative problems in the field of waves and oscillations, optics, and structure of matter such as SHM, damped motion, wave motion, interference, diffraction, polarization, packing factor, Miller indices, etc.       L       Assignment, Class Test, Mid Term, Final Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=       W= Washington Accord Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy: C1 -       C2 -       C3 -       C4 -         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentation, R - Report, F - Final Exam)       Teaching and Learning         Teaching and Learning       Engagement (Hours)         Activities       Engagement (Hours)         Activities       Student-Centered         Learning       18         • Lecture       36         • Revision of the previsous lecture at home       120         Formal Assessment       3         a) Continuous Assessment       3         a) Continuous Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total       120		66 6										
problems in the field of waves and oscillations, optics, and structure of matter such as SHM_1       C3       -       -       2       Assignment, Mid Term, Final Exam         diffraction, polarization, packing factor, Miller indices, etc.       -       -       2       Assignment, Mid Term, Final Exam         WP- Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=       -       -       2       Assignment, Final Exam         WP- Washington Accord Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile       *       -       -       2       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -	001											
waves and oscillations, optics, and structure of matter such as SHM, damped motion, wave 1       C3       -       -       2       Assignment, Class Test, Mid Term, Final Exam         motion, interference, diffraction, polarization, packing factor, Miller       -       -       2       Class Test, Mid Term, Final Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=       -       -       2       Assignment, Class Test, Mid Term, Final Exam         EA=       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile (%P= Knowledge Profile %P= From Exan, Asg – Assignment, Pr – Presentation, R – K	CO3	Solve quantitative										
optics, and structure of matter such as SHM, damped motion, wave motion, interference, diffraction, polarization, packing factor, Miller indices, etc.       C3       -       -       2       Assignment, Mid Term, Final Exam         WP- Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze Evaluate Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentation, R -Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities         Frace-to-face Learning         • Lecture       42         • Practical / Tutorial / Studio       -         • Sudent-Centered Learning       18         • Revision of the previous lecture at home       18         • Preparation for test and examination       3         • Final Examination       3         • Total       120         TEACHING METHODOLOGY       Lecture         Lecture       3         • Total       120												
matter such as SHM, 1       C3       -       -       2       Class Test, Mid Term, Final Exam         diffraction, polarization, packing factor, Miller       -       -       2       Class Test, Mid Term, Final Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving;       EA=       -       2       Class Test, Mid Term, Final Exam         EA=       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile       *       Evel of Bloom's Taxonomy:         C1 -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R - Report, F - Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)       -       -       -         Activities       42       -       -       -       -       -         Studio       -       -       36       -       -       -       -         Self- Directed Learning       18       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -												
damped motion, interference, motion, interference, diffraction, polarization, packing factor, Miller indices, etc.       Image: Complex Research indices, etc.       Image: Complex Research indices, etc.         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile *Level of Bloom's Taxonomy:         C1       C2 -       C3-       C4 -       C5-       C6 -         Remember       Understand       Apply Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R - Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY       Teaching and Learning       Engagement (Hours)         Activities       Engagement (Hours)       -         Activities       Studio       -         Studio       -       -       -         Studio       -       -       -         Studio       -       18       -         Previous lecture at home       18       -       120         Formal Assessment       3       -       -       -         a) Continuous Assessment       3       -       -       -         a) Continuous Assessment       3       -       -       -       -												
motion, interference, diffraction, polarization, packing factor, Miller indices, etc.       Final Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA=       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile         *Level of Bloom's Taxonomy:       C1 -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R - Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY       Teaching and Learning       Engagement (Hours)         Activities       42       Practical / Tutorial /       -         Studio       -       -       -       -         •       Lecture       42       -       -         •       Practical / Tutorial /       -       -       -         •       Studio       -       -       -       -       -         •       Non-face-to-face       36       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -				C3	-	-	2	/				
diffraction, polarization, packing factor, Miller indices, etc.       Image: Complex Problem Solving/ CP= Complex Problem Solving; EA=         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile       *Level of Bloom's Taxonomy:         C1       C2       C3       C4       C5       C6         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F – Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)       Activities         Face-to-face Learning       42       Practical / Tutorial / Studio       -         •       Lecture       42       -       -         •       Non-face-to-face       36       -       -         •       Student-Centered       18       -       -       -         •       Preparation of the       18       -       -       -       -         •       Preparation for test and examination       3       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       - <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>												
packing factor, Miller								Fillal Exam				
indices, etc.       Image: Solving of CP= Complex Problem Solving;         EA=       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile *Level of Bloom's Taxonomy:         C1 -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R -Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY       Teaching and Learning       Engagement (Hours)         Activities       42       Practical / Tutorial /       -         Studio       -       -       Student-Centered       -         Learning       18       -       Studio       -         •       Non-face-to-face       36       -       -         •       Non-face-to-face       36       -       -       -         •       Non-face-to-face       36       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -												
WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving;         EA=         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile *Level of Bloom's Taxonomy:         C1 -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R - Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY       Teaching and Learning       Engagement (Hours)         Activities       42       Practical / Tutorial /       -         Studio       -       -       -         •       Lecture       42       -         •       Practical / Tutorial /       -       -         •       Student-Centered       -       -         Learning       18       -       -         •       Non-face-to-face       36       -         Iearning       18       -       -       -         •       Non-face-to-face       36       -       -       -         •       Preparation for test and examination       -       18       -       -       -       - <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>												
EA=       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile         *Level of Bloom's Taxonomy:       C1 -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R - Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)         Activities       42         •       Practical / Tutorial /         •       Studio         •       Studio         •       Studio         •       Studio         •       Studio         •       Non-face-to-face         learning       18         •       Non-face-to-face         learning       18         •       Non-face-to-face         learning       18         •       Non-face-to-face         learning       120         Formal Assessment       3         home       120         Teaching Assessment       3         a) Continuous Assessment       3			Com	nlex Pro	l hlem Solving/	CP-Com	nlex Proh	lem Solving				
Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1 -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R - Report, F - Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)       Activities         Face-to-face Learning       -       -         •       Lecture       42         •       Practical / Tutorial /       -         ·       Studio       -       -         •       Studio       -       -         ·       Student-Centered       -       -         Learning       18       -       -         •       Non-face-to-face       36       -         Iearning       18       -       -         •       Revision of the       18       -         •       Preparation for test and       -       -         ·       Total       120       -         TeactHI												
Profile/KP= Knowledge Profile         **Level of Bloom's Taxonomy:         CI -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -       Presentation, R -Report, F - Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)       Activities       Activities         Face-to-face Learning       e       42       Practical / Tutorial /       -         Studio       -       .       Student-Centered       -         Learning       18       .       .       .         Self-Directed Learning       18       .       .       .         Non-face-to-face       36       .       .       .       .         Non-faces-to-face       18       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       .       <												
*Level of Bloom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze Evaluate Create (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentation, R - Report, F - Final Exam)          TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities         Face-to-face Learning • Lecture 42          Practical / Tutorial / Studio - Studio - Student-Centered Learning          Self- Directed Learning • Non-face-to-face and learning          Non-face-to-face and learning          Previous lecture at home          Preparation for test and examination          Formal Assessment a) Continuous Assessment          a) Continuous Assessment b) Final Examination          Total         101         Introductory class: Brief discussion on total					· · · · · · · · · · · · · · · · · · ·		5					
C1 -C2 -C3 -C4 -C5 -C6 -RememberUnderstandApplyAnalyzeEvaluateCreate(T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr -Presentation, R - Report, F - Final Exam)TEACHING AND LEARNING STRATEGYTeaching and LearningEngagement (Hours)ActivitiesFace-to-face Learning•Lecture42•Practical / Tutorial /•-Studio-•Student-CenteredLearning•Non-face-to-facelearning18•Revision of theprevious lecture at18•Preparation for test andexamination3Formal Assessment3a)Continuous Assessmenta)Continuous Assessmenta)Continuous Assessmenta)Contexperitive and Collaborative Method, Problem Based MethodCOURSE SCHEDULEWeekLecture101Introductory class:Brief discussion on total												
(T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr –         Presentation, R – Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)         Activities       42         Face-to-face Learning       -         • Lecture       42         • Practical / Tutorial /       -         Studio       -         • Student-Centered       -         Learning       18         • Non-face-to-face       36         learning       18         • Revision of the       18         previous lecture at       -         home       -         • Preparation for test and       -         examination       3         Frail Examination       3         - Total       120         TEACHING METHODOLOGY       -         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE       -         Week       Lecture       Topics to be Covered         1       01       Introductory class:			C5 -		C6 –							
Presentation, R - Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)         Activities       Engagement (Hours)         Face-to-face Learning         • Lecture       42         • Practical / Tutorial /       -         Studio       -         • Student-Centered       -         Learning       18         Self- Directed Learning       18         • Revision of the       18         previous lecture at       18         home       Preparation for test and         examination       3         Formal Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total       120         TEACHING METHODOLOGY       120         TEACHING METHODOLOGY       120         Veck Lecture       Togics to be Covered       Assessment         1       01       Introductory class:       Brief discussion on total		Remember Understan	d	Apply	Analyze	Evaluat	te	Create				
Presentation, R - Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)         Activities       Engagement (Hours)         Face-to-face Learning         • Lecture       42         • Practical / Tutorial /       -         Studio       -         • Student-Centered       -         Learning       18         Self- Directed Learning       18         • Revision of the       18         previous lecture at       18         home       Preparation for test and         examination       3         Formal Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total       120         TEACHING METHODOLOGY       120         TEACHING METHODOLOGY       120         Veck Lecture       Togics to be Covered       Assessment         1       01       Introductory class:       Brief discussion on total												
TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)         Face-to-face Learning       Engagement (Hours)         Face-to-face Learning       42         • Practical / Tutorial /       -         Studio       -         • Student-Centered       -         Learning       18         • Non-face-to-face       36         learning       18         • Revision of the       18         previous lecture at       -         home       -         • Preparation for test and       -         examination       3         Formal Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total       120         TEACHING METHODOLOGY       -         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE       -         Week       Lecture       Topics to be Covered         Assessment       1       01												
Teaching and Learning Activities       Engagement (Hours)         Face-to-face Learning       42         • Lecture       42         • Practical / Tutorial / Studio       -         • Student-Centered Learning       -         Self- Directed Learning       36         • Non-face-to-face       36         learning       18         • Revision of the previous lecture at home       18         • Preparation for test and examination       3         Formal Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total       120         TEACHING METHODOLOGY       Ecture         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE       Week         Week       Lecture         1       01         Introductory class:       Brief discussion on total												
Activities     42       Face-to-face Learning     42       Practical / Tutorial / Studio     -       Studio     -       Studio     -       Studio     -       Student-Centered Learning     -       Self- Directed Learning     36       learning     18       Revision of the previous lecture at home     18       Preparation for test and examination     -       Formal Assessment     3       a) Continuous Assessment     3       b) Final Examination     3       Total     120       TEACHING METHODOLOGY     -       Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method       COURSE SCHEDULE     -       Week     Lecture     Topics to be Covered       1     01     Introductory class:												
Face-to-face Learning       42 <ul> <li>Practical / Tutorial /</li> <li>Studio</li> <li>Studio</li> <li>Student-Centered</li> <li>Learning</li> </ul> - <ul> <li>Student-Centered</li> <li>Learning</li> <li>Non-face-to-face</li> <li>a6</li> <li>learning</li> <li>Revision of the</li> <li>previous lecture at</li> <li>home</li> <li>Preparation for test and</li> <li>examination</li> </ul> Formal Assessment         3           a) Continuous Assessment           a) Continuous Assessment           a) Continuous Assessment               a) Continuous Assessment               a) Continuous Assessment               a) Continuous Assessment               a) Continuous Assessment               a) Continuous Assessment               a) Continuous Assessment               a) Continuous Assessment               a) Continuous Assessment               b) Final Examination               Total               I20               TEACHING METHODOLOGY               Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method               COURSE SCHEDULE <t< td=""><td></td><td></td><td>En</td><td>gagemer</td><td>nt (Hours)</td><td></td><td></td><td></td></t<>			En	gagemer	nt (Hours)							
<ul> <li>Lecture</li> <li>Practical / Tutorial / Studio</li> <li>Student-Centered Learning</li> <li>Student-Centered Learning</li> <li>Non-face-to-face</li> <li>a6</li> <li>learning</li> <li>Revision of the previous lecture at home</li> <li>Preparation for test and examination</li> <li>Formal Assessment</li> <li>a) Continuous Assessment</li> <li>b) Final Examination</li> <li>Total</li> <li>Total</li> <li>120</li> <li>TEACHING METHODOLOGY</li> <li>Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method</li> <li>COURSE SCHEDULE</li> <li>Week Lecture Topics to be Covered</li> <li>Assessment</li> <li>1</li> <li>Introductory class: Brief discussion on total</li> </ul>	-											
<ul> <li>Practical / Tutorial /</li></ul>	Face-t	_										
Studio       -         • Student-Centered	٠					42						
<ul> <li>Student-Centered Learning</li> <li>Self- Directed Learning</li> <li>Non-face-to-face learning</li> <li>Revision of the previous lecture at home</li> <li>Preparation for test and examination</li> <li>Formal Assessment</li> <li>Continuous Assessment</li> <li>Continuous Assessment</li> <li>Continuous Assessment</li> <li>Total</li> <li>Total</li> <li>Total</li> <li>Total</li> <li>Total</li> <li>Total</li> <li>Total</li> <li>Course schedule with the problem Based Method</li> <li>COURSE SCHEDULE</li> <li>Week</li> <li>Lecture</li> <li>Topics to be Covered</li> <li>Assessment</li> <li>O1</li> <li>Introductory class:</li> <li>Brief discussion on total</li> </ul>	•	Practical / Tutorial /				-						
Learning         Self- Directed Learning         • Non-face-to-face         learning         18         • Revision of the         previous lecture at         home         • Preparation for test and         examination         Formal Assessment         a) Continuous Assessment         b) Final Examination         Total         120         TEACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture         Topics to be Covered       Assessment         1       01		Studio				-						
Self- Directed Learning       36         • Non-face-to-face       36         learning       18         • Revision of the       18         previous lecture at       18         home       18         • Preparation for test and       2         examination       7         Formal Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total       120         TeACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered         1       01       Introductory class:	•	Student-Centered										
Self- Directed Learning       36         • Non-face-to-face       36         learning       18         • Revision of the       18         previous lecture at       18         home       18         • Preparation for test and       2         examination       7         Formal Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total       120         TeACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered         1       01       Introductory class:		Learning										
<ul> <li>Non-face-to-face</li> <li>learning</li> <li>Revision of the</li> <li>previous lecture at</li> <li>home</li> <li>Preparation for test and</li> <li>examination</li> </ul> Formal Assessment <ul> <li>a) Continuous Assessment</li> <li>b) Final Examination</li> </ul> Total           Total         120   TEACHING METHODOLOGY Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method           COURSE SCHEDULE   Week Lecture Topics to be Covered           Assessment           1         01	Self-I											
learning       18         • Revision of the previous lecture at home       18         • Preparation for test and examination       18         Formal Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total         Assessment         Assessesement <td>•</td> <td></td> <td></td> <td></td> <td></td> <td>36</td> <td></td> <td></td>	•					36						
<ul> <li>Revision of the previous lecture at home</li> <li>Preparation for test and examination</li> <li>Formal Assessment         <ul> <li>a) Continuous Assessment</li> <li>b) Final Examination</li> <li>Total</li> <li>Total</li> <li>120</li> </ul> </li> <li>TEACHING METHODOLOGY</li> <li>Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method</li> <li>COURSE SCHEDULE</li> <li>Week Lecture Topics to be Covered</li> <li>Assessment</li> <li>1</li> <li>01</li> <li>Introductory class: Brief discussion on total</li> </ul>												
previous lecture at home       preparation for test and examination         • Preparation for test and examination												
home         • Preparation for test and examination         Formal Assessment         a) Continuous Assessment         b) Final Examination         Total         120         TEACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered         1       01       Introductory class:       Brief discussion on total												
<ul> <li>Preparation for test and examination</li> <li>Formal Assessment         <ul> <li>a) Continuous Assessment</li> <li>b) Final Examination</li> <li>3</li> </ul> </li> <li>Total 120</li> <li>TEACHING METHODOLOGY</li> <li>Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method</li> <li>COURSE SCHEDULE</li> <li>Week Lecture Topics to be Covered Assessment</li> <li>1 01 Introductory class: Brief discussion on total</li> </ul>		•										
examination         Formal Assessment         a) Continuous Assessment         b) Final Examination         Total         120         TEACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture         1       01         Introductory class:       Brief discussion on total	_											
Formal Assessment       3         a) Continuous Assessment       3         b) Final Examination       3         Total         Total         Total         TEACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week Lecture Topics to be Covered         1       01       Introductory class:       Brief discussion on total	•											
a) Continuous Assessment       3         b) Final Examination       3         Total         Total         Total         Total         Total         Total         TeACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week Lecture Topics to be Covered         1       01       Introductory class:       Brief discussion on total	Г											
b) Final Examination       3         Total         TeACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture         Topics to be Covered         1       01       Introductory class:       Brief discussion on total												
Total       120         TEACHING METHODOLOGY       Itecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE       Veek         Veek       Lecture         Topics to be Covered       Assessment         1       01         Introductory class:       Brief discussion on total												
TEACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introductory class: Brief discussion on total	b) Final Examination 3											
TEACHING METHODOLOGY         Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introductory class:       Brief discussion on total	Total 120											
Lecture and Discussion, Co-operative and Collaborative Method, Problem Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introductory class:       Brief discussion on total												
COURSE SCHEDULE           Week         Lecture         Topics to be Covered         Assessment           1         01         Introductory class:         Brief discussion on total												
WeekLectureTopics to be CoveredAssessment101Introductory class:Brief discussion on total												
1 01 Introductory class: Brief discussion on total												
syllabus, basic requirements of the course,		1 01 Introductory class: Brief discussion on total										
		syllabus, bas	sic r	equireme	ents of the	course,						

	00	assessment of the course	
	02	Periodic motion, oscillatory motion, simple	
		harmonic motion (SHM), properties of SHM,	
		differential equations, general solution of SHM,	
	02	graphical representation of SHM	CT 1/A acienment
	03	Velocity, acceleration, phase and epoch, time	CT-1/Assignment
2	0.4	period, frequency and angular frequency of SHM	
2	04	Total energy and average energy of SHM,	
	07	problems	
	05	Simple pendulum, torsional pendulum, spring-	
	06	mass system	
	06	LC oscillatory circuit, two body oscillations, reduced mass	
3	07		
3	07	Composition of SHM	
		Composition of SHM, problems	
4	09	Damped oscillations and its differential equation	
4	10	Displacement equation of damped oscillations and	
		its different conditions, electric damped oscillatory circuit	
	11	Forced oscillations and its differential equation,	
	11	displacement equation of forced oscillations,	
		resonance	
	12	Wave motion : expression for a plane progressive	
	12	wave, differential equation of wave motion,	
		particle velocity, wave velocity	
5	13	Energy density of a plane progressive wave,	CT-2/Assignment
-		average energy in a plane progressive wave,	
		problems	
	14	Stationary wave : node, anti-node, problems	
	15	Lens and combination of lenses, equivalent lens,	
		power of lens, cardinal points	
6	16	Defects of images and different aberrations	
	17	Defects of images and different aberrations	
	18	Interference of light, young's double slit	
		experiment	
7	19	Analytical treatment of interference, energy	
		distribution	
	20	Interference fringes, interference in thin films	
	21	Newton's ring, Interferometer	
	22	Diffraction : Fresnel & Fraunhofer diffraction,	
		diffraction by single slit	
	23	Diffraction by double slit, diffraction gratings	
	24	Fraunhofer diffraction at a circular aperture,	
0	27	resolving power of optical instrument	
9	25	Polarization of light, Brewster's law, Malus' law	Mid Term/Assignment
	26	Polarization by double refraction, Nicol prism:	
		Polarizer and analyzer	
10	27	Optical activity: specific rotation, polarimeters	
10	28	Laser: spontaneous and stimulated emission,	
	20	applications of laser	
	29	Classification of solids, types of crystalline solids,	
		crystal, lattice, basis, crystal structure, plane	
		lattice, space lattice, Bravais and non-Bravais	
		lattices	

	30			arameters, primitive and							
				nd their distinctions,							
				ructure of NaCl and CsCl							
11	31		· ·	units: linear and num	erical						
			eters and, Mi								
	32			cking factor and coordin	nation						
			er for differen								
	33			lattice constant and dens	ity of						
				numerical problems							
12	34			g, relation between inter-	planar						
				indices, problems							
	35			Bragg's law, method							
				inter-planar spacing	from						
			ction patterns								
	36			point defects, line de	efects,						
			e defects								
13	37			: point defects, line de	efects,	CT-3/Assignment					
			e defects			CI-J/Assignment					
	38	bes of									
			in solids								
	39			ids : valence band, condu							
				, distinction between a	metal,						
			onductor and								
14	40			ve energy, binding er	nergy,						
		Made									
		calcul	ation of total	l potential energy of a p	air of						
		atoms									
	41			otal potential energy a							
				ation of an ionic cr	rystal,						
		proble									
	42		w of the sylla	ıbus							
ASSES	SMENT S'	TRATE									
Compo	nents		Grading	CO	Bloom	i's Taxonomy					
Continu	ous Assess	sment									
(Class a	ssignments	5/	10.01								
	Term/ Act		40%	CO1, CO2, CO3		C1, C2, C3					
	articipation										
	Final Exam		60%	CO1, CO2, CO3		C1, C2, C3					
	Total Marks			0.01, 0.02, 0.03		C1, C2, C3					
			100%		1						
	RENCE BO		D ( 1		1	- 1					
	1. Physics for Engineers : Part-I and Part-II : Dr Giasuddin Ahmad										
	2. Physics, Volume I and Volume II : Resnick and Halliday										
3.											
4.											
5.	5										
6.					E.Whi	ite					
7.				es: Grant R. Fowles							
8.				Michael J. Kidger							
9.				al and N. Subrahmanyam	L						
10	10. Introduction to Solid State Physics: Charles Kittle										
	11. Solid State Physics: S. O. Pillai										
	12. Solid State Physics: Ali Omar										
				Physics : B.S. Saxena, R.	C. Gup	ta, P.N. Saxena					
13					· · · · · · · · · · · · · · · · · · ·						

14. B.Sc Physics : C. L. Arora.

COURSE INFORMATION	
Course Code: PHY 130	Credit Hour: 1.5
Course Title: Physics Sessional	Contact Hour: 3.0
PRE-REQUISITE	

N/A

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

This is a laboratory course in basic physics in the fields of waves and oscillations, optics, mechanics, electricity, modern physics, and thermal physics. The course will emphasize the fundamental experiments in different fields of physics that can be applicable to a wide spectrum of engineering disciplines. This laboratory course will enable students to understand basic physics practically as well as work with a team or individual.

OBJECTIVE

- 1. To develop basic physics knowledge practically
- 2. To practice use of basic scientific instrument

COURSE CONTENT

Quantitative measurement of different parameters in the field of waves and oscillations, optics, mechanics, electricity, modern physics and thermal physics such as:

Specific resistance of materials, high resistance, resistance of a galvanometer, Electrochemical equivalent (ECE) of copper, comparison of the E.M.F's of two cells, radius of curvature, wavelength of light, focal length of lens, specific rotation of sugar, refractive index of a liquid, thermal conductivity of a bad conductor, temperature co-efficient of resistance, pressure co-efficient of a gas, specific heat of a liquid, acceleration due to gravity, spring constant, rigidity modulus, young's modulus, moment of inertia, conservation of linear momentum, frequency of a tuning fork, surface tension, Planck's constant.

SKILL	MAPPING (CO – PO MAPP	PING)											
No	Course Outcome	PRO	PROGRAM OUTCOMES (POs)										
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to Define the different parameters regarding waves and oscillations, optics, mechanics, electricity, modern physics and thermal physics etc.												
2	CO2: Be capable to Describe the different phenomena regarding waves and oscillations,												

3	optics, mec electricity, modern p and thermal physics CO3: Be skilled Construct Experimen an individual or by a											
	phenomena rega	ferent arding ations,										
		anics, hysics	$\checkmark$									
4	CO4: Be able to Prepreport for an experiment.	-	V									
GOLID												
No	SE OUTCOMES & G Course Outcome	ENERI	<u>C SKI</u>	LLS								
NO	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP		Assessment Methods				
CO1	Define the different parameters regarding waves and oscillations, optics, mechanics, electricity, modern physics and thermal physics etc.	1	C1				1	Ç	)uiz,	Repo Exar		nal
CO2	Describe the different phenomena regarding waves and oscillations, optics, mechanics, electricity, modern physics and thermal physics etc.	1	C1				1	Test,	, Qu	iz, Rej Exan		Final
CO3	Skilled to Construct Experiments by an individual or by a group to determine different phenomena regarding waves and oscillations, optics, mechanics, electricity, modern physics and thermal physics etc.	1	C2				2	Test,	, Qu	iz, Re Exan		Final
CO4	Prepare a report for an experimental work.	1	C2				2			Repo	rt	

	WP= Wa EA=	ashington Ac	cord Com	plex Pro	blem Solvin	ng/ CP= Com	plex Proble	em Solving;			
	Engineer Profile/ I	ring Activitie KP= Knowle if Bloom's Ta	dge Profil	e	Activities; W	VK= Washin	gton Accore	d Knowledge			
	Cl –	C2 –	axonomy.	C3-	C4 –	C5 -	C	6 –			
	Rememb		stand		Analyze	Evalua		reate			
					·						
		PR – Project				am, Asg – A	ssignment,	Pr –			
TEAC		tion, R –Rep ND LEARN									
-	ning and L		1	ement (H							
Activi	•	carning	Lingagy	ciliciti (I	iours)						
	o-face Lea	arning									
	Lecture (	-				36					
hours/we	$eek \times 12$ v	<b>`</b>									
	d Learnin										
	ıl/ Assigni					12					
	week $\times 12$										
Self- D	virected Le	earning									
•	Non-face	e-to-face				1					
	learning										
•	Revision	of the				2					
	previous	lecture at									
	home										
•	-	ion for the	3								
		mination	5								
	Assessme										
,	Continuo		2								
	Assessme		4								
b)	Quiz and	viva									
						<i>c</i> 0					
	Tota		7			60					
		HODOLOG									
Lecture	and Discu	ssion, Proble	em Based	wiethod							
COUR	SE SCHE	DITE									
		Topics to I	e Covere	-d			Assessmen	nt			
1	01	Introductory			ussion on tot	tal syllabus.		n any one			
		basic requir									
		of the cours				•					
		laboratory, introduction to different basic equipment									
2	02	Determinati					Perform	n any one			
		using meter				al length of					
		a concave le									
3	03	Determinati					Perform	n any one			
		deflection									
		galvanomete	2			method /					
		Determinati	·	ecific h	eat of a liq	uid by the					
		method of c	ooling								

4	04		E of copper by using		Perform any one					
		voltameter / Determination of the Young's modulus								
			nethod. / Determinatio							
		Young's modulus fo	wire by							
5	05	Searle's apparatus	1 (1 ( 1'	1. 1 / 1	Daufaura ana ana					
5	05		wavelength of sodium		Perform any one					
			g a plane diffraction							
			moment of inertia o	f a Fly-						
-	0.6	wheel about its axis o			D (					
6	06		radius of curvature of	-	Perform any one					
		÷	n's ring method/ Deter							
			o-efficient of resistanc	e of the						
_	07	material of a wire usin	<u> </u>		<b>D</b> (					
7	07		specific rotation of s		Perform any one					
		1	nation of the refractive							
		a liquid by plane m	irror and pin method	using a						
		convex lens								
8	08		thermal conductivity		Perform any one					
		5	nethod / Verification of							
		of conservation of line	ear momentum / Deter	mination						
		of the surface tension	on of water by capill	ary tube						
		method and hence to	verify Jurin's law.							
9	09	Determination of the	value of g acceleratio	n due to	Perform any one					
		gravity by means	of a compound pene	dulum /						
		Comparison of the	E.M.F's of two cel	ls by a						
		potentiometer.								
10	10	Determination of the	spring constant, effect	ive mass	Perform any one					
		and the rigidity modul	us of the spring / Deter	nination						
		of the pressure co-e	efficient of a gas at	constant						
		volume by constant v	olume air thermometer							
11	11	Determination of t	he Planck's constan	t using	Perform any one					
		photoelectric effect / 2	Determination of the fi	requency						
		of a tuning fork by M	elde's experiment							
12	12	Viva & lab final expe								
12	13		• . 1							
13	15	Viva & lab final expe	rimental exam							
14	14	Quiz exam			Quiz					
ASSES	SMENT	STRATEGY								
Compo	nents	Bloom's	Taxonomy							
Continu	ous	70%								
Assessn										
	ment/Tes									
Mid Ter	m/ Activ	re l	CO1, CO4	CO1, CO4 C1, C2						
Class										
Particip	ation/Rep	port)								
	Quiz	20%	CO1 CO2 CO3	CO1, CO2, CO3						
1	Viva	10%			C1, C2					
Tot	al Marks									
		BOOKS		I						
KEFEF	ENCE	DOORS								

- Practical physics for degree students : Dr Giasuddin and Md. Sahabuddin 1.
- Practical Physics: G. L. Squires
- 2. 3. B.Sc. Practical Physics: C. L Arora
- 4. Practical Physics: S.L. Gupta and V. Kumar

COURSE	INFORMATION									
Course Cod	e: Math 101	Credit Hour: 3.0								
Course Title	e: Differential and Integral Calculus	Contact Hour: 3.0								
PRE-REQ	UISITE									
None										
CURRICU	JLUM STRUCTURE									
	Based Education (OBE)									
SYNOPSI	S/ RATIONALE									
Purpose of	this course is to introduce knowledge of Calculus and	use it to engineering study.								
OBJECTIV	VE									
1.	Be able to acquire knowledge on differential and int	egral calculus to solve engineering								
	problems and other applied problems.									
2.	2. Be able to understand the important aspects of rate of change, tangent, normal, area and									
	volume.									
3.	Be expert in applying knowledge of functional ana	lysis such as increasing, decreasing,								
	maximum and minimum values of a function.									

COURSE CONTENT

Differential Calculus: Introduction, differential calculus for engineering, continuity and differentiability of functions, differentiation of various functions, successive differentiation, Leibnitz's theorem, Rolle's theorem, Mean-value theorem, expansion of functions, partial differentiation, Euler's theorem, tangent and normal, maxima and minima, curvature, asymptotes.

Integral Calculus: Definition of integration, various techniques of integration, integration by substitution, standard integrals, integration by parts, integration by successive reduction, definite integrals, Walli's formula, integration as a limit of sum, improper integrals, Beta and Gamma functions, multiple integral, lengths of curves, area of the region enclosed by two curves, volume of solid of revolution.

SKILL	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome	PRO	PROGRAM OUTCOMES (POs)										
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Define limit, continuity and differentiability of functions, identify rate of change of a function with respect to independent variables and describe different techniques of evaluating indefinite and definite integrals.	V											
2	CO2: Apply concepts and techniques of differentiation and integration to solve	$\checkmark$											

r	.1 11 1.1						1	1					
	the problems related												
3	to engineering study. CO3: Calculate												
5	1	,											
	average value related												
	to engineering study.												
COURS	E OUTCOMES & GENER	RIC	SKILL	S				1	<u> </u>				
No	Course Outcome												
		Corresponding											
		ndi		s Iy*								ent	
		spc		n, Ion								Assessment	
		rre	S	XOL				_		-		ses	
		S	PC	Bloom's Taxonomy*	CP			CA		KP		As	
CO1	Define limit, continuity,												
001	differentiability of												
	functions, rate of change											C	lass Test,
	of a function with respect			C1		1			-	3			nal Exam,
	to independent variables,											As	signment
	the extremum value of												
CO2	functions. Apply the concepts and				+								
02	techniques of												
	differentiation and												lass Test,
	integration to solve the			C3		1				3			lid-term,
	problems related to											F1	nal Exam
	engineering study.												
CO3	Calculate length, area,												
	volume and average			C3		1				2			signment,
	value related to engineering	1		C3		1				3			id Term, al Exam
	measurement.											1.11	ai Exaiii
	WP= Washington Accord	Co	mplex P	roblei	n So	lving	g/ CP	= Co	mplex P	roblem	ı So	olvir	g: EA=
	Engineering Activities/ C.												
	Profile/ KP= Knowledge	Pro	file						C				C
	*Level of Bloom's Taxon	om											
	$C1 - C2 - U_{2}$	1		C4				C5 -		C6			
	Remember Understan	u	Appl	y An	aiyz	e		Evalu	iate	Cre	eate	;	
	(T-Test, PR – Project, Q –	- ()1	niz M–	Mid 7	Ferm	Exa	mА	sg	Assionm	ent Pr	·_1	Pres	entation
	R – Report, $F$ – Final Exar		, 1 <b>11</b>	.,	. UTIII	LAU	, . 1	55 1	199181111			. 100	
TEAC	HING AND LEARNING S		RATEGY	ľ –									
	ng and Learning Activities					Er	igage	emen	t (Hours)	)			
	-face Learning												
	Lecture (3 hours/week $\times$ 1-	4 w	veeks)						4	2			
	ected Learning												
	e-to-face learning									25			
	n of the previous lecture at	ho	me							21			
-	tion for final examination								2	21			
	Assessment									0			
,	Continuous Assessment									8			
b) F	Final Examination									3			

		Total 1	20
TEACH	ING METHOD		
Lecture a	and Discussion,	Co-operative and Collaborative Method, Problem Based M	ethod
COUR	SE SCHEDUL	E	
Week	Lecture	Topics to be Covered	Assessment
	01	Introduction to differential calculus for engineering	
	01	study, limit of a function and its properties.	
1	02	Basic limit theorems with proofs, limit at infinity and	
1	02	infinite limit, Sandwich (Squeezing) theorem with problems.	
		Concept of differentiation, definition, classification	
	03	of discontinuity and solution of problems	
	0.4	Basic concept of differentiability, definition,	
	04	derivative of a function, differentiable function.	
2	05	Differentiability – one sided derivatives (R.H.D and	
2	03	L.H.D), solving problems	CT1
	06	Successive differentiation – Concept and problem	
		solving	
2	07	Leibnitz's theorem and its applications	
3	08	Determination of (y_n)_0	
	09 10	Mean Value theorem Taylor theorem	
4	10	Indeterminate forms – concept and problem solving,	
4	11	L'Hospital's rul	CT 2
		Partial differentiation - partial derivatives of a	012
	13	function of two variables and problems	
	-	Partial differentiation - partial derivatives of	
5	14	homogeneous function of two variables, Euler's	
5		theorem for two variables and problems	
		Partial differentiation - partial derivatives of a	
	15	homogeneous function of several variables, Euler's	
		theorem for several variables and problem solvingTangents and Normals – Tangents and Normals in	
		Cartesian, equation of tangent at the origin, equation	
	16	of normal of functions of explicit and implicit forms,	
	10	Angle between two intersection of two curves:	
		problem solving	CT 3
		Tangents and Normals – Tangents and Normals in	
		Cartesian, equation of tangent at the origin, equation	
6	17	of normal of functions of explicit and implicit forms,	
		Angle between two intersection of two curves;	
		problem solving Tangents and Normals – Tangents and Normals in	
		Cartesian, equation of tangent at the origin, equation	
	18	of normal of functions of explicit and implicit forms,	
		Angle between two intersection of two curves;	
		problem solving	
		Maxima and minima of functions of single variables:	
	19	concept, increasing and decreasing function, concave	
7		up and concave down functions	Mid Term
,	20	Curvature	ing rollin
	21	Asymptotes	
	22	Introduction to integral calculus	

	23	Standard integrals, ap	egrals : concept of definite plications.	and indefinite	
	24	Indefinite in techniques o	tegrals :Method of substitution fintegration	tution, various	
9	25	Indefinite in	itegrals : Integration by gration, integration by par		
	26		y the method of successiv		
	27		grals : definite integrals v		
	21	and problem			
	28	Definite int formula	egrals : Reduction for	mula, Walli's	
	29	Definite inte sum	grals : Definite integral as	the limit of	
	30	Beta function	n :Concept and solution of	f problems	
11	31	Gamma func	tion : Concept and problem	n solving	
		Relation be	etween Beta and Gami	ma functions,	
	32		duplication formula, p	roblems and	
		applications			CT 4
1.0	33		grals :Double integrals		
12	34		grals :Triple integrals		
	35	and three var			
	36		of curves in Cartesian coor		
13	37	Arc lengths parametric c	of curves in polar co urves	ordinates and	
	38	Area in Cart	esian co-ordinate		
	39	Area under coordinates	a plain curve in Cartes	ian and polar	
14	40	Area of a reg and polar co	gion enclosed by two curve ordinates	es in Cartesian	
	41	Volume of s	olid of revolution		
	42	Volume of s	olid of revolution		
ASSESS	SMENT STRAT	EGY			
Compor	nents	Grading	СО	<b>Bloom's Taxe</b>	onomy
Continu	ous Assessment				
	ssignments/ CT/				
	m/ Active Class	40%	CO1, CO2, CO3		C1, C2, C3
Participa		1070	001, 002, 003		01, 02, 00
i articipt	uiony				
Fi	inal Exam	60%	CO1, CO2, CO3		C1, C2, C3
To	otal Marks	100%			
	BOOKS		<b>I</b>		
		Anton, Irl C.	Bivens, Stephen Davis		
	•		Dr Md Abdul Matin and	Bidhu Bhushar	h Chakraborty
		•	Equation by Md Abdul M		•
	ENCE BOOKS				
		ve and Physica	ll Approach by Morris Kli	ne	
	~		· · · · · · · · · · · · · · · · · · ·		

Calculus. An Intuitive and Physical Approach by Morn
 Differential Calculus by B.C. Das and B.N. Mukherjee
 Integral Calculus by B.C. Das and B.N. Mukherjee

Course Title: Differential Equations and Matrix

PRE-REQUISITE

MATH 101 (Differential and Integral Calculus)

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

Purpose of this course is to introduce knowledge to solve differential equations and apply them to solve engineering problems. Also to acquire knowledge on matrix, formulate the engineering problems in matrix form and solve them.

#### OBJECTIVE

- 1. Be able to acquire knowledge on ordinary and partial differential equations.
- 2. Be able to understand important aspects of ordinary & partial differential equations and be able to solve them.

Credit Hour:

Contact Hour: 3.0

3.0

3. Be able to apply differential equations and matrices in solving engineering problems.

COURSE CONTENT

**Differential Equations:** Introduction & formulation of differential equations, solution of first order ordinary differential equations by various methods, application of first order differential equations, solution of ordinary differential equations of higher order, solution of Euler's homogeneous linear ordinary differential equations, Frobenious methods, Bessel's functions, Legendre's polynomial, linear first order partial differential equations, nonlinear first order partial differential equations, standard form differential equations of higher order and wave equation, particular solutions with boundary and initial condition, linear partial differential equations with constant coefficients, non-linear partial differential equations.

**Matrix:** Different types of matrices, transpose, adjoint of a matrix, inverse matrix, rank of matrix, elementary transformation, matrix algebra, solution of system of linear equations, matrix polynomials, eigen-value and eigen-vector, Cayley Hamilton theorem.

21/1	LL MAPPING (CO – PO MAPPIN	G)											
No	Course Outcome	PROC	GRA	MC	DUT	CON	MES	(PO	s)				
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Define various types of differential equations and identify the classifications of ordinary and												
	partial differential equations to solve engineering problems.	V											
2	CO2: Apply the knowledge to solve ordinary and partial differential equations.												
3	CO3: Apply various operations of matrices to formulate engineering problems and solve them.												
COU	<b>JRSE OUTCOMES &amp; GENERIC S</b>	SKILLS											
No	Conres Ontcome Corresponding POs	Bloom's Taxonomy*		CP			CA			KP		Assessment	Methods

eigen-value and eigen-vector, Cayley Hamilton t SKILL MAPPING (CO = PO MAPPING)

0.01				1	T	r	r				
		ous types of equations and		C1	1	-	3	Class Test, Final Exam, Assignment			
CO2	differential	nowledge of equations ees to solve engineering	1	C3	1	-	3	Class Test, Mid-term, Final Exam			
CO3	operations to formulat problems at	he various of matrices to te engineering nd solve them.	1	C3	1	-	3	Assignment, Mid Term, Final Exam			
	Engineering Profile/ KP *Level of E	ington Accord g Activities/ C = Knowledge I Bloom's Taxon	A= Co Profile omy:	omplex A	ctivities; WK	= Washington	n Accord K				
	C1 – Remember	C2 – Understan		C3- C Apply A	C4 – Analyze	C5 - Evaluate	C6 – Creat	e			
		– Project, Q – Final Exam)	Quiz	, M – Mic	d Term Exam	n, Asg – Assig	gnment, Pr –	Presentation, R –			
TEA	ACHING AN	ND LEARNIN	G STI	RATEGY	7						
Tea	ching and Lo	earning Activit	ties		Engagem	Engagement (Hours)					
Face	-to-face Lea	rning									
	Lecture				42						
	Practical	/ Tutorial / Stu	ıdio		-						
	Student-0	Centered Learn	ning				-				
Self-	Directed Le										
•		-to-face learni	ng				25				
•		of the previ		ecture at	t						
	home	···· ··· ···			-		21				
		on for final ex	amina	tion			21				
Form	al Assessme										
		is Assessment					8				
b)	Final Exar						3				
TEAC		Total HODOLOGY					120				
1		sion, Co-operat	ivo or	d Collaba	rotivo Matha	d Drohlam Da	and Mathad				
	RSE SCHEI		ive an			u, FIODICIII Ba	iseu metilou				
Weel			Cove	red			Ac	sessment			
1	01	Introduction			of differentia	lequations.	1 10				
-		degree and or									
1	02	Introduction									
		degree and or	rder of	f differen	tial equation	s		CT1			
	03	Introduction						CII			
		degree and or	rder of	f differen	tial equation	s					
2	04	Solution of			tterential eq	uations by					
	05	various r Solution of	nethoo first		forantial	untions by					
	05	Solution of	mst	oruer di	nerennar eq	uations by					

		verious methods	
	06	various methods	
	00	Solution of first order differential equations by various methods	
3	07		
3	07	Application of first order ordinary differential	
	08	equations in Malthusian population modelApplication of first order ordinary differential	
	08	11	
	09	equations in Newton's cooling law	
	09	Application of first order ordinary differential	
4	10	equations in electrical circuit.Application of first order ordinary differential	
4	10		
	11	equations in trajectory.         Solution of higher order differential equations	CT2
	11	Solution of higher order differential equations	
5	12	Solution of higher order differential equations	
5	13		
	14	Solution of higher order differential equations	
	15	Solution of higher order differential equations by	
6	16	method of variation of parameterFormation of partial differential equation	
0	10		
	17	Linear first order PDE, Nonlinear first order PDEParticular solutions with boundary and initial	
	10	condition, Non-linear PDE of order one: Charpit's	
		method	
7	19	Linear PDE with constant coefficients, Applications	
/	19	of DE	
	20	Linear PDE with constant coefficients, Applications	
	20	of DE	
	21	Linear PDE with constant coefficients, Applications	
	21	of DE	
8	22	Wave equations	
_	23	Particular solutions with boundary and initial	
		conditions	
	24	Particular solutions with boundary and initial	Mid Term Exam
		conditions	
9	25		
		Second order PDE and classifications to canonical	
		Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution	
1			
	26	(standard)-parabolic, elliptic, hyperbolic solution	
		<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic</li> </ul>	
		<ul><li>(standard)-parabolic, elliptic, hyperbolic solution</li><li>by separation of variables,</li><li>Second order PDE and classifications to canonical</li></ul>	
		<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic</li> </ul>	
	26	<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution</li> </ul>	
	26	<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> </ul>	
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10	26	<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Application of ODE and PDE in Engineering study</li> <li>Definition of matrix, different types of matrices,</li> </ul>	
10	26 27 28 29	<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Application of ODE and PDE in Engineering study Definition of matrix, different types of matrices, algebra of matrices,</li> </ul>	
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	26 27 28 29 30 31 32	<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Application of ODE and PDE in Engineering study</li> <li>Definition of matrix, different types of matrices, algebra of matrices,</li> <li>Transpose and adjoint of a matrix and inverse matrix</li> <li>Solution of system of linear equations</li> </ul>	CT3
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11	26 27 28 29 30 31 32 33 34 35	<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Application of ODE and PDE in Engineering study</li> <li>Definition of matrix, different types of matrices, algebra of matrices,</li> <li>Transpose and adjoint of a matrix and inverse matrix</li> <li>Solution of system of linear equations</li> <li>Solution of system of linear equations</li> </ul>	CT3
11	26         27         28         29         30         31         32         33         34         35         36	<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Application of ODE and PDE in Engineering study</li> <li>Definition of matrix, different types of matrices, algebra of matrices,</li> <li>Transpose and adjoint of a matrix and inverse matrix</li> <li>Solution of system of linear equations</li> <li>Solution of system of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Rank, nullity and elementary transformations</li> </ul>	CT3
11	26 27 28 29 30 31 32 33 34 35	<ul> <li>(standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)- parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Second order PDE and classifications to canonical (standard)-parabolic, elliptic, hyperbolic solution by separation of variables,</li> <li>Application of ODE and PDE in Engineering study</li> <li>Definition of matrix, different types of matrices, algebra of matrices,</li> <li>Transpose and adjoint of a matrix and inverse matrix</li> <li>Solution of system of linear equations</li> <li>Solution of system of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> <li>Solution of linear equations</li> </ul>	CT3

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REFER	RENCE B	OOKS			
1. Ord	inary and l	Partial Differen	ntial Equations-	- Dr. M.D. Raisinghania,	
		quations- Shep		-	
3. Elen	nentary Li	near Algebra-	Howard Anton	, Chris Rorres	
			. Abdur Rahma		

COURSE INFORMATION	
Course Code: LANG 102	Credit Hour: 1.5
Course Title: Communicative English- I	Contact Hour: 3.0
PRE-REQUISITE	
None	
CURRICULUM STRUCTURE	

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

The English language course is designed for the students to develop their competence in communication skills for academic purposes emphasizing speaking, reading, listening and writing. The approach will be communicative and interactive and will involve individual, pair and group work. Students will be exposed to diverse text types to refine their reading skills, engaging in activities and discussions that foster effective writing type. 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. Special emphasis is placed on the various forms of essay including descriptive, narrative, cause-effect, compare-contrast, and argumentative. Upon completion of this course, student should demonstrate proficiency in communication across diverse contexts, engage in group activities, and deliver formal speech for academic, professional and social purposes. This course also incorporates classroom instructions to provide guidelines on presentations and communication skills. Addionally, the couse emphasizes providing constructive feedback on students' oral performances.

### OBJECTIVE

- 1. To develop the four basics skills of English language, i.e. listening, speaking, reading and writing.
- 2. To enhance students' interpersonal skills through participation in various group interactions and activities.
- 3. To improve students' pronunciation to enhance comprehensibility in both speaking and listening.
- 4. To gain proficiency in crafting well- organized paragraphs and learn to edit and revise both their own as well as peer's writing.

## COURSE CONTENT

**Speaking:** Introduction to Language: Introducing basic skills of language. English for Science and Technology Self-introduction and introducing others: How a speaker should introduce himself to any stranger / unknown person / a crowd. Name, family background, education, experience, any special quality/interest, likings/disliking, etc. Asking and answering questions,

**Expressing likings and disliking;** (food, fashion etc.) Asking and giving directions Discussing everyday routines and habits, Making requests/offers/invitations/excuses/apologies/complaints Describing personality, discussing and making plans(for a holiday or an outing to the cinema), Describing pictures / any incident / event Practicing storytelling, Narrating personal experiences/Anecdotes Telephone conversations (role play in group or pair) Situational talks / dialogues: Practicing different professional conversation (role play of doctor-patient conversation, teacher –student conversation)

**Listening:** Listening and understanding: Listening, note taking and answering questions; Students will listen to recorded text, note down important information and later on will answer to some questions Difference between different accents: British and American accents; Documentaries from BBC and CNN will be shown and students will try to understand; Listening to short conversations between two persons/more than two.

**Reading:** Reading techniques: scanning, skimming, predicting, inference; Reading Techniques: analysis, summarizing and interpretation of texts.

Writing: Introductory discussion on writing, prewriting, drafting; Topic sentence, paragraph development, paragraph structure, describing a person/scene/picture, narrating an event Paragraph

writin	g, Compare-contrast and c	ause- e	effect	parag	raph									
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	reading and writing													
3	CO3: Communicate ide											ŗ		
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6	06	Tele pair)	phone conversatior ; Situational talks rent professional	ns (role play in group or / dialogues: Practicing conversation (role play conversation, teacher ation)					
7	07	Listening and understanding: Listening, note taking and answering questions; Students will listen to recorded text, note down important information and later on will answer to some questions							
8     08     Difference between different accents: British and American accents; Documentaries from BBC and CNN will be shown and students will try to understand									
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Public	Speaking								
	p Presentatio		30%	CO1, CO2, CO3, CO4	C2, C3, C4, C5				
	otal Marks		100%						
	ENCE BO								
	Langan, J. ( blication.	2005	). College Writing S	Skills with Readings (6th	Ed). McGraw-Hill				

- 2. Interactions 1 (Reading), John Langan, Latest edition, McGraw-Hill Publication
- 3. Jones, L. (1981). Functions of English. (Student's Book, 2nd Ed.) Melbourne, Australia: Cambridge University Press.
- 4. Dixon, R.J. (1987). Complete course in English. (Book 4). New Delhi, India: Prentice Hall of India. (For book presentation).
- 5. From Paragraph to Essay Maurice Imhoof and Herman Hudson Headway Series Advanced Level (2 parts with CDs): Oxford University Press Ltd.
- 6. Speak like Churchill stand like Lincoln James C. Humes.
- 7. Cambridge IELTS Practice Book.
- 8. Selected Sample Reports and Selected Research Articles.

COURSE INFORMATION							
Course Code: GEBS 101	Credit Hour: 2.0						
Course Title: Bangladesh Studies	Contact Hour: 2.0						
PRE-REQUISITE							
None							
CURRICULUM STRUCTURE							
Outcome Based Education (OBE)							
SYNOPSIS/ RATIONALE							
This course has been designed for underg	raduate engineering students to help them learn the rich						
history of Bangladesh, and to provide them	with basic knowledge of historical events which eventually						
led to the formation of Bangladesh and	constitution of Bangladesh, current trends in economic						
	ltural aspects which will make them responsible citizen.						
OBJECTIVE							
1. To equip students with factual knowledge that will enable them to learn the history of							
Bangladesh.							
	2. To trace the historical roots of Bangladesh as an independent state focusing on the social,						
	nents that have taken place since its independence.						
L	f the development of Bangladesh and its culture.						
	the students about the Geography, Economy, Politics and						
Culture of Bangladesh.							
COURSE CONTENT							
a. Main Contents: Impact of Geography, H	History, Environment, Economy, Constitution and Culture						
of Bangladesh in Engineering Applicati							
b. Detail Contents:							
	undary, Physiography, River system, Forest andClimate,						
Demography of Bangladesh, Maritime zones.							
History: Overview of the ancient Bengal an	thropological identity of the Bengali race, main trends in						
	ler the East India Company, religious and social reform						
movements, nationalist movements, division of the Indian sub-continent, language movement 1948-							

History: Overview of the ancient Bengal, anthropological identity of the Bengali race, main trends in the history of medieval Bengal, Bengal under the East India Company, religious and social reform movements, nationalist movements, division of the Indian sub-continent, language movement 1948-1952, education movement of 1962, six-point movement of 1966, mass uprising of 1969, war of independence and emergence of Bangladesh in 1971, Constitution of Bangladesh, Pre and post liberation development in the field of engineering and technology, Bangladesh's contribution to world peace and its security, engineering developments in Bangladesh (Kaptai Dam, Padma bridge, power plants, Karnaphuli River Tunnel etc.) and its impact on socio-economic aspect. Environment, Economy and Culture : Land, Characteristics of tropical monsoon climate, Forests and biomass, Fish, Minerals, Health, Education, Agriculture, Industries, NGOs, Population, Sociological and Cultural aspects of Bangladesh, Economy and National development, Development and Progress of the Millennium Development Goals (MDGs), Public Administration in Bangladesh, State of Good Governance in Bangladesh, Art and Literature, Main traditional cultural events,

	LL MAPPING (CO – PO MAP												
No	Course Outcome		ROGR	AM	OUT	COM	ES (P	POs)					
-		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to identify	r					1	1					
	specific stages of												
	Bangladesh's political												
	history, through the ancient,												
	medieval, colonial and post-												
	colonial periods and variety						•						
	of cultural identities of												
	Bangladesh.												
2	CO2: Be proficient to <b>explai</b>	n		-									
2	the economy and patterns of												
	economic changes through						1						
	qualitative and quantitativ						N						
	analysis.												
COU	<b>JRSE OUTCOMES &amp; GENER</b>	RIC S	KILLS	5				•					
No	Course Outcome												
	6	POs											
		I	× *							ut			
		2								me	A C		
		S'	Bloom's Taxonomy*							Assessment	Ĩ		
	ļ	ŐŐ	3lo ax	G		CA		КР		Ass	ла		
<b>a a i</b>		Ч	щμ	$\cup$			i	ي <b>تد</b> ر		~ ~	4		
CO1													
	specific stages of												
	Bangladesh's political												
	history, through the		C1,						_		Class	Test,I	Final
	ancient, medieval,	6	C1, C2	-		-			7			Exam	
	colonial and post-		02										
	colonial periods and												
	variety of cultural												
	identities of Bangladesh.							<u>.</u>					
CO2													
	economy and patterns of		C2								Class	Test,I	Final
	economic changes through	6	,C4			-			7			Exam	mai
	qualitative and quantitative		,04								1	Lisuin	
	analysis.		<b>D</b> 1	<u> </u>					·		<u> </u>	<b>F</b> •	
	WP= Washington Accord Co												=
	Engineering Activities/ CA=		piex A	CUV1	ues;	W K=	w ash	ungto	II ACC	Jru K	nowie	uge	
	Profile/ KP= Knowledge Prof *Level of Bloom's Taxonomy												
	C1 - C2 - C2 - C2 - C2 - C2 - C2 - C2 -	y: C	3_ (	C4 –			C5 -			C6 –			
	Remember Understand		oply A				Eval			Crea			
	Remember Onderstand	$\mathbf{A}$	ppry 1	mai	<i>y 2</i> C		Lval	uut		Cica			
	(T-Test, PR – Project, Q – Qu	uz. N	1 – Mi	d Tei	m E	xam. A	Asg —	Assi	anmen	t. Pr-	- Prese	entatio	n. R –
	Report, F – Final Exam)	,	_ 1,11			, 1	-~0			-, - •			, - •
TE	ACHING AND LEARNING S	TRA	TEGY	7									
		1111											

Vision-2021, Digitalization, Tourism and Natural Resources, Bangladesh and International Relations. SKILL MAPPING (CO – PO MAPPING)

Tea	ching	and Learning Activities	Engagement (Hours)				
-		ce Learning					
•	• Le	ecture		28			
•	• Pr	actical/ Tutorial/ Studio		10			
•	St	udent – Centered Learning					
Self-	Dire	cted Learning					
•	N	on-face-to-face learning		8			
•	Re	evision of the previous	10				
	lee	cture athome		18			
•	Pr	reparation for final					
	ex	amination					
		ssessment					
a)	Pop	o Quiz/Class Test/Mid-Term		3			
	Exa	am		3			
b)	Fin	al examination					
		T- (. 1		20			
		Total		80			
		<u>B METHODOLOGY</u>	Collaborative Mathed Durchter	n Resad Mathed			
		Discussion, Co-operative and SCHEDULE	Conaborative Method, Probler				
		Topics to be Covered					
k	tur	Toples to be covered	Assessment				
	e						
		Introductory class: Brief	discussion on the total				
	01	syllabus, basic requirements	s of the course, methods of				
1		assessment of the course					
	00	Bangladesh Geography: I					
	02		tem, Forest and Climate,				
		Demography of Bangladesh		CT1			
	03	Overview of the ancient	, main trends in the history				
2	05	of medieval Bengal	, main ucitus in the history				
	04		Company				
	05	Religious and Social reform					
3	06	Nationalist movements,					
	00	subcontinent					
	07	Language movement 1948-	1952, Education movement				
4	~ '	of 1962	1050 51				
	08	Language movement 1948-	1952, Education movement				
	09	of 1962 Six-point movement of 1960	6 Mass uprising of 1060				
5	09	War of Independence and					
5	10	in 1971	Emergence of Danglauesh				
	11	Constitution of Bangladesh		Mid Term Exam			
6	12	Constitution of Bangladesh					
		Bangladesh's contribution to	o world peace and security,				
	13	Pre and post liberation deve					
7		and technology					
/		Bangladesh's contribution to					
	14	Pre and post liberation d					
		and technology					

		Land Cl	naracteristics of	f tropical Monsoon climat	e						
	15		Forests and biomass, Fish								
8				nt in Bangladesh ( Kapt							
	16		Dam, Padma bridge, power plants, Karnaphuli River								
	17		Funnel etc. ) and its impact on socio-economic aspect         Minerals, Health and Education,								
9	17 18		, Health and Ed	ucation,							
				iological and Cultural aspe	cts						
10	19	of Bangl		lological and cultural aspe							
	20		y and national de	evelopment,							
11	21			ogress of the Millenni	um						
	21		ment Goals (MI		CT 2						
	22			id Waste: Method Public							
	22		tration in Bance in Banglade	ingladesh, State of Goo	d						
	23		Literature	511							
12	23		al cultural even	ts							
10	25		021, Digitalizati								
13	26		and Natural Res		CT 3						
14 27 Bangladesh and International Relations											
28 Revision of the course											
ASSESSMENT STRATEGY											
Comp Contir			Grading	CO	Bloom's Taxonomy						
Asses											
		nments/									
CT/M			40%	CO1, CO2	C1, C2, C4						
Active	e Clas	s		,							
Partici	ipatio	n)									
	Final E		60%	CO1, CO2	C1, C2, C4						
	otal N		100%								
		CE BOO		1 Kahar Khan and David (	ahan Uhan an						
				l Kabir Khan and Daulatunr Republic of Bangladesh	ianar Knanam						
			gladesh: Akbar								
		•	desh, Vols, 1-3:								
	•	•		: R C Majumdar							
6. Dy	ynasti	c History	of Bengal: Dr. A	Abdul Mumin Chowdhury							
			gladesh: Willian								
			ngladesh: Harun								
				dia of Bangladesh, Vols, 1- iod 1526-1765): R. A. Chan							
			vers: Nitesh Ser		uia						
				01							
	12. A History of Bangladesh: Cambridge University Press										
13. ł	<ol> <li>Bengali Nationalism and the Emergence of Bangladesh: A.F Salahuddin Ahmed</li> <li>Language Movement and The Making of Bangladesh: Safar Ali Akanda</li> </ol>										

COURSE INFORMATION							
Course Code: Math 201	Credit Hour: 3.0						
Course Title: Vector Analysis, Laplace Transformation and	Contact Hour: 3.0						
Coordinate Geometry							
PRE-REQUISITE							
CHEM 103, PHY 129							
CURRICULUM STRUCTURE							
MATH 101 (Differential and Integral Calculus), MATH 103 (Dif	ferential Equations and Matrix)						
SYNOPSIS/ RATIONALE							
Purpose of this course is to introduce basic knowledge to identify	y and solve vector mathematical						
problems, to demonstrate practical applications of Laplace Tran	problems, to demonstrate practical applications of Laplace Transform and analyze co-ordinate						
geometry.							
OBJECTIVE							
1. Be able to acquire knowledge on vector and	alysis, Laplace transform and						
geometry.	-						
2. Be able to solve problems with straight lines, pair of s	traight lines, circles, conics in 2D						
and 3D co-ordinate systems.	-						
3. Be able to find the length, volume and area of object	ts related to engineering study by						
using vector, Laplace transform, also be able to solve t	he problems of the pair of straight						
lines, circles, system of circles, parabola, ellipse.							
COURSE CONTENT							
Vector Analysis: Definition of vector and scalars & vector algeb	ora, scalar and vector products of						
two vectors and their geometrical interpretation, triple products and	multiple products, differentiation						
of vectors, gradient of scaler functions, divergence and curl of vector	or functions, physical significance						
of gradient, divergence and curl, definition of line, surface and volu							
Gran's theorem and its application. Stake's theorem and its application. Gauge theorem and its							

Green's theorem and its application, Stoke's theorem and its application, Gauss theorem and its application in engineering study.

**Laplace Transform:** Definition of Laplace transform and application of Laplace transform in engineering study, Laplace transform of some standard functions and properties of Laplace transform, sufficient condition for existence of Laplace transform, inverse Laplace transform, some special theorems on Laplace transform, solution of differential equations by Laplace transform, Heaviside expansion formula, convolution theorem, evaluation of improper integral, application of Laplace transform.

**Co-ordinate Geometry:** Introduction to geometry in engineering study and rectangular coordinates, transformation of co-ordinates, changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms, circles, equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves, equations of parabola, ellipse in Cartesian and polar coordinates, system of circles (radical axes, coaxial circles, limiting points), three dimensional co-ordinate system, direction cosines, projections, the plane (angle between two planes, parallel & perpendicular plane, distance of a point from a plane), standard equation of sphere, ellipsoid.

SKILI	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome	PR	OGR	AM (	OUT	COM	1ES (	POs)					
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Learn the physical explanation of different vector notation and Define Laplace transform, inverse Laplace transform,												

	different types o	fmotri	200				тг		тт		
	different types o and their proper		ces,								
2	CO2: Expla		the								
2	characteristics										
	and familiari		with $$								
	straight lines,										
	straight lines,	circ									
	radical axis and										
	2D and 3D c										
	systems.										
3	CO3: Calculat	e len	gth,								
	volume and area										
		nginee									
	study by usin										
	Apply Laplace										
	to ODE and PD		1/								
	knowledge of g		y in '								
	engineering stu										
	the problems of										
	straight lines, system of	circ circ									
	parabola, ellipse		ies,								
COUR	SE OUTCOMES	$\frac{2}{8}$ GF	VERICS	SKII I	S						
No	Course				20			1		Γ	
110	Outcome	03									
		Corresponding POs	*							Ħ	
		ono	s my							ner s	
		dse	, m							loo	
		Corr POs	Bloom's Taxonomy*	4		A		4		Assessment Methods	
		Ŭ Ă	Β	CP		CA		KP		ΑŊ	
CO1	Define vector									~	_
	terms, Laplace		<b>C</b> 1						-		iss Test,
	transform and	. 1	C1		1				3		al Exam,
	geometrical									Ass	ignment
CO2	terms Identify										
02	Identify different										
	properties of										
	straight lines,										
	pair of straight									Cla	lss Test,
	lines, circles,		C2		1				3		d-term,
	radical axis and										al Exam
	center in 2D										
	and 3D co-										
	ordinate										
	systems.							1			
CO3	Apply Laplace							1			
	transform and							1	_		ignment,
	0	1	C3		1				3		erm, Final
	engineering							1		E	lxam
	study.			 		C a1'		Carro	an Di	hlan: C	ladia an T-A
	WP= Washingto										
	Engineering Act Profile/ KP= Kn				x Acuv	mes; v	v и = М	asningt	UII ACC		wieuge
L	*Level of Bloom's Taxonomy:										

	C1 – Rememb		4 – nalyza	C5 - Evaluate	C6 – Create			
			-					
(T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F – Final Exam)								
TEAC		ND LEARNING STRATEGY						
		earning Activities	Engagemer	nt (Hours)				
Face-te	o-Face Le	arning						
Lect				42				
		orial / Studio		-				
		ed Learning		-				
Self- D	irected Le	6						
•		e-to-face learning		25				
•		of the previous lecture at home	21 21					
•	-	on for the final examination		21				
	Assessme			~				
		as Assessment		8				
b)	Final Exar	nination		3				
		Total		120				
TEACH	ING METI	HODOLOGY						
Lecture a	and Discus	sion, Problem-Based Method						
COUR	SE SCHEI	DULE						
Week	Lecture	Topics to be Covered		As	sessment			
1	01	Definition of vector and sca						
		algebra, scalar and vector pro						
	02	vectors and their geometrical in Definition of vector and sca						
	02	algebra, scalar and vector pro						
		vectors and their geometrical in						
	03	Definition of vector and sca						
		algebra, scalar and vector pro	oducts of two					
		vectors and their geometrical in						
2	04	Triple products and multiple pr						
		dependence and independence	of vectors,		CT1			
	05	Differentiation of vectors Gradient of scalar functions, dir	vergence and					
	05	curl of point functions	vergence and					
	06	Physical significance of	gradient,					
		divergence and curl	<i>8</i> ,					
3	07	Definition of line, surface						
		integral, integration of vect	tors, Green's					
	00	theorem and application						
	08	Definition of line, surface						
		integral, integration of vect	tors, Green's					
	09	theorem and application Green's theorem and its application	ation					
4	10	Gauss theorem and its applicati						
	10	Engineering						
	11	Stoke's theorem and its applicat	tion.		CT			
	12	Introduction to geometry for en			CT2			
		rectangular co-ordinates, trans						
		co-ordinates						

5       13       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         14       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         15       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         6       16       Circles (tangents, normal, chord of contact, pole and polar), equation of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       0         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
reduction to its standard forms and properties         14       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         15       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         6       16       Circles (tangents, normal, chord of contact, pole and polar), equation of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       18	
14       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         15       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         6       16       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
general equation of second degree and reduction to its standard forms and properties         15       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         6       16       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
general equation of second degree and reduction to its standard forms and properties         15       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         6       16       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
reduction to its standard forms and properties         15       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         6       16       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       I8       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
15       Changes of axes, pair of straight lines, general equation of second degree and reduction to its standard forms and properties         6       16       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       T8         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
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reduction to its standard forms and properties         6       16         Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       T8         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
6       16       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         17       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves       CT 3         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves         18       Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
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angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves17Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curvesCT 318Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curvesCT 3	
joining the origin to the point of intersection of two given curves17Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curvesCT 318Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
of two given curves17Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curvesCT 318Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
<ul> <li>17 Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves</li> <li>18 Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves</li> </ul>	
pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curvesCT 318Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curvesCT 318Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
angle between straight lines, pair of lines joining the origin to the point of intersection of two given curvesCT 318Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
joining the origin to the point of intersection of two given curves18Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
of two given curves18Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
18 Circles (tangents, normal, chord of contact, pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
pole and polar), equation of conics, homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
homogeneous equations of second degree, angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
angle between straight lines, pair of lines joining the origin to the point of intersection of two given curves	
joining the origin to the point of intersection of two given curves	
of two given curves	
7 19 Circles (tangents, normal, chord of contact,	
pole and polar), equation of conics,	
homogeneous equations of second degree,	
angle between straight lines, pair of lines	
joining the origin to the point of intersection	
of two given curves	
20 Equations of parabola, ellipse in Cartesian	
and polar coordinates, system of circles	
(radical axes, coaxial circles, limiting points)	
21 Equations of parabola, ellipse in Cartesian	
and polar coordinates, system of circles	
(radical axes, coaxial circles, limiting points)	
8 22 Equations of parabola, ellipse in Cartesian	
and polar coordinates system of circles	
(radical axes, coaxial circles, limiting points) Mid Term Exa	am
23 Equations of parabola, ellipse in Cartesian	
and polar coordinates, system of circles	
(radical axes, coaxial circles, limiting points)	
24 Equations of parabola, ellipse in Cartesian	
and polar coordinates, system of circles	
(radical axes, coaxial circles, limiting points)	
9 25 Three dimensional co-ordinate system,	
direction cosines, projections, plane (angle	
between two planes, parallel & perpendicular	
plane, distance of a point from a plane),	
straight line (coplanar lines, shortest distance	
between two given straight lines), standard	
equation of sphere, ellipsoid, hyperboloid	

	1		
	26	Three dimensional co-ordinate system,	
		direction cosines, projections, plane (angle	
		between two planes, parallel & perpendicular	
		plane, distance of a point from a plane),	
		straight line (coplanar lines, shortest distance	
		between two given straight lines), standard	
		equation of sphere, ellipsoid, hyperboloid	
	27	Three dimensional co-ordinate system,	
		direction cosines, projections, plane (angle	
		between two planes, parallel & perpendicular	
		plane, distance of a point from a plane),	
		straight line (coplanar lines, shortest distance	
		between two given straight lines), standard	
		equation of sphere, ellipsoid, hyperboloid	
10	28	Three dimensional co-ordinate system,	
10	20	direction cosines, projections, plane (angle	
		between two planes, parallel & perpendicular	
		plane, distance of a point from a plane),	
		straight line (coplanar lines, shortest distance	
		between two given straight lines), standard	
	20	equation of sphere, ellipsoid, hyperboloid	
	29	Definition of Laplace transform and	
		Application of Laplace transform for	
		Engineering, Laplace transform of some	
		elementary functions and properties of	
	2.0	Laplace transform	
	30	Definition of Laplace transform and	
		Application of Laplace transform for	
		Engineering, Laplace transform of some	CT 4
		elementary functions and properties of	
		Laplace transform	
11	31	Sufficient condition for existence of Laplace	
		transform	
	32	Laplace transform of derivatives and its	
		application	
	33	Laplace transform of Integration with	
		application, Laplace transform of sine and	
		cosine integral	
12	34	Unit step function and its application	
	35	Periodic function with examples, Laplace	
		transform of some special function.	
	36	Definition of inverse Laplace Transform and	
		its properties	
13	37	Partial fraction and its application in inverse	
		Laplace Transform	
	38	Heaviside formula and its application	
	39	Convolution theorem, Evaluation of	
	39	*	
		improper integral, Application of Laplace	
14	40	transform	
14	40	Solve ordinary differential equation s by	
	4.1	Laplace transform	
	41	Solve partial differential equation s by	
	10	Laplace transform	
	42	Application of Laplace transform in	
	1	Engineering study	

ASSESSMENT STRATEGY								
Components	Grading	СО	Bloom's Taxonomy					
Continuous Assessment								
(Class assignments/ CT/	40%	CO1, CO2, CO3	C1, C2, C3					
Mid Term/ Active Class	40%	001, 002, 003	C1, C2, C5					
Participation)								
Final Exam	60%	CO1, CO2, CO3	C1, C2, C3					
Total Marks	Total Marks 100%							
TEXT BOOKS								
1. Vector Analysis- Mu	urray R. Spieg	gel, Seymour Lipschutz, l	Dennis Spellman					
2. Laplace Transforms-	- Murray R. S	piegel	_					
3. A Text Book on Co-ordinate Geometry with Vector Analysis - Rahman & Bhattacharjee.								
REFERENCE BOOKS								
1. Vector Analysis- K.	1. Vector Analysis- K.A. Strout, Dexter Booth							
2. A Student's Guide to	D Laplace's T	ransforms by Deniel Fleisc	h					

COURSE INFORMATION	
Course Code: MATH 203	Credit Hour: 3.0
Course Title: Applied Math for Engineering	Contact Hour: 3.0

PRE-REQUISITE

MATH-101 (Differential and Integral Calculus), MATH-103 (Differential Equations and Matrix), MATH-201 (Vector Analysis, Laplace Transformation and Coordinate Geometry)

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/RATIONALE

In this course students will be introduced to various methods to solve various civil, environmental and water resources engineering problems dealing with Fourier Analysis. Students will also be able to apply different methods to solve above mentioned problems with by statistical tools.

#### OBJECTIVE

- 1. To formulate civil, environmental and water resources engineering problems into mathematical frameworks and solve the resulting models by using Fourier analysis.
- 2. To understand 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.

COURSE CONTENT

**Fourier Analysis:** Definition and expansion of a function of x, real and complex form of Fourier series, physical applications of Fourier series, finite transform, Fourier integral, Fourier transforms, inverse Fourier transforms and their uses in solving boundary value problems (Wave equations, heat equations and damped equations).

**Statistics:** Frequency distribution, measures of central tendency and dispersion, variation, skewness and kurtosis, concept of probability, conditional probability, probability distributions i.e. binomial, Poisson, negative exponential, normal, sampling of mean and standard deviation by normal, Chi-square distributions, sampling theory, hypothesis testing, inference including t-tests, correlation and regression analysis.

	MAPPING (CO – PO MAI	PPIN	G)										
No	Course Outcome	PRO	OGR	AM	OU'	ГCOI	MES	(POs)	)				
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Identify periodic functions with various periods. Apply Fourier analysis to solve civil, Environmental and water resources engineering problems.												
2	CO2: Recognize different types of functions in Fourier series, analyze them and execute boundary value problems.		$\checkmark$										
3	CO3: Describe data in easy way in which information can easily be expressed in numerical form. Select and compare data on specific field and analysis to take the best decision among		$\checkmark$	$\checkmark$									

	alternatives. Identiti interpret sampling and different test	theor	у										
	future situations.												
	E OUTCOMES & O	GENE	ERIC S	KILLS				1		_			
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP		CA		KP		Assessment	Methods		
CO1	Be able to define periodic function, Fourier transform.		C1	1,3		-			2,6				/Class nt/Final n
CO2	Be able to apply probability distribution theory and Bayesian inference to civil, environmental and water resources engineering problems focusing probability and statistical analysis	2	C3	1,3		-			2,4				/Class nt/Final n
CO3	Be able to develop simple probabilistic models to evaluate uncertainty in probability and statistical analysis into engineering systems	1	C4	1, 2,3		-			2,4,6				/Class t/Final
	WP= Washington A EA= Engineering Activit Profile/ KP= Know *Level of Bloom's	ties/ ( ledge Taxo	CA= C Profil	omplex e	Act	ivities;	C C	= Wa	shington				U
	C1 – C2 –			C3- Apply		4 – nalyze		C5 Ev	- aluate		C6 Cre	_ eate	
TEAC	(T-Test, PR – Proje Presentation, R – Re HING AND LEARN	eport,	F – Fi	nal Exa		Term E	Exam,	Asg	– Assig	nme	ent, P	r —	
	ing and Learning Act				En	gagem	ent (F	Hours	;)				
Face-to-face Learning         Lecture (3 hours/week × 14 weeks)       42													
	<b>Learning</b> / Assignments (2 ho	urs/w	eek ×	6					12				

	dent Learnin								
	•	(1-hour lecture $\approx$ 1-hour	48						
learning									
		and final exam		7					
	Assessment								
,	Continuous A		08						
d) F	Final Examin	nation		03					
		Total		120					
ТЕАСНІ	NG METHO	Total		120					
		n, Co-operative and Collabo	orative Method Problem	n Based Learning (PBL)					
	SE SCHEDU	· •		in Dused Leanning (I DL)					
Week	Lecture	Topics to be Covered		Assessment					
1	01								
	02	-Definition and expansion		Final Exam					
	03	real and complex form o	i Fourier series.						
2	04	_		Class Test/Class Assignment/					
	05	Physical applications of	Fourier series	Final Exam					
	06								
3	07								
	08	Fourier integral		Mid Term/ Class					
4	09			Assignment/ Final Exam					
4	10 11	Finite and infinite Four	ion thomaforma						
	11		ler transforms						
5	12								
5	13	Inverse Fourier transfor	rms						
	15		11115						
6	16								
0	10	- Solution of boundary v							
	18	equations, heat equation	ns)						
7	19			Class Test/Final Exam					
	20	Solution of boundary val	lue problems (damped						
	21	equations)	• • •						
8	22	Fraguency distribution	maggurag of control						
	23	-Frequency distribution, -tendency and dispersion	measures of central						
	24	tendency and dispersion							
9	25	-Variation, skewness and	l kurtosis concept of						
	26	probability, conditional							
10	27	r,		Mid Term/ Class Assignment/					
10	28 29	Probability distributions		Final Exam					
		negative exponential, no							
11	30 31								
11	32	Sampling of mean and							
	33	normal, Chi-square distr	ibutions						
12	34								
	35								
	36	-Sampling theory, Hypotl	hesis testing						
13	37			Class Test/ Final Exam					
	38	Inference including t-tes	ts						
	39								
14	40								

41 42	Correlation and re	gression analysis						
ASSESSMENT STRA	ATEGY							
Components	Grading	СО	Bloom's Taxonomy					
Continuous Assessment (Class assignments/ CT/ Mid Term/ Active Class Participation)	40%	CO1, CO2, CO3	C1,C3, C4					
Final Exam	60%	CO1, CO2, CO3	C1,C3, C4					
Total Marks	100%							
TEXT BOOKS								
	<ol> <li>Fourier Analysis with Applications to Boundary Value Problems- Murray R. Spiegel</li> <li>Probability and Statistics for Engineers, Richard L. Scheaffer, James T. McClave</li> </ol>							
<b>REFERENCE BOOI</b>	KS							
	. Advanced Engineering Mathematics -Michael D. Greenberg							

COURSE IN	JFORMATION	
Course Code:	GEA 201	Credit Hour: 2.0
Course Title:	Principles of Accounting	Contact Hour: 2.0
PRE-REQU	ISITE	
None		
	UM STRUCTURE	
	sed Education (OBE)	
SYNOPSIS/	RATIONALE	
-		
OBJECTIVE		
	Introduce fundamental principles and concepts of acco	ounting, including the accounting
	equation and the double-entry bookkeeping system.	
	Explain the preparation and interpretation of financial	
	Financial Position, Statement of Comprehensive In-	come, Statement of Changes in
	Equity.	
	Develop a comprehensive understanding of cost acc	ounting principles and concepts
	including cost classification and cost behavior.	
	Develop the competency to apply cost accounting t	
	decisions, including Absorption costing and Variable of	costing, CVP Analysis, Job Order
	Costing and Process costing and Relevant Costing.	
COURSE C		
	in Contents:	
(1)	Accounting in Action	
(2)	Recording Process	
(3)	Adjusting the Accounts and prepare financial state	ement
(4)	Financial Statement Analysis	
(5)	Computerized Accounting System and	
(6)	Cost Concepts	
(7)	Absorption costing and Variable costing	
(8)	Job Order Costing and Process Costing	
(9)	Short & Long-Term Decision-Making in Account	ting
b. Deta	ail Contents:	
(1)	Accounting in Action	
a	. History & Definition of Accounting,	
b	. Objectives and Importance of Accounting	
с	. Accounting & Engineering	
d		· · · ·
	Accepted Accounting Principles (GAAP), Ethics in	n Accounting
e		
(2)	Recording Process: Journal, Ledger, T-account an	nd Trial balance
(3)	Adjusting the Accounts: Adjusting Entries, Adj	usted Trial Balance, Income
	Statement, Retained Earnings Statement and State	ement of Financial Position
	(Balance Sheet)	
, Worksheet		
(4)	Financial Statement Analysis: Horizontal Analysi	is, Vertical Analysis and Ratio
	Analysis	
(5)	Computerized Accounting System: Manual vs. Co	omputerized Accounting system,
	Some Accounting Software: QuickBooks, Xero, Z	
	TallyPrime.	
	-	

	(6)	Cost C	oncents												
	(0) a.		-		shino	Feat	tures	of M	anao	erial	Acc	ountir	ıσ		
	а. b.		Explain the Distinguishing Features of Managerial Accounting Identify the Three Broad Functions of Management												
	с.		Classification of Costs on Various Bases												
	с. d.														
	u.		Indicate How Cost of Goods Manufactured is Determined, Break Even Point BEP)for Different Projects.												
					ojeci										
	(7)	Absorp	ntion co	sting :	and V	ariał	ole c	ostino	<b>.</b> .						
	( <i>r</i> ) a.	Prepare		-				_	-	ahle	Cos	ting a	and	Ahso	rntion
	и.	Costing			nenus	Du	jeu	JII u	v arr	uoie	005	ing t	ing .	1050	iption
	b.	Cost Vo	•		CVP)	Ana	lvsis	s for d	liffer	ent e	noina	erino	nro	iects	
	с.														n costing
	с.	profitcal			101100	, III F	1011	.5 000	ween	van	uore	und t	10501	puol	reosting
	d.	•			s for	and a	aoair	nst va	riable	and	abso	orntio	n co	stino	
	(8)	Job Or								e une		npulo.		541115	
	(0) a.	Job Orde													
		Process													
	(9)	Short &			Deci	sion-	Mal	ting in	n Aco	count	ting				
		Relevan													
		How to								0					
	с.									ck in	Can	ital B	udge	eting	, Budgeting
		for vario							ajea	•••	- oup				, 20080008
	d.							t Valı	ie an	d Int	ernal	Rate	Of I	Retur	n Methods
SKILI	L MAPP	ING (CO													
No		Outcome					OUT	COM	IES (	POs)	)				
				1	2	3	4	5	6	7	8	9	10	11	12
1		Understa													
		nental pr												,	
		ancial a	nd co	st											
2	accoun		1	1											
2	CO2:		derstan												
	analysi	al report	ing an	a											
3		s Understa	nd cos	st											
5	behavio							1							
	control	. unu		~*										v	
4	CO4:	Apply	co	st			l –	1							
		110019	00	cost											
1	accoun													./	
	making	ting too	ols fo nforme	or											
	making busines	ting too ting in times too times too	ols fo nforme ns	or d											
COUR	making busines	ting too	ols fo nforme ns	or d	C SK	ILLS	<u> </u>								
COUR	making busines	ting too ting in times too times too	ols fo nforme ns S & GE	or d NERI	C SK	ILLS	5								
COUR	making busines	ting too ting in times too times too	ols fo nforme ns S & GE	or d NERI	C SK	ILLS									ent Is
	making busines SE OU	ting too ting in times too times too	ols fo nforme ns S & GE	or d NERI	C SK		3							√	sment nods
COUR	making busines RSE OU Co	ting too too too too too too too too too too	ols fo nforme ns S & GE	or d NERI	C SK	CP	5		CA		0,2				sessment lethods
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	making busines RSE OU Co	ting too ting i too too too too too too too too too to	ols fo nforme ns S & GE	or d NERI s *fu	C SK		5		CA		C7			√ 	Assessment Methods
No	making busines SE OU Cc Out	ting too s decisio TCOMES purse come	ols fo nforme ns S & GE	or d NERI	C SK		5		CA		CD CD	2		√	Assessment Methods
	making busines SE OU Co Out	ting too g i ss decisio TCOMES ourse come tand the	ols fo nforme ns S & GE	or d NERI	C SK				CA		92				
No	making busines SE OU Cc Out Unders fundan	ting too g i ss decisio TCOMES purse come tand the nental	ols fo nforme ns S & GE	Bloom's NAM	C SK		5		CA						nment,Final
No	making busines SE OU Co Out	ting too s decisio TCOMES ourse come tand the nental les of	Corresponding Corresponding Corresponding Corresponding	or d NERI	C SK				CA						

		-							
	Understan	d		C2					
	financial	1	11		-		-	1	Mid- Term, Final
	reporting	and							Exam
	analysis Understan	daast		<u> </u>					
	behavior	and	11	C2				1	Mid- Term, Final
	cost contro		11		-		-	1	Exam
C04	Apply accounting	cost							
	tools	g for							
	making	101	11	C2				1,2	Assignment,Final
	informed		11	C2	-		-	1,2	Exam
	business								
	decisions								
		hingto	n Acco	rd Cor	nnlex Proh	len	Solving/ CP	= Complex F	Problem Solving; EA=
									ccord Knowledge
	Profile/ KI					eur	, , , , , , , , , , , , , , , , , , ,	, ashington 1	leeora mio wieage
	*Level of								
	C1 –		22 -	2		C4 -	_ (	С5 -	C6 –
	Remember	· I	Inderst	and	Apply A	Ana	alyze	Evaluate	Create
					11 2				
	(T-Test, Pl	R - Pr	oject, Q	2 – Qu	iz, M – Mie	d T	erm Exam, A	sg – Assignn	ent, Pr-Presentation,
	R-Report	, F – F	inal Ex	am)					
TEAC	CHING AN	<b>ID</b> LE	ARNI	NG ST	RATEGY				
Teach	ning and Le	earnin	g Activ	ities			Engagemer	nt (Hours)	
Face to	o Face Lea	rning	5						
Lecture	(2 hours/w	eek x	14 wee	eks)				28	
Guide	d Learning	g							
Tutoria	al/ Assignn	nents (	2 hours	s/week	x 5 weeks	3)		10	
Indepe	endent Lea	rning	ξ					24	
Individ	lual learnin	ıg (1-Ì	our lec	ture $\approx$	1 hour				
learnin	g)	-						13	
	ation for te	sts an	d exam	inatior	1				
Forma	l Assessme	nt							
a)	Pop Quiz/	Class '	Test/M	id-Ter	m Exam			2	
-	Final exan							3	
	0/1411					$\neg$		_	
		Г	'otal					80	
	ING METH								
			lo-opera	ative a	nd Collabor	ativ	ve Method, Pro	oblem Based	Method
	SE SCHEI								
Week	Lecture								Assessment
1	01						of accounting	2	
-	02				s of accoun	ntin	g.		
_	03				reporting				
2	04						it assumption	,	
					entity assu				CT1
-	05	Acco	unting	equati	on and its	con	nponents		<b>U</b> 11
3	06			of bus	iness transa	acti	ons on		
			unting	. 1		1.7			
	07			al stat	ements and	1 ho	ow they are		
4		prepa							
1	08	Journ	nai						

_	09	Journal			
5	10		ger, Trial balance		
	11	Adjusting Acco			
6	12	Worksheet.			
7	13	Completion of t	he Accounting cycle.		
7	14	Financial Staten			
8	15	Managerial Acc			Mid Term Exam
8	16	Cost Concepts			
9	17	Job Order Cost	Accounting		
9	18	Job Order Cost	Accounting		
10	19	Process Cost Ac			CT2
10	20	Process Cost Ac	counting		
11	21		rofit Relationships		
11	22	Cost-Volume-P	rofit Relationships		
	23	Performance E	Evaluation through Standar	rd	
12	23	Costs			
12	24	Performance E	Evaluation through Standar	rd	
	24	Costs	-		CT3
13	25	Incremental Ana	alysis		
15	26	Incremental Ana	alysis		
14	27	Capital Budgeti	ng		
14	28	Capital Budgeti	ng		
ASSESS	SMENT S'	TRATEGY			
Compor	nents	Grading	CO	Bloom	's Taxonomy
Continue	ous				
Assessm	nent				
(Class as	ssignments	s/			
CT/ Mid	l Term/	40%	CO1, CO2, CO3, CO4		C2
Active C	Class				
Participa	ation)				
1	,				
Fin	al Exam	60%	CO1, CO2, CO3, CO4		C2
Tot	al Marks	100%			
REFER	ENCE BO	OOKS			
4. Fina	ncial Acco	ounting IFRS edit	ion by Weygand, Kimmel &	Kieso (	(3th)
			andt, Kieso& Kimmel (IFRS		

<b>COURSE I</b>	NFORMATION	
Course Code		Credit Hour: 2.0
	: Fundamentals of Economics	Contact Hour: 2.0
PRE-REQU		
None		
	LUM STRUCTURE	
	ased Education (OBE)	
	S/ RATIONALE	
-		
OBJECTIV	Έ	
1.	To help students demonstrate the knowledge of the fu	undamental concepts of economics.
2.	To teach how efficiency in organizational decision-m	
3.	To help students understand consumer behavior,	-
	different market structure.	5
4.	To help students realize the importance of various i	macroeconomic aggregates such as
	national income, full employment, unemployment,	
	inflation, productivity and the major challenges assoc	
	aggregates.	
5.	To help students apply the basic theories of economic	s to make their project management
	cost-effective.	1
6.	To help students recognize the basic features of eco	phomic development and regarding
	planning for the economy of the country.	
COURSE 0	CONTENT	
Fundamenta	l of Economics: Definition	
	Possibility Frontier and Engineering Decision: 1. PPF C	Curve.; Applying the PPF to Society
	y the Engineers.	
	ry: Law of diminishing marginal utility.	
	Definition. 2. Law of Demand. 3. Market Demand. 4. F	Reason for demand curve downward
	athematical Analysis	
	Definition. 2. Supply curve. 3. Market Equilibrium.	
	Demand: 1. Different types of elasticity. 2.Different	types of price elasticity. 3.Relation
	R, MR and elasticity. 4. Mathematical Analysis	ST T
	e Curve Analysis Consumers Equilibrium: Budget Line	e, MRS, Consumer Choice
	Function from Engineering point of view: 1. TP, AP,	
3. Law of re	<b>e e i</b>	I I I I I I I I I I I I I I I I I I I
	sis and Engineering Economics: 1. TC, AC, MC. 2. Sh	ort run cost analysis
	Market Structure and Engineering Decision: 1. Perfec	
	y and Monopolistic Market	
-	t of Macroeconomics: Definition	
• •	come: GDP, GNP, NNP, NI	
	w of National Income and Engineering Resources: Tw	o Three and Four sector Economy
	wings Function, APS, MPS. Derive the savings fi	
	athematically and graphically.	unetion from consumption
	ns: Consumption functions, APC, MPC	
-	Investment Theories, Investment Multiplier	
	Plan considering the Inflation Rate of the Country: De	emand-Pull and Cost-Push Inflation
<b>U U</b>	of Monetary policy on Engineering Plan: Impact and U	
	of Fiscal Policy on Engineering Plan: Impact and Use	
	Developments: 1 or 2 Theories of Economic Developm	nent
	tal problems; Conversion and load management; The	long run issues: Exchange between
long run & s	hort run benefits of projects.	
	282	

Renewable energy and non-renewable energy: The allocation over N periods; Efficient inter-temporal allocations

Environmental Sustainability: SDG goals and progress of Bangladesh.

Economic Problems in Developing Countries especially in Bangladesh. SKILL MAPPING (CO – PO MAPPING)

	L MAPPING (CO – PO MAPPI			MO			C /D4	20					
No	Course Outcome	PRC	OGRA					-	0	0	10	11	10
1	CO1. De able de ser las de l	1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to understand												
	the basic concepts and												
	principles of Microeconomics; demand,												
	supply market equilibrium, consumer behavior,												
	production, market structure												
	and Macroeconomics;												
	national income, employment,												
	consumption function, saving												
	function, inflation.												
2	CO2: Be able to determine the												
2	equilibrium of in micro &												
	macroeconomic level to reach											,	
	maximum social welfare.												
	Understand financial												
	reporting and analysis												
3	CO3: Be able to analyze												
-	consumer behavior,												
	production process, cost of												
	production and market												
	structure to the benefit of both												
	the consumer and the												
	producer.												
4	CO4: Be able to evaluate the												
	economy of Bangladesh												
	through national income,												
	consumption, investment,												
	inflation situation and												
	recommend economic policy											,	
	to develop the domestic												
	economy as well as the												
	relationship with the global												
COU	economy. RSE OUTCOMES & GENERIC	T CVI	10	I		l	I	1		I			l
	Course Outcome	SVII	LLS					-					
INO	Course Outcome		50										
			ling		*					L			
		ľ	buc	s	'ny					en			
			spc	'n,	lot					sm sds			
			Corresponding POs	loc	XOI					Assessment Methods			
		i	POs	Bloom's	Ta	CP	CA		КР	Assessme Methods			
CO1	Be able to understand the	hasic						_					
001	concepts and principles	of									_	_	
	Microeconomics; demand, su		1		C2	-		_	1	Clas		, Mid	
		umer	T		C4	_			1		Final	Exan	1
		arket											
	production, m					1							

	structure	and Macroeconomi	cs.					
	national	income, employme						
	consumpt							
	function, i		0					
CO2	Be able	e to determine t	he	C3				
	equilibriu	m of in micro	& 11				1	Class Test, Mid Term,
		nomic level to rea	ch 11		-	-	1	Final Exam
		social welfare.						
CO3		to analyze consum		C4				
		production process, co						Class Test, Mid Term,
		tion and market structu			-	-	1,2	Final Exam
		efit of both the consum	ner					
	and the pr		~f					
	Be able to Banglades	evaluate the economy sh through nation						
		sh through nation sonsumption, investme						
	inflation s	situation and recomme	nd					Class Test, Mid Term,
		policy to develop t		C4	-	-	1,2	Final Exam
		economy as well as t						i mai L/aum
	relationsh							
	economy.							
	WP= Was	hington Accord Compl						
		ng Activities/ CA= Con	nplex Activ	vities; WK	K= Wa	shing	ton A	ccord Knowledge
		P= Knowledge Profile						
		Bloom's Taxonomy:	n ~:		~-			
	C1 –		C4 - C4 -			-		C6 –
	Remembe	r Understand A	Apply Ana	uyze	Ev	aluate	e	Create
			M – Mid Te	erm Exan	n, Asg	– Ass	signm	ent, Pr – Presentation, R
		F – Final Exam)						
		ND LEARNING STRA						
		earning Activities	Engagen	nent (Hou	ırs)			
	o Face Lea	_				•		
		veek x 14 weeks)				28		
	d Learnin							
	0	nents (2 hours/week x				10	)	
5 week	/							
	endent Le					24	ŀ	
		ng (1-hour lecture $\approx 1$						
	earning)	<b>.</b>				13	5	
		ests and examination						
	l Assessme							
c)	Pop Quiz/	Class Test/Mid-Term				2		
	Exam					3		
d)	Final exan	nination						
		Total				80	)	
TEACH		HODOLOGY						
		sion, Co-operative and C	Collaborativ	e Method	, Probl	lem B	ased M	Method
	SE SCHE				,			
	Lecture	1	vered Assessment					Assessment
		Introduction to		ing Econ	omics			CT1
1	01	Importance of Econor	-	-				~
L	1	importance of Leonor		5	•			

		Definition	f accomonica	Difference				
	02		of economics and macroeconom					
	02							
	03		ier (PPF) and Engi terminants of Dem					
2	05	Demand and del Demand curv						
2	04			c idea and				
	05	Mathematical A		Maalaan am				
2	05		rminants. Market					
3	06		pice (Indifferenc	e Curve and				
		Budget Line)	Decention of					
	07		rve, Properties of					
4		IC, MRS	handion in the ne	int of minur of				
	08	Engineers	luction in the po	int of view of				
	09		Short run and long	rup cost curvo				
5	10	Firms Equilibriu		g run cost curve				
	10	Different types						
6		How the Engine		perfectly				
0	12	competitive mar		perfectly				
	13		ers will act in Mo	nopoly Market				
7	14	National Income		nopoly mainer				
	15		d and Aggregate	Supply	Mid Term Exam			
8			tion of Level of Income and					
0	16	Employment	of Level of Inc					
	17		Employment The	OT V				
-	17		f Income and Exp					
9	18		tilize the resource					
	10	making process		CT2				
	19	Consumption Fu			012			
10	20	Saving Function						
	20	Inflation, Type of						
11	22	Impact of Inflati						
	23		problem and its in	nact on society				
12	23	Cost benefit ana		ipact on society				
	25		omic Developmen	\t				
13	25							
	20		roblems in Develo			CT3		
	27		the Engineers in	the Economic				
14		Development of How the E	Engineers compare	e their				
14	28		ojects in the cor					
	20	Economy.	ojects in the col					
ASSESS	MENT S	TRATEGY						
Compon			Grading	СО	I	Bloom's Taxonomy		
-	ous Asses							
		s/ CT/ Mid Term/	40%	CO1, CO2, CO	3.004	C2, C3, C4		
`	lass Parti		1070	201, 202, 20	-, r	02, 03, 01		
	Final	1 /	60%	CO1, CO2, CO	3 CO4	C2, C3, C4		
		Marks	100%		2,004	C2, C3, CT		
RFFFP	ENCE B		10070	1				
		P. A. Samuelson	and W. D. Nordh	aus (7th Edition)	)			
	•					on)		
		ics by Robert S. P	•		Sui Eaiti	011)		
		nics by N. Gregory						
4. Princ	cipie of E	conomics by N. G	regory Mankiw (8	stn Edition)				

# 5. Engineering Economics by Niall M. Fraser and Elizabeth M. Jewkes. (5th Edition)

COURS	E INFORMATION												
	ode: GES 201								Cre	dit H	lour:	2.0	
Course T	itle: Fundamentals of So	ociol	ogy						Cor	ntact	Hou	r: 2.0	
	EQUISITE		0,5										
None													
CURRI	CULUM STRUCTURE												
	e Based Education (OBI	E)											
SYNOP	SIS/ RATIONALE												
OBJEC													
	4. Understanding soci	al ph	enon	nena									
	SE CONTENT												
	n Contents: Understandi												
	il Contents: Nature and												
	ocial research and rese												
	elopment, Globalization												
	al problems, social strati												
	omic life, Environment												
	human society, Urbaniz				devel	opm	ent, S	Socia	l cha	nges	and	techr	iology.
	MAPPING (CO – PO M					CON							
No	Course Outcome	<u>PR</u>	OGR.	AM ( 3				POs) 7	8	9	10	11	10
1	CO1: Be able to	1	2	3	4	5	6	/	8	9	10	11	12
1	CO1: Be able to understand the basic												
		-											
	nature, scope and perspectives of	v	v										
	sociology												
2	CO2: Be proficient to			-					-				
2	apply sociological												
	imagination to the												
	context of social												
	problems of BD			v									
	society												
3	CO3: Be able to												
5	understand the stages												
	of social research												
	processes and							Ň					
	methodologies												
4	CO4: Be skilled												
	enough to analyze												
	different cultures,												
	civilizations and											,	
	different social											$\checkmark$	
	problems and												
	design solutions for												
	those												
	uiusu											L	

6	<ul> <li>understand analyze</li> <li>stratification, different</li> <li>systems, soo capitalism and them to BD so</li> <li>CO6: Be ai apply corr</li> <li>knowledge to societal and of issues</li> <li>environmental Context</li> <li>sustainable</li> <li>development</li> </ul>	ble t ble t ntextua asses cultura i l fc	d d l l l n, e o d l s s l l n o r			√ /	
	RSE OUTCOMES		ENERI	C SKILLS			
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	C	CA	Ł	Assessment Methods
CO1	Be able to understand the basic nature, scope and perspectives of sociology	1,2	C1, C2	1		7	Assignment, Class Test, Final Exam
	Be proficient to apply sociological imagination to the context of social problems of BD society	3	C3	1		7	
CO3	understand the stages of social research processes and methodologies	7	C2	1		7	Mid Term Exam, Final Exam
CO4	Be skilled enough to analyze different cultures, civilizations and different	11	C4	1,3		7	Mid Term Exam, Final Exam

social problems and design solutions for those       i       i       i         CO5       Be able to understand and analyze social stratification, different social systems, socialism, capitalism and relate them to BD society       7       C2       1       7       Assignment, 0 Test, Final E         CO6       Be able to apply contextual knowledge to assess societal and cultural context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving: E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3- C4 - C5 - C6 - Remember Understand Apply Analyze       C4 - C5 - C6 - Remember Understand Apply Analyze         TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)	xam					
design solutions for those       i       i       i       i         CO5       Be able to understand and analyze social stratification, different social systems, socialism, capitalism and relate them to BD society       7       C2       1       7       Assignment, 0 Test, Final E         CO6       Be able to apply contextual knowledge to assess societal and cultural context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving: E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze       C3 - C4 - C5 - C6 - Remember Understand Apply Analyze         TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)	xam					
for those       Image: social straification, different social and yze social straification, different social straification, different social straification, different social socialism, capitalism and relate them to BD society       7       C2       1       7       Assignment, G Test, Final E Socialism, capitalism and relate them to BD society         CO6       Be able to apply contextual knowledge to assess societal and cultural relate them to sustainable development       7       C3       1       7       Class Test, F Exam         MP Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile       *Level of Bloom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze Evaluate Create         TC-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presenta R - Report, F - Final Exam       TEACHING AND LEARNING STRATEGY	xam					
CO5       Be able to understand and analyze social stratification, different social systems, socialism, capitalism and relate them to BD society       7       C2       1       7       Assignment, G Test, Final E         CO6       Be able to apply contextual knowledge to assess societal and cultural issues in environmental context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze Evaluate Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presenta R - Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY	xam					
understand and analyze social stratification, different social systems, socialism, capitalism and relate them to BD society       7       C2       1       7       Assignment, 0 Test, Final E         CO6       Be able to apply contextual knowledge to assess societal and cultural context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 -       C3       C4 -       C5 -       C6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presenta R –Report, F – Final Exam)       TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)	xam					
analyze social stratification, different social systems, socialism, capitalism and relate them to BD society       7       C2       1       7       Assignment, 0 Test, Final E         CO6       Be able to apply contextual knowledge to assess societal and cultural context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving: E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Blom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze Evaluate Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presenta R – Report, F – Final Exam)       TEACHING AND LEARNING STRATEGY	xam					
stratification, different social systems, socialism, capitalism and relate them to BD society       7       C2       1       7       Assignment, Q Test, Final E         CO6       Be able to apply contextual knowledge to assess societal and cultural context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile       WE= Washington Accord Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze       C3 - C4 - C5 - C6 - Remember Understand Apply Analyze         TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)	xam					
different social systems, socialism, capitalism and relate them to BD society       7       C2       1       7       Assignment, G Test, Final E         CO6       Be able to apply contextual knowledge to assess societal and cultural context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile       *       VK= Washington Accord Knowledge Profile         *Level of Bloom's Taxonomy: C1 - C2 - C3- C4 - C5 - C6 - Remember Understand Apply Analyze       C3 - C4 - C5 - C6 - Remember Understand Apply Analyze       Ca - Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presenta R –Report, F – Final Exam)       TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)	xam					
systems, socialism, capitalism and relate them to BD society       7       C2       1       7       Test, Final E         CO6       Be able to apply contextual knowledge to assess societal and cultural issues in environmental context for sustainable development       7       C3       1       7       Class Test, Final E         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile       *Level of Bloom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze       C1 - C2 - C6 - Remember       C3 - C4 - C5 - C6 - Remember       C6 - Remember         TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)	xam					
Socialism, capitalism and relate them to BD society       Image: Colored Science Scien						
capitalism and relate them to BD society       capitalism and relate them to BD society       capitalism and relate them to BD society         CO6       Be able to apply contextual knowledge to assess societal and cultural context for sustainable development       7       C3       1       7       Class Test, F Exam         environmental context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving, E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3- C4 - C5 - C6 - Remember Understand Apply Analyze       C1 - C2 - C6 - Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentar R - Report, F - Final Exam)       TEACHING AND LEARNING STRATEGY	inal					
relate them to       BD society       BD society       BD society         CO6       Be able to apply contextual knowledge to assess societal and cultural issues in environmental context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile       *Level of Bloom's Taxonomy:       C1 -       C2 -       C3 - C4 -       C5 -       C6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar R –Report, F – Final Exam)       TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)	inal					
BD society       Image: CO6       Be able to apply contextual knowledge to assess societal and cultural issues in environmental context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving, E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile *Level of Bloom's Taxonomy:       C1 -       C2 -       C3 - C4 -       C5 -       C6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentar R -Report, F - Final Exam)       TEACHING AND LEARNING STRATEGY	inal					
CO6       Be able to apply contextual knowledge to assess societal and cultural issues in environmental context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile       *       *       C6       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -	inal					
contextual knowledge to assess societal and cultural issues in environmental context for sustainable development       7       C3       1       7       Class Test, F Exam         with environmental context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving, CP= Complex Problem Solving; E Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze       C6 - Evaluate         C1 - C2 - C3 - C4 - C5 - C6 - Remember Understand Apply Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentar R -Report, F - Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)	inal					
knowledge to assess societal and cultural issues in environmental context for sustainable development       7       C3       1       7       Class Test, F Exam         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving/ development       WP= Washington Accord Complex Problem Solving/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3 C4 - C5 - C6 - Remember Understand Apply Analyze Evaluate Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar R – Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities	inal					
assess       societal and       r       C3       1       r       Class Test, F         issues       in       r       c3       1       r       Class Test, F         environmental       context       for       sustainable       r       context       for         development       development       r       r       complex       robust complex       robust complex         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile       *Level of Bloom's Taxonomy:       c1 -       c2 -       c3 - c4 -       c5 -       c6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar       R – Report, F – Final Exam)       T         TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)	inal					
and       cultural       7       C3       1       7       Class Test, F         issues       in       environmental       7       C3       1       7       Class Test, F         environmental       context       for       sustainable       1       7       Class Test, F         environmental       context       for       sustainable       1       7       Class Test, F         environmental       context       for       sustainable       1       7       Class Test, F         environmental       context       for       sustainable       1       1       1       1         development       1       1       1       1       1       1       1       1         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1	inal					
issues       in       7       C3       1       7       Exam         environmental       context       for       1       1       1       1       Exam         context       for       sustainable       1       1       1       1       Exam         development       1       1       1       1       1       1       1       1         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E       Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge       Profile/ KP= Knowledge Profile       *         *Level of Bloom's Taxonomy:       C1 -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar       R – Report, F – Final Exam)       T         TEACHING AND LEARNING STRATEGY       Teaching and Learning Activities       Engagement (Hours)       Engagement (Hours)						
context       for         sustainable       development         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1 -       C2 -         C3-       C4 -         C5 -       C6 -         Remember       Understand         Apply       Analyze         Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar         R –Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)						
sustainable       development         WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1 -       C2 -         C3-       C4 -         C5 -       C6 -         Remember       Understand         Apply       Analyze         Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar         R –Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)						
development       WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1 -       C2 -         C3 -       C4 -         C5 -       C6 -         Remember       Understand         Apply       Analyze         Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentar         R -Report, F - Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)						
WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; E         Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1 -       C2 -         C3 -       C4 -         Remember       Understand         Apply       Analyze         Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar         R –Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities						
Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge         Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1 -       C2 -         C3 -       C4 -         Remember       Understand         Apply       Analyze         Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentat         R – Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)						
Profile/ KP= Knowledge Profile         *Level of Bloom's Taxonomy:         C1 -       C2 -         C3-       C4 -       C5 -         Remember       Understand       Apply         Analyze       Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar         R –Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)	A=					
*Level of Bloom's Taxonomy:         C1 -       C2 -       C3 -       C4 -       C5 -       C6 -         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentar       R - Report, F - Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)       Engagement (Hours)						
C1 –       C2 –       C3-       C4 –       C5 -       C6 –         Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar       R –Report, F – Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)       Engagement (Hours)						
Remember       Understand       Apply       Analyze       Evaluate       Create         (T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar       R – Report, F – Final Exam)       TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)						
(T-Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentar         R –Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)						
R –Report, F – Final Exam)         TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)						
TEACHING AND LEARNING STRATEGY         Teaching and Learning Activities       Engagement (Hours)	ion,					
Teaching and Learning Activities Engagement (Hours)						
Face-to-face Learning						
-						
• Lecture 28						
Practical/ Tutorial/ Studio     10	10					
Student – Centered Learning						
Self- Directed Learning						
Non-face-to-face learning     8						
Revision of the previous     10	10					
lecture athome 18	18					
Preparation for final						
examination						
Formal Assessment						
a) Pop Quiz/Class Test/Mid-Term 3						
Exam 3						
b) Final examination						
Total 80						

TEACH	ING MET	HODOLOGY						
			and Collaborative Method,	Probl	em Based Method			
	SE SCHEI		,					
Week	Lecture	Topics to be Cov	vered		Assessment			
	01		and scope of sociology					
1	02	Sociological imag	gination					
	03	Perspectives of so	ociology					
2	04	Orientation of so	ciological theories (Class	sical,				
	04	Contemporary an	d Post-modern)					
3	05	Social research an	nd its process.		CT1			
3	06	Research designs	and techniques					
4	07	Introducing cultu	re and its variations					
4	08	Civilization and t	heories of civilization.					
ج	09	Defining family a	and its changes					
5	10	Socialization pro	cess and development of	self				
	11		alization and its impac					
6	11	human life	_					
	12	Factors responsib	le to globalization					
7	13		pact in modern society		Mid Term Exam			
/	14	Addressing social	problems of Bangladesh	1				
8	15	Introducing socia	l groups and organization	ns				
0	16	Introducing burea	aucracy and good governa	ance				
	17		social stratifications and social					
9	17	inequality						
	18	Poverty and its ty		CT2				
10	19	Industrial revolut	ion and aftermath					
10	20	Urbanization and	city development					
	21	Capitalism: feat	ures and influence in	the				
11	21	contemporary soc	ciety					
11	22	Socialism: feature	es and influence in the					
		contemporary soc						
12	23	Environment and	human activities					
12	24	Climate change a	nd global risk					
-	25		ngladesh: problem or					
13	25	prospect						
	26	Crime and deviar	ce: a brief analysis					
14	27	Review 1						
14	28	Review 2						
ASSESS	SMENT ST	FRATEGY						
Compor		Grading	СО	Bloo	m's Taxonomy			
Continuo		6			*			
Assessm								
	ssignments	./						
CT/ Mid	•	40%	CO1, CO2, CO3, CO4,		C1, C2, C3, C4			
Active C		+070	CO5		$C_1, C_2, C_3, C_7$			
Participa								
1 articipa	(1011 <i>)</i>							
	al Errarri							
Fin	al Exam	60%	CO1, CO2, CO3, CO4,		C1, C2, C3, C4			
	1 1 1		CO5, CO6					
	al Marks	100%		L				
	ENCE BO			0.01	2			
1. Soci	ology in N	lodules: by – Rich	ard Schaefer, 2nd edition	, 2013	5			

- 2. Sociology Primary Principles: by CN Shankar Rao
- 3. Anthony Giddens- 5th edition
- 4. Relevant journal

COURSE INFORMATION	
Course Code: LANG 202	Credit Hour: 1.5
Course Title: Communicative English- II	Contact Hour: 3.0
PRE-REQUISITE	
LANG 102	
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	

SYNOPSIS/ RATIONALE

The English language course is designed for the students to develop their competence in communication skills for academic purposes emphasizing speaking, reading, listening and writing. The approach will be communicative and interactive and will involve individual, pair and group work. Students will be exposed to diverse text types to refine their reading skills, engaging in activities and discussions that foster effective writing type. 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. Special emphasis is placed on the various forms of essay including descriptive, narrative, cause-effect, compare-contrast, and argumentative. Upon completion of this course, student should demonstrate proficiency in communication across diverse contexts, engage in group activities, and deliver formal speech for academic, professional and social purposes. This course also incorporates classroom instructions to provide guidelines on presentations and communication skills. Additionally, the course emphasizes providing constructive feedback on students' oral performances.

#### OBJECTIVE

- 1. To develop English language skills to communicate effectively and professionally.
- 2. To strengthen students' presentation skills.
- 3. To develop competency in academic reading and writing.

#### COURSE CONTENT

**Reading:** Reading Comprehension: Practice using different techniques Academic reading: comprehension from departmental or subject related passages; Vocabulary for Engineers (some common Engineering terms for both general and dept specific); Reading subject specific text to develop vocabulary

**Writing:** Writing semi-formal, Formal/official letters, Official E-mail Applying for a job: Writing Cover Letter and Curriculum Vitae; Essay writing: writing steps, principles and techniques, outlining, revising, editing, proofreading; Narrative and descriptive writing: comparison-contrast and cause-effect, argumentative and opinion expression, assignment writing; Analyzing and describing graphs or charts; Practicing analytical and argumentative writing

**Speaking:** Public Speaking: Basic elements and qualities of a good public speaker; Set Speech and Extempore Speech: How to get ready for any speech – set or extempore. Individual / Group presentation: How to be ready for presentation, prepare the script for a good speech, prepare power point slides, etc. Selected books/Selected stories for presentation.

Listening: Listening to long lectures on some topics, Listening and understanding speeches/lectures of different accents.

SKILL MAPPING (CO – PO MAPPING)

No	Course Outcome	ome PROGRAM OUTCOMES (POs)													
			1	2		4	5	6	7	8	9	10	11	12	
1	CO1: Understan		,												
	techniques of ac														
	0	become chnical													
	vocabularies.	chnical													
2	CO2: Understan	d the													
	techniques of o	effective	-												
	academic writing in	ncluding													
	research articl writing.	e/report													
3	CO3: Commu	inicate									-	-			
5		present													
	their reports and re	-													
	work within the s											v			
	possible time	noncest													
4	CO4: Analyze any	7													
-	problem critically, i														
	data and sy	nthesize													
	information to provi	de valid													
COUR	conclusions. SE OUTCOMES &	GENE		CK	пт	2								I	
COON	SE OUTCOMES &					,									
		ing	s,	*1										nt	
	Course Outcome		'n,	Ś				-		0.			Assessment Methods		
No	Course Outcome	sOd	Bloom's	onc	CP			CA		07	2			leth	
		OIL	Bl	I ax										As: M	
		0													
CO1	Understand the														
	techniques of		~									А	ssign	nment, Quiz	
	academic		C2	,	-			-		1	l		U		
	reading and	1													
	become familiar with technical														
	vocabularies														
CO2	Understand the			+											
	techniques of													roject/	
	effective		C3		-			-		1	l			ignment,	
	academic writing													Quiz	
	including	1													
	research														
	article/report														
	writing.														
CO3	Communicate			+								+			
	effectively to											Pro	-	Assignment,	
	present their	10	C4		-			-		1	l			Quiz	
	reports														
	and research														
	and research														

	1 .1. 1										
	work within the										
	shortest possible										
CO 1	time										
CO4	Analyze any										
	problem						<b>.</b>				
	critically,						Project/				
	interpret data and	10	~-				Assignment,				
	synthesize	10	C5	-	-	-	Quiz				
	information to										
	provide valid										
	conclusions.										
	WP= Washington	Accord	Comn	lev Proble	m Solving/ C	P– Compley ]	Problem Solving:				
	EA=	Accolu	comp		in Solving/ C	I = Complex I	r tobletti Solving,				
		ities/ CA	= Coi	nplex Act	ivities: WK=	Washington A	Accord Knowledge				
	Profile/ KP= Know			r		8	6				
	*Level of Bloom's	s Taxono	my:								
	C1 - C2				4 –	C5 -	C6 –				
	Remember Un	derstand	l A	Apply A	nalyze	Evaluate	Create				
	(T-Test, PR – Proj	act O		м ма	Torm Exam	Asa Assiant	nont Dr				
	Presentation, R – Proj				renn Exam, A	nsg – Assigni	nent, F1 –				
TEAG	CHING AND LEAP										
	ning and Learning A			1	ement (Hours)	)					
	o Face Learning	ieu vities		Lingug	ement (mours)	/					
Lecture	U					20					
	al / Tutorial / Studi	0				20					
	t-Centered Learnin					20					
-	d Learning	0									
	al/ Assignments			16							
	Directed Learning										
•	Non-face-to-face	learning									
•	Revision of the pr	-	ecture								
	at home										
•	Preparation for the	e final									
	examination										
Forma	l Assessment										
	uous Assessment										
		na									
	iptive writing Read	Ũ				4					
	listening Test, Publi	IC									
Speaki	-										
Report	Submission										
Present											
	Total					60					
ТЕАСН	ING METHODOLO	)GY		00							
	and Discussion, Pro		ased N	lethod							
	una 21500551011, 1 10		u 11	100100							
COUR	SE SCHEDULE										
0000											

Week	Lecture	Торі	cs to be Covered		Assessment					
				on: Practice using						
1	01	differ	rent techniques	C C						
	00	Acad	emic reading: co	mprehension from						
2	02			ct related passages						
3	03	Voca Engin speci	abulary for Engineers (some common neering terms for both general and dept ific) Reading subject specific text to lop vocabulary							
4	04		ng semi-formal, ial E-mail	Formal/official letters,						
5	05	and story	Curriculum	Writing Cover Letter Vitae Practicing urrating personal s						
6	06	techn		g steps, principles and g, revising, editing,						
7	07	Narra comp argur	ntive and operation of the second sec	descriptive writing: and cause – effect, opinion expression,	Assignment, rioject,					
8	08	Anal	yzing and describ	oing graphs or charts						
9	09	Pract writii		and argumentative						
10	10		c Speaking: I ties of a good put	Basic elements and blic speaker						
11	11		•	npore Speech: How to ch – set or extempore.						
12	12	ready good slides Selec	for presentation speech, prep s, etc.	resentation: How to be on, prepare script for paring power point lected stories for						
13	13	Liste	ning to long lectu	are on some topics						
14	14	Liste speec								
	SMENT ST	1								
	Components Grading CO			СО	Bloom's Taxonomy					
Continuous Assessment (Compulsory) Descriptive writing Reading Test			70%	CO1, CO2, CO3, CO4	C2, C3, C4, C5					
	3 12									

Listening Test									
Public Speaking									
Group Presentation	30%	CO1, CO2, CO3, CO4	C2, C3, C4, C5						
Total Marks	100%								
REFERENCE BOOKS									
1. Jones, L. (1981). Fu Australia: Cambrid	U	ish. (Student's Book, 2nd ress.	d Ed.) Melbourne,						
2. Dixon, R.J. (1987). Complete course in English. (Book 4). New Delhi, India: Prentice Hall of India. (For book presentation).									
3. Langan, J. (2005). College Writing Skills with Readings (6th Ed). McGraw-Hill Publication.									
4. Interactions 1 (Reading), John Langan, Latest edition, McGraw-Hill Publication									

# 5.3. Courses Offered by Academic Wing

COURSE INFORMATION								
Course Code: GERM 352	Credit Hour: 1.0							
Course Title: Fundamentals of Research Methodology	Contact Hour: 2.0							
PRE-REQUISITE								
None								
CURRICULUM STRUCTURE								
Outcome Based Education (OBE)								
SYNOPSIS/ RATIONALE								
The Fundamentals of Research Methodology is a hands-on course								
in the foundational methods and techniques of academic research								
context. UG students would examine and be practically exposed to the main components of a								
research framework i.e., problem definition, research design, dat								
research, time management, report writing, and presentation								
knowledge, participants would be well-placed to conduct disciplin								
in an area of their choosing. In addition to their application in an a								
methodologies discussed in this course would be similar to the	ose deployed in professional							
research environments.								
OBJECTIVE								
The primary objective of this course is to provide orientation to the	UG students on how to conduct							
a research project. Some other objectives of the course are:								
1. To evaluate/review related extant literature, form a var	iety of sources, pertinent to the							
research objectives/questions.								
2. To expose students to various research methodolog	gies (design), relevant to the							
research problem needing to be addressed.	1 11/							
3. To explain and justify how researchers will collect and								
4. To educate students in the common mistakes, research								
and ethical considerations while conducting research COURSE CONTENT	in respective field.							
Foundations of Research: Meaning of Research, Definitions	of Pasaarah Objactivas of							
Research, Motivation in Research, General Characteristics of								
Research, Types of Research, and Concept of theory, empiricism, d Characteristics of scientific method.	reductive and inductive meory,							
	Deview of Literature How to							
<b>Problem Identification and Formulation:</b> Meaning and need of Conduct the Paview of literature Passarch Question Investig								
Conduct the Review of literature, Research Question – Investig								
Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypoth	esis & Alternative Hypothesis.							
Hypothesis Testing – Logic & Importance.	a of a good massamph design							
<b>Research Design:</b> Concept and Importance in Research – Feature	e							
Exploratory Research Design – concept, types and uses, Descriptiv								
types and uses. Experimental/Computational Design: Concept of	of Independent & Dependent							
variables.								
<b>Data Analysis:</b> Data Preparation – Univariate analysis (frequency								
percentages), Bivariate analysis – Cross tabulations and Chi-	square test including testing							
hypothesis of association.								
<b>Research Misconduct and Ethics:</b> Understand the research	• •							
misconduct, Ethical issues in conducting research, Ethical issues re	nated to publishing, Plagiarism							
and Self-Plagiarism.								
Use of Tools / Techniques for Research: Layout of a Research Pag								
information effectively, Reference Management Software like Z	Lotero/Mendeley, Software for							

	ormatting like LaTe		Office, S	oftwa	are for	r detec	tion	of Pla	igiari	sm. '	Tim	e mai	nager	nent
	veloping Gantt Chart L MAPPING (CO –		APPING	)										
No	Course Outcome				MO	UTCO	ME	S (PO	s)					
110			1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to u the research fund ethics as a re professional condu research team and problem stateme research objectives.	amenta esearch ict in formul	als, ier, a					$\checkmark$			$\checkmark$			
2	standard guidelines.	resear g resear ckgrou followi	rch Ind Ing			$\checkmark$								$\checkmark$
3	CO3: Be able to academic writin presentation skil demonstrate considerations in co research.	g a ls a ethi onducti	und und cal ing							$\checkmark$				
COUI	RSE OUTCOMES &	GEN	ERIC SK	ILLS	5									
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	Ę	C	CA		КЪ	1	Assessment Methods				
CO1	Be able to understand the research fundamentals, ethics in conducting research, professional conduct in research teamwork and formulate problem statement and research questions or objectives.	6,9	C2	1	1,3	_	_	;	8	Class Quiz, Midte and Final Quiz Presentation				
CO2	Be able to formulate and compose a research proposal considering research activities/design, background studies, and following standard guidelines.	4,12	C6	1	,7	_	-	6	,8	Report Subm		omiss	ion	

demonstrate ethical 8,10 C2 1,2 – 7 Prestation	Proposal and Report ission Solving;
EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord K Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3- C4 - C5 - C6 -	C C
Remember Understand Apply Analyze Evaluate Crea	te
(T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Presentation, R – Report, F – Final Exam) TEACHING AND LEARNING STRATEGY	r —
Teaching and Learning	
Activities Engagement (Hours)	
Face-to-face Learning	
• Lecture 24	
<ul> <li>Practical/ Tutorial/</li> <li>12</li> </ul>	
Studio	
Self-Directed Learning	
Prepare project     5	
presentation	
Conduct literature     15	
review for project	
report	
Formal Assessment	
Class Quiz	
Project Proposal     20	
Report	
• Presentation 2	
Final Quiz	
Total 80	
TEACHING METHODOLOGY	
Lecture and Discussion, Problem Based Method	
COURSE SCHEDULE	
Week         Topics to be Covered         Assessment           Foundations         of         Descerably         Meaning         of         Descerably	
Foundations of Research: Meaning of Research, Definitions of Research, Objectives of Research	
Definitions of Research, Objectives of Research, Motivation in Research, General Characteristics of	
1 Research, Criteria of Good Research, Types of	
Research, Concept of theory, empiricism, deductive	
and inductive theory, Characteristics of scientific	
Method.	
2 Practice session on Foundations of Research Class Quiz	

			nulation: Meaning &							
			How to Conduct the uestion – Investigation							
3			sues –Hypothesis –							
5			s –Null Hypothesis &							
			esis Testing – Logic &							
	Importance.	51	6 6							
4	Practice session	n on Proble	m Identification &	Preliminary Presentation on						
4	Formulation			project proposal						
			mportance in Research							
			design – Exploratory							
5			s and uses, Descriptive							
	Research Designation and uses. Ex	perimental D								
	Independent & D									
6	Practice session of			Class Quiz						
			– Univariate analysis							
7	-	·	e charts, percentages),							
7			ations and Chi-square	Midterm Quiz						
	test including tes	sting hypothesis	s of association.							
8	Practice session of	on Data Analysi	S							
	Research Misco	nduct and Eth	nics: Understand the							
9			research misconduct,							
		search, Ethical issues								
		and Self- Plagiarism.								
10			sconduct and Ethics							
		-	Research: Layout of a							
	-		to search required							
11		•	erence Management							
11			, Software for paper	Final Quiz						
	e		Office, Software for							
	developing Gantt	•	e management and							
	Practice session of		/ techniques for							
12	Research		/ teeninques for							
13	Review Session (	Theory) – I /Fin	nal Presentation	Final Presentation						
14	Review Session (									
	Submission		_							
ASSESS	SMENT STRATE	GY								
	Components	Grading	CO	Bloom's Taxonomy						
	uous Assessment									
	ss assignments/	40%	CO1, CO2, CO3	C2, C6						
	tation/ Mid Term/		001,002,000	,						
-	Class Participation)									
	t Proposal Report	<u> </u>	CO1, CO2, CO3	C2, C6						
	Final Quiz	CO1, CO2, CO3	C2, C6							
	Total Marks 100%									
	ENCE BOOKS									
			÷	or Researchers. Springer, by						
	Deb, Dipankar, Dey, Rajeeb, Balas, Valentina E.									
	2. Research Methods for Engineers, 1st Edition, by David V. Thiel.									
<b>э</b> . На	3. Handbook of Research Methodology by Talati, J.K.									

- 4. Introducing Research Methodology: A Beginner's Guide to Doing a Research Project by Uwe Flick
- 5. DRM, a Design Research Methodology by Lucienne T.M. Blessing and Amaresh Chakrabarti
- 6. Research Methods: Information, Systems, and Contexts by Kirsty Williamson, Graeme Johanson
- 7. Zelkowitz, M. V. and Wallace, D. R. (1998), Experimental models for validating technology, Computer, vol. 31, no. 5, pp. 23-31.
- 8. Internet, mail, and mixed-mode surveys: the tailored design method (3rd ed.) by Dillman, D. A., Smyth, J. D., & Christian, L. M.
- 9. Improving survey questions: design and evaluation. Sage Publications, by Fowler, F. J.
- Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates, by Cohen, J., Cohen, P., West, S., & Aiken, L.
- 11. Experimental and Quasi-Experimental Design for Generalized Causal Inference. Boston, Mass: Houghton Mifflin, by Shadish W.R., Cook T.D. & Campbell P.T.
- 12. Computational handbook of statistics (4th ed.). New York: Longman, by Bruning, J. L. & Kintz, B. L.

# 5.4. Courses Offered by Department of Civil Engineering (CE)

COURS	SE INFORMATION												
	Course Code: CE 385 Credit Hour: 3.0												
	Title: Design of Civil Engineerin	g St	truct	ures	[			Conta					
	EQUISITE	-											
	EWCE 101 (Analytica; Mechanics), EWCE 211 (Mechanics of Solids)												
CURRICULUM STRUCTURE													
Outcome Based Education (OBE)													
SYNOPSIS/ RATIONALE													
	e design course for reinforced												
	nents, such as beam and slab, of a												
	rn how to design a reinforced co												
	edge gained from this course will	be	used	<u>d 1n l</u> a	ater	sem	ester	s and	ın p	rotes	siona	al lit	e.
OBJEC		f		<b>f</b>	4		4.0						
	Γο obtain fundamental knowledge									forf	1		h
	Γo gain experience in the design of reinforcement requirement for bea												
	building. code provisioned	ann a	ina i	Jona	anu	anci	lorag		/a110	ous m	emo		Jia
	Γο be familiar with the code provisioned	icia	hod a	afati	and	lcor	vices	hility	of re	ainfo	rcad	con	croto
	structures.	15101	licu i	safety		1 301	vicea	unity	0110		iceu	COII	ciele
	SE CONTENT												
	nental behavior of reinforced co	ncre	ete. i	introd	lucti	on	to str	ength	des	ign a	nd a	alter	nate
	methods, flexural design of beam												
	design method, shear, diagonal												
	of one-way slabs, design of two												
method			5	0	11				0	I			
SKILL	MAPPING (CO – PO MAPPING	i)											
No	Course Outcome	PR						S (PO	· ·				
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Able to <b>understand</b> the	.7	.7										
	Fundamental mechanics and		$\checkmark$										
	design methodology of reinforced cement concrete												
	(RCC) according to updated												
	code.												
2	CO2: Able to <b>design</b> different			_									
	types of beams (singly												
	reinforced, doubly reinforced												
	and T-beam), slabs (one-way												
	and two-way) and web												
	reinforcement for beam												
3	CO3: Able to generate practical												
	detail drawings of RCC beams			./									
	and slab accounting the code		V	$\checkmark$									
	provisioned development length,												
	anchorage, and splicing												
1	requirement of reinforcing bars			1				1	1	1	1	1	1 1

COURSE OUTCOMES & GENERIC SKILLS									
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	Đ	CA	KP	Assessment Methods		
CO1	Able to <b>understand</b> the fundamental mechanics and design methodology of reinforced cement concrete (RCC) according to updated code.	1	C2	1		3,4	Class Test, Final Exam		
CO2	Able to <b>design</b> different types of beams (singly reinforced, doubly reinforced and T-beam), slabs (one-way and two-way) and web reinforcement for beam	3	C4, C	5 1		4,5,6	Class Test, Mid-term, Final Exam		
CO3	Able to <b>generate</b> practical detail drawings of RCC beams and slab accounting the code provisioned development length, anchorage, and splicing requirement of reinforcing bars	3	C4	1		4,5	Assignment, Class Test, Final Exam		
	Remember Understand (T-Test, PR – Project, Q – Quiz,	omplex C3- Apply , M – I	C4 – C4 – Analy Mid Ter	ties; WK=	Washing C5 - Evaluate	ton Ac	cord C6 – Create		
TEAC	Presentation, R – Report, F – Fin HING AND LEARNING STRA								
	ing and Learning Activities	1201		Engagen	nent (Hou	irs)			
Face-to	-face Learning Lecture (3 hours/week × 14 week	ks)				42			
	<b>Learning</b> // Assignments (2 hours/week × 6	ó week	(5)			12			
Self- Di	rected Learning Non-face-to-face learning Revision of the previous lecture Preparation for the final examina				32 8 20				
a) (	Assessment Continuous Assessment Final Examination		3 3						

		Total	1	20
TEACHI	NG METH	IODOLOGY		
		ion, Problem-Based Method		
	SE SCHED			
Week		Topics to be Covered		Assessment
··· cen		Introduction to Concrete, Rein	forced Concrete and	
	01	prestressed concrete, load accord		
		Introduction to strength des		
1	02	design methods,		
		Safety provision of ACI	Code	
	03	serviceability.	0000,	
		Fundamental assumption of	f RC concrete,	~ .
	04	Behavior under axial load		CT 1
2	05	Design example.		
		Materials, properties under com	pression, shrinkage.	
	06		e, relaxation etc.	
	o <b>-</b>	Flexural analysis and design of	-	
2	07	homogenous beam		
3	08	RC concrete beam behavior.		
	09	Design example.		
	10	Design of tension reinforced rec	tangular beam, ACI	
	10	Code Provisions	C I	
4	11	Under reinforced, over-reinforce	ed beam, minimum	
	11	reinforcement ratio.		
	12	Design of Singly reinforced beam		
	13	Design example of singly rei		
	1.4	Design aid, Practical considerati		
5	14	beam,	C	
	15	Rectangular beam with	tension and	
	15	compression.		
	16	Doubly Reinforced beam analysis		
6	17	Design example of doubly rei	nforced beam.	
	18	Design example of doubly rei	nforced beam.	Mid Term Exam
	19	T-beam analysis		
7	20	Effective flange width, strength an	nalysis.	
	21	T-beam analysis		
	22	T-beam design example		
	23	Shear and diagonal tension i	-	
8	23	tension in homogenous elastic be		
	24	Reinforced concrete beam	without shear	CT 2
		reinforcement		012
_	25	ACI code provision for shear desi	gn	
9	26	Design Example.		
	27	Design of web reinforcement.		
	28	Design problems.		
10	29	Analysis and design of slab, des		
	30	Temperature shrinkage	reinforcement,	
		Design example of one-way slab.	- f	
11	31	Design example and detailing		
	32	Behavior of two way edge su	pported slab, column	

	-					
		supported sl	ab.			
	33	ethods.				
	34	Introduction	to mon	nent coefficient me	ethod	
12	35	Design exa coefficient r		vo-way slab using	g moment	CT 3
	36	Design exa coefficient r		vo-way slab using	g moment	
	37	Design exa coefficient r		vo-way slab using	g moment	
13	38	Design and	reinforceme	ent detailing of two	-way slab.	
	39	Bond and fundamental		and Development	nt length,	
14	40	Bond streng	•	velopment length, C.		
14	41	Bar cut-off	and bent poi	nt of beams, Bar sp		
	42	Design exam	nple of deve	lopment length.		
ASSESS	MENT ST	RATEGY				
Compon	ents		Grading	СО	Bloom's 7	Faxonomy
Continuo	us Asses	sment (Class				
assignments/ CT/ Mid			40%	CO1, CO2, CO3		C2, C4.C5
Term/Ac	tive Class	Participation)				
	Final Ex	am	60%	CO1, CO2, CO3		C2, C4.C5
Total Marks 100%						
REFER	ENCE BC	OKS				
1 D .	1 1 0					NC 0 11

1. Reinforced Concrete: Mechanics and Design - James Wight and James MacGregor, 6th Ed.

2. Design of Concrete Structures – Nilson (12th Edition).

3. Design of Concrete Structures - Nilson, David & Dolan, 14th Ed.

4. BNBC 1996, 2006, 2015, 2020.

COURSE INFORMATION	
Course Code: CE 386	Credit Hour: 1.5
Course Title: Civil Engineering Structures Design Sessional	Contact Hour: 3.0
PRE-REQUISITE	
EWCE-213 (Structural Analysis I), CE-385 (Design of C	ivil Engineering Structures I)
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	
SYNOPSIS/ 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 b	ridge and balanced cantilever
bridge.	-
OBJECTIVE	

- 1. To apply basic concept of limit state design to determine design load
- 2. To design the elements of a low-rise masonry building.

3. To design the various structural components of a slab bridge and a balanced cantilever bridge as per Bridge Design Specification.

#### COURSE CONTENT

Design of slab bridge, balanced cantilever bridge (AASHTO LRFD 2012) and low-rise

buildi	ng using ACI code.												
	MAPPING (CO – PO MA	APPI	NG)	)									
No					OUT	COM	1ES	(POs	)				
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Apply the basic												
	concepts of limit state			v									
	design												
2	CO2: <b>Design</b> the				-								
	elements of a low-rise			•									
2	masonry building												
3	CO3: <b>Design</b> of												
	various structural												
	components of a slab												
	bridge and a balanced												
	cantilever bridge as per												
	Bridge Design Specifications.												
COUE	SE OUTCOMES & GENI	FDIC	' CK	TIT	C				1		1		
COUR					ы С								
			ы В		*							It	
		-	Corresponding POs		Bloom´s Taxonomy*							Assessment	ds
No	Course Outcome		POs		IOU	CP		CA	KP			ssn	Methods
			Tes F		8 loc	Ŭ		0				sse	Me
		τ	<u> </u>		ц Ц							Ą	
CO1	Apply the basic concep												
	of limit state design		1		05	1		_	1,.	<i>,</i>			est, Quiz
CO2	Design the elements of		3		C5	1		_	4		Rep		Class Test,
	low-rise masonry building		0		00							Q	uiz
CO3	<b>Design</b> of variou											_	
	structural components of											Rep	
	slab bridge and a balance		3		C5	1,2	2	-	4,5,	6			Test,
	cantilever bridge as p					,			9- 9		Prese		on, Final
	Bridge Desig	'n										Qu	1Z
	Specifications.		1.	D		. C . 1			C	1	D1	.1	C - 1
	WP= Washington Accord EA=		mple	ex P	robiei	n <b>S</b> 01	vin	g/ CP=	= Con	npie	x Prot	blem	Solving;
		A = 0	Com	nley	Acti	vities	· w	K = W	/ashir	otor	h Acce	ord K	Cnowledge
	Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile												
	*Level of Bloom's Taxonomy:												
	C1 - C2 - C3 - C4 - C5 - C6 -												
	Remember Understand Apply Analyze Evaluate Create												
(T - Test PR - Project O - Ouiz M - Mid Term Even Ass. Assignment Pr													
(T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F – Final Exam)													
TEACHING AND LEARNING STRATEGY													
Teaching and Learning Activities     Engagement (Hours)													
	o-face Learning	-0				Jiiguz	5011	(I	10010	/			
1 acc t	Lecture (3 hours* 12 week	s)								36			
	Lecture (5 nours 12 week	)								20			

Calf D	Since te d Leonaine						
Sell-L	Directed Learning	1			2		
•	Non-face-to-face	•		3			
•	Revision of the pr	evious lectu	ire at		12		
	home				2		
•	Preparation for fin		3				
Forma	l Assessment						
•	Continuous Asses	sment			3		
•	Final Examination	ı			3		
	Tota	ıl			60		
TEACH	ING METHODOL	OGY					
Lecture	and Discussion, Pro	blem Based	Method				
	SE SCHEDULE						
Week	Topics to be Cov	vered			Assessment		
1	Introduction to the		a masonry	building			
	following BNBC g						
	low rise masonry		C				
2		C					
2	Design of Beam						
3	Design of Stairs						
4	Design of sunshad	e and lintel					
5	Design of Foundat						
6	Quiz				Mid Term Quiz		
7	Introduction on b	ridge desigr	n and Desi	gn of Slab			
	Bridge with detaili	ng		-			
8	Introduction to the	e design of	a balanced	l cantilever			
	bridge. Design o		b and ra	iling of a			
	balanced cantileve						
9	Analysis of Interio	or Girder for	r dead load	ls and live			
	loads						
10	Analysis of Interio	or Girder for	dead loads	s and live			
	loads						
11	Design of Interior						
12	Design of Exterior		diaphragm				
13	Design of articulat	ion.					
14	Quiz and Viva				Final Quiz		
	SMENT STRATE		[ava				
Compo		Grading	СО		Bloom's Taxonomy		
	ous Assessment						
	ssignments/	50%	C01 C	O2, CO3	C3, C5		
	ation/ Mid Term/			- <b>-</b> , 005			
Active Class Participation)							
	Final Quiz	50%	CO1, C	O2, CO3	C3, C5		
	Total Marks 100%						
	RENCE BOOKS						
	esign of Concrete S				d 15th Edition)		
2. Bangladesh National Building Code (BNBC) - 2012							
3. AA	ASHTO LRFD Brid	dge: Design	Specificati	ons 2012			

COURSE INFORMATION	
Course Code: CE 387	Credit Hour: 4.0
Course Title: Design of Civil Engineering Structures II	Contact Hour: 4.0
PRE-REQUISITE	
EWCE 101 (Analytical Mechanics), EWCE 211 (Mechanics of S	Solids), CE 385 (Design of
Civil Engineering Structures I)	_
CURRICULUM STRUCTURE	
Outcome Based Education (OBE)	

SYNOPSIS/ RATIONALE

It is the second design course for reinforced concrete structures after CE 385. 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.

#### OBJECTIVE

- 1. To obtain skill in designing different reinforced cement concrete (RCC) building components such as column, shear wall and footings under different types of loading
- 2. To understand the fundamental behavior of structural steel and design provision of tension and flexural members
- 3. To gain fundamental knowledge on prestressed concrete.

#### COURSE CONTENT

Design of columns under uniaxial and biaxial loading, structural design of footings, pile caps, design of RCC shear wall. Prestressed Concrete: concepts of prestressing, materials, anchorage systems, analysis of sections for flexure and shear, design of prestressed concrete beam. Behavioral principles and design of structural steel, design of tension members, bolted and welded connections, flexural members, design of beam-columns, connection design, moment connections, detailing of steel structures.

SKILL	SKILL MAPPING (CO – PO MAPPING)												
No	Course Outcome	PRO	PROGRAM OUTCOMES (POs)										
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to												
	understand basic												
	behavior of prestressed												
	concrete and structural	v											
	steel material.												
2	CO2: Be able to design												
	building components												
	such as reinforced		√										
	cement concrete (RCC)		v	v									
	column and shear wall												
3	CO3: Be able to design		,	,									
	footing and retaining		$\checkmark$										
	wall												
4	CO4: Be able to <b>design</b>												
	different structural												
	steel members such as												
	truss chord, beam and		v	v									
	determine the												
	connection requirement												
COUR	SE OUTCOMES & GEN	IERIC	C SK	ILLS	5								

	11							
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods	
CO1	Be able to understand basic behavior of prestressed concrete and structural steel material.	1	C2	1	-	5,6	Class Test, Mid Term, Final Exam	
CO2	Be able to design building components such as reinforced cement concrete (RCC) column and shear wall	3	C4, C5	1	-	5,6	Presentation/ Mid-term, Final Exam	
CO3	Be able to design footing and retaining wall	3	C4, C5	1	-	3	Assignment, Class Test, Final Exam	
CO4	Be able to design different structural steel members such as truss chord, beam and determine the connection requirement	3	C4, C5	1	-	3	Assignment, Class Test, Final Exam	
	WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy:							
	C1 – C2 – Remember Understand (T-Test, PR – Project, Q – Quiz	Apply $z, M - M$		Exam, .	C5 - Evalı Asg –		C6 – Create nent, Pr –	
	Presentation, R – Report, F – Fin		1)					
	CHING AND LEARNING STR	ATEGY			1	- (T	<b>T</b> )	
	ning and Learning Activities			E	ngage	ment (F	iours)	
race-t	o-face Learning Lecture (4 hours/week × 14 we	eeks)				:	56	
Tutoria	<b>d Learning</b> al/ Assignments (2.5 hours/week Directed Learning	$1 \times 6$ wee	eks)		15			
Sell-L	e	38 13			13			
Forma	Preparation for the final examination of the f			•	32			
a) b)		3 3						
	Total 160							
ТЕАСН	Total 160 TEACHING METHODOLOGY							
	Lecture and Discussion, Problem-Based Method							
	SE SCHEDULE							

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	sessment	Lecture Topics to be Covered	Week				
1         02         Lateral ties and spiral           03         Design example of rectangular tied column           04         Design example of spiral column, spiral design for circular column         CT           2         05         Strain compatibility analysis and interaction diagram (diagram (contd)         CT           3         06         Strain compatibility analysis and interaction diagram (contd)         Design example of column strength interaction diagram           3         07         Design of column under uniaxial loading         09           09         Biaxial bending, Reciprocal load Method         10         Design of continue uniaxial loading           12         Single column footing         12         Single column footing           13         Rectangular footing (contd)         14         Design of shear wall           6         17         Analysis and design of two way slab         18           18         Analysis and design of two way slab         18         Analysis and design of two way slab           19         Introduction to prestress concrete         Mid Term           21         Three concepts of prestressed concrete (contd)         24           22         Three concepts of prestress concrete         CT :           9         26         Loss of prestress flexural members </td <td></td> <td></td> <td></td>							
03         Design example of rectangular tied column           04         Design example of spiral column, spiral design for circular column         CT           2         05         Strain compatibility analysis and interaction diagram 06         CT           3         07         Design example of column strength interaction diagram         CT           08         Design of column under uniaxial loading         09         Biaxial bending, Reciprocal load Method           10         Design of column for uniaxial loading         01         Design of column under uniaxial loading           11         Footing and foundation: design of wall footing         12         Single column footing           12         Single column footing         13         Rectangular footing (contd)         14           15         Design of shear wall         16         17         Analysis and design of two way slab           18         Analysis and design of two way slab         18         Analysis of prestressed concrete         19           10         Three concepts of prestressed concrete         11         Three concepts of prestressed concrete         11           20         Three concepts of prestress do concrete (contd)         21         Three concepts of prestress do concrete (contd)           21         Three concepts of prestress flexural members <t< td=""><td></td><td></td><td>1</td></t<>			1				
04         Design example of spiral column, spiral design for circular column         CT           2         05         Strain compatibility analysis and interaction diagram (ond)         CT           3         06         Strain compatibility analysis and interaction diagram (contd)         Design example of column strength interaction diagram           3         07         Design of column under uniaxial loading           09         Biaxial bending, Reciprocal load Method           10         Design discussion on various foundation           4         11         Footing and foundation: design of wall footing           12         Single column footing         13           13         Rectangular footing (contd)         14           6         Design of shear wall         16           6         Trace concepts of prestress concrete         11           7         20         Three concepts of prestress concrete (contd)         14           18         Analysis and design of two way slab         18         18           19         Introduction to prestress concrete (contd)         21         Three concepts of prestress concrete (contd)           21         Three concepts of prestress concrete         24         Loss of prestress concrete (contd)           23         Prestressing varial members (contd)							
$ \begin{array}{ c c c c c } \hline 04 & for circular column & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 & $		Design example of spiral column spiral design					
2         05         Strain compatibility analysis and interaction diagram diagram (contd)           3         07         Design example of column strength interaction diagram           08         Design of column under uniaxial loading           09         Biaxial bending, Reciprocal load Method           10         Design of column under uniaxial loading           11         Footing and foundation: design of wall footing           12         Single column footing           13         Rectangular footing (contd)           5         14           16         Design of shear wall           16         Design of shear wall           17         Analysis and design of two way slab           18         Analysis and design of two way slab           18         Analysis and lesign of prestressed concrete           20         Three concepts of prestressed concrete (contd)           21         Three concepts of prestressed concrete           22         Three concepts of prestressed concrete           23         Prestressing systems and end anchorage           24         Loss of prestress concrete           25         Loss of prestress flexural members           10         29         Analysis of prestress flexural members           20         Ana	CLI						
$ \begin{array}{ c c c c c } \hline 06 & Strain compatibility analysis and interaction \\ diagram (contd) & \\ \hline 07 & Design example of column strength \\ interaction diagram & \\ \hline 09 & Biaxial bending, Reciprocal load Method & \\ \hline 0 & Design discussion on various foundation & \\ \hline 10 & Design discussion on various foundation & \\ \hline 11 & Footing and foundation: design of wall footing & \\ \hline 12 & Single column footing & \\ \hline 13 & Rectangular footing (contd) & \\ \hline 14 & Design of shear wall & \\ \hline 16 & Design of shear wall & \\ \hline 16 & Design of shear wall & \\ \hline 18 & Analysis and design of two way slab & \\ \hline 18 & Analysis and design of two way slab & \\ \hline 19 & Introduction to prestress concrete & \\ \hline 20 & Three concepts of prestressed concrete (contd) & \\ \hline 22 & Three concepts of prestressed concrete (contd) & \\ \hline 22 & Three concepts of prestressed concrete (contd) & \\ \hline 22 & Three concepts of prestressed concrete (contd) & \\ \hline 22 & Loss of prestress concrete & \\ \hline 24 & Loss of prestress concrete & \\ \hline 25 & Loss of prestress concrete & \\ \hline 26 & Loss of prestress concrete (contd) & \\ \hline 27 & Loss of prestress concrete (contd) & \\ \hline 29 & Analysis of prestress flexural members & \\ \hline 10 & 29 & Analysis of prestress flexural members (contd) & \\ \hline 30 & Analysis of prestress flexural members (contd) & \\ \hline 31 & Design of prestress flexural members (contd) & \\ \hline 32 & Design of prestress flexural members (contd) & \\ \hline 33 & Design of prestress flexural members (contd) & \\ \hline 33 & Design of prestress flexural members (contd) & \\ \hline 33 & Design of prestress flexural members (contd) & \\ \hline 33 & Design of prestress flexural members (contd) & \\ \hline 33 & Design of prestress flexural members (contd) & \\ \hline 33 & Design of prestress flexural members (contd) & \\ \hline 34 & Introduction to steel structure, property of steel & \\ \hline 37 & Analysis of tension member. & \\ \hline 38 & Analysis of tension member. & \\ \hline 39 & Welded connections, types of weld, weld capacity calculation & \\ \hline 14 & Design of compression member. & \\ \hline 40 & Introduction to compression member. & \\ \hline 41 & Desi$			2				
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(Cla Mid	tinuous Assessment ss assignments/ CT/ Term/ Active Class cipation)	40%	CO1, CO2, CO3, CO4	C2, C4, C5				
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	Final Exam	60%	CO1, CO2, CO3, CO4	C2, C4, C5				
	Total Marks	100%						
REF	<b>FERENCE BOOKS</b>	5						
1.	Reinforced Concret	te: Mechanics	and Design – James Wight an	d James MacGregor, 6th				
	Ed.							
2.	2. Design of Concrete Structures – Nilson (12th Edition)							
3.	3. Design of Concrete Structures – Nilson, David & Dolan, 14th Ed							
4.	BNBC 1996, 2006,	2015, 2020						

# 5.5. Courses Offered by Department of Computer Science and Engineering (CSE)

COURSE INFORMATION										
Course Code: CSE 278	Credit Hour: 1.5									
Course Title: Computer Programming and Computation										
Sessional										
PRE-REQUISITE										
None										
CURRICULUM STRUCTURE										
Outcome Based Education (OBE)										
SYNOPSIS/ RATIONALE										
The Structured Programming Language Sessional course i										
fundamental principles, and mechanism of programming										
skills for program design and development. The lab begins										
of structured programming language and then covers othe	r important topics related to structured									
programming language.										
OBJECTIVE										
1. To learn basic ideas of programming languages.										
2. To learn how to program with C.										
3. To learn how to think about the problems, an										
programming language using other languages like	C++ and MATLAB Programming in th									
future.										
COURSE CONTENT										
Basic programming Structures: Mathematical problems										
memory allocation, Operators, Expressions, Basic Input/o										
Structure: Practice problems on —if elsel, —switchl, Flor										
Practice problems on One- dimensional array, Multi-dime										
<b>Function:</b> Practice problems on Function, Parameter Pas problems on recursion; <b>Pointer:</b> Practice problems on Diff.										
arguments, Call by value vs call by reference; <b>Dynam</b>										
allocate memory using Malloc, Calloc, Free, Realloc; User										
on Structures, Unions, Enumerations; <b>File I/O:</b> Read, wr										
Preprocessors: Header files, Preprocessor; Error Handlin										
MATLAB; Introduction to hi-level computational program										
analysis: basic matrix computation, solving systems of 1										
transcendental equations.	inear equations, non intear equations,									
SKILL MAPPING (CO – PO MAPPING)										
No Course Outcome PROGRAM OU	TCOMES (POs)									
1 2 3 4	5 6 7 8 9 10 11 12									
1 CO1: Discuss algorithms and										
solve problems using $$										
computers	+ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$									
2 CO2: Analyze the fundamental										
principles, typical $$ characteristics, and										
characteristics, and mechanisms of a structured										
programming language										
programming ranguage										
3 CO3: Apply practical										

	knowledge to developrogramming skills respect to program de development.	s w	isic /ith and	$\checkmark$				
4	CO4: Ability to numerical analys engineering problems.	is	<b>ply</b> to	$\checkmark$				
COURS	SE OUTCOMES & GEN	VERIC	C SKILLS					
No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	Cb	CA	KP	Assessment Methods	
CO1	Discuss algorithms and <b>solve</b> problems using computers.	1	C1-C3	1	-	5	Final Exam, Class Test, Assignment	
CO2	Analyzethefundamentalprinciples,typical	the ntal s, typical istics, and sms of a d ming C4 3 - 7 Final Exam, Test, Assign Quiz						
CO3								
CO4	Ability to <b>apply</b> numerical analysis to engineering problems.	2	C3	3	-	2,3	Final Exam, Assignment, Quiz	
	WP= Washington Accord Complex Problem Solving/ CP= Complex Problem Solving; EA= Engineering Activities/ CA= Complex Activities; WK= Washington Accord Knowledge Profile/ KP= Knowledge Profile *Level of Bloom's Taxonomy: C1 - C2 - C3- Apply C4 - C5 - C6 - Remember Understand AnalyzeEvaluate Create							
(T – Test, PR – Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F – Final Exam)								
TEACHING AND LEARNING STRATEGY         Teaching and Learning       Engagement (Hours)         Activities       Engagement (Hours)								
	Face-to-face LearningLecture (1.5 hours/week × 1421							
Class	Assignment (1.0				14			

hours/we	$ek \times 14$ v	weeks)						
Assignm	<b>Learning</b> lent Pre- k x 14 w	paration eeks)	(1	14				
-	dent Lean	,	and		6			
Assessm Quiz +V					5			
TEACHI	Total NG METH		DGY		60			
Lecture a	nd Discuss	ion, Prot	olem-Based	Learning (PBL)				
COURS	E SCHED	ULE						
Week	Lecture		to be Cov	ered		Assessment		
1	1			blems using printf, scanf				
2	2	Practic —swit	e Problems ch	s on —if elsell, —else ifl,				
3	3			: nested if-else		Report, Assignment/Class		
4	4			loop- For, Do While		Test		
5	5			: nested loop				
6	6	•	one-dimen character ar	sional array, multi-dimens rray/ string	sional			
7	7	Mid Q				Mid term		
<u>8</u> 9	8		e problem	on User Defined Data	Types:	Report, Assignment/Class Test		
_	-		ire, Union					
10	10	Final (	Quiz and Vi	va		Final Exam/Project, Viva		
11	11		nment, mat	rices, function, loop, file L				
12	12	equation	ons using N	ar algebraic and transcer umerical Methods in MA	TLAB	Report, Assignment		
13	13	Solving equation	ndental TLAB					
14	14		Final exam					
ASSESS	MENT ST	RATEG	Ϋ́Υ					
Compon	ents		Grading	СО	Bloom	's Taxonomy		
Lab Report/Lab Test/ Continuous Assignments			20%	CO1, CO2, CO4		C1-C3, C4		
Assessme	ent Class Particip	oation	5%	CO1, CO2, CO3, CO4		C1-C3, C4, C6		
	Online		20%	CO1, CO2		C1-C3, C4		
	Mid Or	117	20%	CO1, CO2, CO3	C1-C3, C4, C6			
Mid Quiz 2			2070	0.01, 0.02, 0.05	1	$C1^{-}CJ, CT, CU$		

Final Quiz and Viva	35%	CO1, CO2, CO3, CO4	C1-C3, C4, C6					
Total Marks	100%							
REFERENCE BOOKS								
1. Teach Yourself C (3rd Edition) by Herbert Schidlt								
2. Programming in Ansi C (6th Edition) by E Balagurusamy								
3. C: The Complete Reference (4th Edition) by Herbert Schildt								
4. C Programming Language (2nd Edition) by Dennis M. Ritche								
5. Numerical Methods for Engineers and Scientists – J. D. Hoffman								
6. App. Numerical Methods with Matlab for Engrs and Scientists – S.C. Chapra.								
7. Numerical Mathematical Analysis – James b. Scarborough								
8. Introductory Methods o	8. Introductory Methods of Numerical Analysis – S.S. Sastry							
9. Numerical Methods for Scientific and Eng. Computation - Jain, Iyengar, Jain.								

### 5.6. <u>Courses Offered by Department of Electrical, Electronic and</u> <u>Communication Engineering (EECE)</u>

COURSE INFORMATIONCourse Code: EECE 167Credit Hour: 3.0Course Title: Basic Electrical TechnologyContact Hour: 3.0								
PRE-REQUISITE								
None.								
CURRICULUM STRUCTURE								
Outcome Based Education (OBE)								
SYNOPSIS/ RATIONALE								
To gain basic knowledge on basic AC and DC electrical circuits, electrical machines and also th	eir							
principle of operation, characteristics and applications.								
OBJECTIVE								
1. To develop the basics of electrical circuits and different problems solving technique								
2. To impart the basic operating principle of electrical machines like DC motor, DC gen	erator							
and Transformer etc.								
3. To impart the concept of active, reactive and apparent powers, power factor and reso	nance							
in series and parallel circuits.								
4. To introduce with electrical wiring consideration and basic service design concepts.								
COURSE CONTENT								
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 residentia								
commercial loads. (Illumination and lighting, Air Conditioning, heating, lifts, intercom, public ad								
system, telephone system and LAN, security system including CC TV, stand by generator and subs								
design considerations.) Basic principles and application of different types of electrical mac								
(Generator, motor, alternator, and transformer) Introduction to Electronics devices with s	imple							
application: Diodes, rectifiers. SKILL MAPPING (CO – PO MAPPING)								
No     Course Outcome     PROGRAM OUTCOMES (POs)								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	12							
1 CO1: Be able to apply network $$	12							
theorems to simplify real life								
complex networks.								
2 CO2: Be capable to explain the $$	+							
structure, operating principle and								
main features of electrical machines								
and their applications.								
3     CO3: Be able to understand AC	+							
circuit concents and solve both								
single phase and three phase circuit $$								
problems.								
4 CO4: Be able to discover the basic $$	+							
idea of wiring design and electrical								
appliances.								

No	Course Outcome	Corresponding POs	Bloom's Taxonomy*	CP	CA	KP	Assessment Methods			
CO1	Be able to apply network theorems to simplify real life complex networks.	1	C3	1	-	3	Class Test, Final Exam			
CO2	Be capable to explain the structure, operating principle and main features of electrical machines and their applications.	1	1 $\begin{array}{c cccc} C2, \\ C4 \end{array}$ 1 - 1,3		1,3	Class Test, Mid-term, Final Exam				
CO3	Be able to understand AC circuit concepts and solve both single phase and three phase circuit problems.	$\begin{array}{c} 2 \\ 2 \\ C5 \end{array} \begin{pmatrix} C2, \\ 1 \\ 1 \end{pmatrix}$		-	3	Assignment, Mid Term, Final Exam				
CO4	Be able to discover the basic idea of wiring design and electrical appliances.			-	5	Assignment, Final Exam				
	Engineering Activities/ CA= C Profile/ KP= Knowledge Profi *Level of Bloom's Taxonomy C1 – C2 – Remember Understand (T-Test, PR – Project, Q – Qu –Report, F – Final Exam)	ile 7: C3 Ap	- C ply A	4 – nalyze	C5 - Evalua	ate	C6 – Create			
TFAC	CHING AND LEARNING STR	RATEGY								
	and Learning Activities	Engagement (Hours)								
	o-face Learning	<i>6.6</i>								
weeks)	Lecture (3 hours/week $\times$ 14	42								
Tutoria $\times 6$ we	<b>Guided Learning</b> Tutorial/ Assignments (2 hours/week × 6 weeks)			12						
Self- D	Self- Directed Learning <ul> <li>Non-face-to-face learning</li> <li>Devicing of the previous</li> </ul>			11						
•	<ul><li> Revision of the previous lecture at home</li><li> Preparation for the final</li></ul>			18						
	examination	32								
	Formal Assessment c) Continuous Assessment				2					
	Final Examination				3					
	Total	120								

	ING METHO		
		on, Co-operative and Collaborative Method, Problem Based Me	thod
	SE SCHEDU	JLE	
Week	Lecture	Topics to be Covered	Assessment
1	01	Basic idea about Electrical Circuit, Circuit variables and elements	
	02	Applications of electrical circuits, Introduction to basic laws of circuits	
	03	Nodes, Branches, Loops, Voltage divider law and examples	CT1
2	04	Current divider law and examples, Wye-Delta transformation	CII
	05	Methods of circuit analysis, Nodal analysis and examples	
	06	Mesh analysis and examples, Super node with examples, Basic circuit theorems	
3	07	Super mesh with examples, Nodal VS Mesh analysis	
	08	Superposition theorem, Thevenin's theorem with examples	
	09	Norton's theorem with examples, Maximum power transfer in a circuit	CT2
4	10	Introduction: Concept of phasor and complex impedance / admittance	012
	11	Introduction: Concept of phasor and complex impedance / admittance	
	12	Analysis of simple series and parallel circuits	
5	13	Theory of Active power, reactive power, apparent power (volt ampere)	
	14	Mathematical Problems of Active power, reactive power, apparent power (volt ampere)	
	15	Power factor and energy associated with these circuits	
6	16	Concept of complex power, Phasor diagram	
	17	Impedance triangle and power triangle associated with complex circuits.	MID
	18	Resonance in series and parallel circuits	Term Exam
7	19	Synchronous Generator: Operating principle, Losses in Alternator	
	20	Equivalent circuit of synchronous Generator, Excitation systems of Synchronous Generator	
	21	Emf equation of synchronous generator, Mathematical problems	
8	22	Three phase induction motor: principle, Rotating magnetic field	
	23	Construction of squirrel cage IM, equivalent circuit, vector diagram, torque-speed characteristics	
	24	starting and braking, speed control, starting and torque speed characteristics	CT3
9	25 Synchronous motor: Operation, Starting method synchronous motor		015
	26	Vector diagrams of synchronous motor	
	27	Effect of loading under different excitation condition.	
10	28	Introduction to semiconductor devices and its classifications	

	29	P-type and N-type Semiconductor dio	materials and de and its band diagram	doping,	
	30	cteristics of r diode and			
11	31	Introduction to BJ operation of BJT Operating regions of	T and construction, Pri	nciple and	
	32	different			
	33	cs curves, and CC			
12	34	ers			
	35				
	36	e supply			
13	37	alculation			
	38	alculation			
	39	lential and , Air			
14	40	Heating, lifts, in telephone system a	tercom, public addres	ss system,	
	41	Security system inc and substation desi	cluding CC TV, stand by	generator	
	42	Review Class			
ASSESS	SMENT STR.	ATEGY			
Compo	nents	Grading	СО	Bloom's Ta	axonomy
Continu	ous Assessme	ent			•
(Class as	ssignments/ C	2T/ 40%			
	m/ Active Cla	(	C2, C3, C4, C5		
Participa					
-	inal Exam	(	C2, C3, C4, C5		
Т	, , , ,				
	ENCE BOO	100%			
			ll M., Corcoran, George	F. Kerchne	r
			Charles Alexander, Mattl		

### 5.7. Courses Offered by Department of Mechanical Engineering (ME)

COUR	SE INFORMATION												
	Code: ME 142							Cred	it Ho	our:	1.5		
Course	Title: Workshop Sessional							Cont	act H	Iour:	3.0		
	EQUISITE												
None													
CURR	ICULUM STRUCTURE												
Outcor	ne Based Education (OBE)												
SYNO	PSIS/RATIONALE												
In this	course students will be introduce	ed wit	h diff	feren	t woo	od wo	rkin	g too	ols, bo	ench	tolls	, han	d tools
and ma	achine tools. Students will be al	so pre	esente	ed wi	th w	elding	g tec	hniq	ues.	This	train	ing v	will be
useful	for the students in later projects.												
OBJEC	CTIVE												
1.	The student will be able to use	differ	ent n	nanut	factu	ring (	mac	hinir	ıg, w	eldin	ig, fo	undr	y, sheet
m	etal working, etc.) processes requ	ired t	o ma	nufac	ture	a proc	luct	from	the	raw i	mater	ials.	
	He will be able to use different												
3.	He will be aware of the safety p	recau	tions	while	e woi	rking	in w	orks	hop.			•	
COUR	SE CONTENT												
Machi	ne shop: (3/4 hrs/week)												
Kinds	of tools, common bench and ha	and to	ols, 1	narki	ng a	nd lay	yout	tool	s, me	easur	ing t	ools,	cutting
tools,	tools, machine tools, bench work with job, drilling, shaper, lathe and milling machines: introduction,												
type, s	type, size and capacity, uses and applications.												
Weldi	ng shop: (3/4 hrs/week)												
	ds of metal joints: Riveting, groo	oving	solde	ring,	weld	ling, T	Type	s of	weld	ing je	oints	and	welding
	e, Position of arc welding and po												
	machineries, Welding of differen												
	ss steel, aluminum, Types of elec												
	welding: Visual, destructive and												
	g equipment, Gases and types o												
	s, test of gas welding.		,		0			51			,		
SKILL	MAPPING (CO – PO MAPPIN	G)											
No	Course Outcome	PRO	GRA	MO	UTC	OME	S (P	Os)					
		1	2	3	4	5	6	7	8	9	10	11	12
1	CO1: Be able to study the basics												
	of workshop engineering	v											
	practice.												
2	CO2: Be able to identify the hand												
	tools and instruments and acquire												
	measuring skills.												
													ļ
3	CO3: Be able to acquire practical												
	skills by performing the												
	experiments in different shops of workshop.												
COUP	SE OUTCOMES & GENERIC S	KILL	9										
COUR	SE OUTCOMES & OENERIC S	INILL	S S										

NoCourse Outcome $\frac{ge}{b_{0}}$ $\frac{ge}{b_{0}}$ $\frac{ge}{b_{0}}$ $\frac{ge}{b_{0}}$ $\frac{ge}{b_{0}}$ $\frac$											1	
$ \begin{array}{ c c c c } hasics of workshop & 1 & C1 & 1 & 1 & Term Exam, Assignment \\ engineering practice. & Assignment \\ hand tools and & Assignment \\ hand tools and & Assignment \\ instruments and 5 & C1 & 1 & 1 & Report, Mid \\ instruments and 5 & C1 & 1 & 1 & Report, Mid \\ skills. & Assignment \\ column \\ skills & Assignment \\ column \\ experiments in \\ different shops of & Assignment \\ experiments in \\ different shops of & Assignment \\ experiments in \\ different shops of \\ workshop. & Assignment \\ \hline C1 & C2 & C3 & C4 & C5 & C6 \\ Remember & Understand & Apply & Analyze \\ \hline C2 & C3 & C4 & C5 & C6 \\ Remember & Understand & Apply & Analyze \\ \hline C2 & C3 & C4 & C5 & C6 \\ Remember & Understand & Apply & Analyze \\ \hline C2 & C0 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C3 & Apply & Analyze \\ \hline C2 & C0 & C1 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C2 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C6 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C5 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C5 \\ \hline C1 & C1 & C2 & C3 & C4 & C5 & C5 & C6 \\ \hline C2 & C1 & C2 & C2 & C3 & C4 & C5 & C5 \\ \hline C2 & C1 & C2 & C2 & C3 & C4 & C6 \\ \hline C2 & C1 & C2 & C2 & C3 & C4 & C6 \\ \hline C2 & C1 & C1 & C1 & C1 \\ \hline C1 & C1 & C1 & C1 \\ \hline C2 & C1 & C1 & C1 \\ \hline C1 & C1 & C1 & C1 \\ \hline C1 & C1 & C1 & C1 \\ \hline C2 & C2 & Study of Electric Arc welding process and \\ \hline various types of joint \\ \hline C1 & 01 & Introduction \\ \hline C1 & 01 & Introduction \\ \hline C1 & 01 & Study on different types of joint by T1G \\ \hline \end{array}$	No	Course O	utcome	Corresponding POs	Bloom's Taxonomy*	CЪ		CA		KP	Assessment Methods	
$ \begin{array}{ c c c c } hand tools and instruments and a contract of the sequence of t$		basics of engineering	workshop practice.	1	C1	1				1	Term Exam,	
$ \begin{array}{ c c c c c } \hline C03 & Be able to acquire practical skills by practical skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by practical skieles by provide skieles by practical skieles by practical skieles by provide skieles by provide skieles by practical skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by provide skieles by prov$	CO2	hand too instruments acquire r	ls and and	5	C1	1				1	Term Exam,	
$ \begin{array}{ c c c c c c } \hline C2 - & C3 - & C4 - & C5 - & C6 - \\ \hline Remember & Understand & Apply & Analyze & Evaluate & Create \\ \hline Remember & Understand & Apply & Analyze & Evaluate & Create \\ \hline Remember & Understand & Apply & Analyze & Evaluate & Create \\ \hline (CP - Complex Problems, CA - Complex Activities, KP - Knowledge Profile, T - Test, PR - Project, Q - Quiz, M - Mid Term Exam, Asg - Assignment, Pr - Presentation, R - Report, F - Final Exam, Viva - V) \\ \hline TEACHING AND LEARNING STRATEGY \\\hline Teaching and Learning Activities & Engagement (Hours) \\\hline Face-to-face Learning Activities & Engagement (Hours) \\\hline Face-to-face Learning & 36 \\\hline Guided Learning \\\hline Tutorial/ Assignments (1 hours/week × 12 weeks) & 36 \\\hline Guided Learning \\\hline a. Non-face-to-face learning \\ a. Non-face-to-face learning \\ a. Non-face-to-face learning \\\hline b. Revision of the previous lecture at home & 2 \\ c. Preparation for final examination & 3 \\\hline Formal Assessment \\\hline a. Continuous Assessment & 4 \\ b. Final Examination/Quiz and Viva & 2 \\\hline\hline TeACHING METHODUCGY \\\hline Lecture and Discussion- Problem Based Method \\\hline COURSE SCHEDULE \\\hline \hline Week & Lecture & Topics to be Covered \\\hline 1 & 01 & Introduction \\\hline 1 & 01 & Introduction \\\hline 2 & 02 & Study of Electric Arc welding process and various types of joint \\\hline 3 & 03 & Study on different types of joint by TIG \\\hline \end{array}$	CO3	Be able to practical s performing experiments different s workshop.	kills by the in hops of	4		1				1,5	Exam,	
Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Report, F Final Exam, Viva - V)TEACHING AND LEARNING STRATEGYTeaching and Learning ActivitiesEngagement (Hours)Face-to-face Learning Lecture (3 hours/week × 12 weeks)36Guided Learning Tutorial/ Assignments (1 hours/week × 12 weeks)312Self- Directed Learning a. Non-face-to-face learning b. Revision of the previous lecture at home c. Preparation for final examination1b. Revision of the previous lecture at home c. Preparation for final examination3Formal Assessment a. Continuous Assessment b. Final Examination/Quiz and Viva4b. Final Examination/Quiz and Viva2Total60TEACHING METHODOLOGYLecture and Discussion, Problem Based MethodCOURSE SCHEDULEWeekLecture a O2Study of Electric Arc welding process and various types of joint101Introduction202Study on different types of joint by TIG		<u>C1 -</u> <u>C2 -</u> <u>C3 -</u> <u>C</u>										
Teaching and Learning ActivitiesEngagement (Hours)Face-to-face Learning Lecture (3 hours/week × 12 weeks)36Guided Learning Tutorial/ Assignments (1 hours/week × 12 weeks)12Self- Directed Learning a. Non-face-to-face learning1b. Revision of the previous lecture at home c. Preparation for final examination2Formal Assessment a. Continuous Assessment b. Final Examination/Quiz and Viva4b. Final Examination/Quiz and Viva2Total60TEACHING METHODOLOGYLecture and Discussion, Problem Based MethodCOURSE SCHEDULEWeekLecture Introduction101Introduction202Study of Electric Arc welding process and various types of jointReport, Mid Quiz, Viva303Study on different types of joint by TIGReport, Mid Quiz, Viva	Project, Q – Quiz, M – Mid Term Exam, Asg – Assignment, Pr – Presentation, R – Re											
Face-to-face Learning Lecture (3 hours/week × 12 weeks)36Guided Learning Tutorial/ Assignments (1 hours/week × 12 weeks)12Self- Directed Learning a. Non-face-to-face learning1a. Non-face-to-face learning b. Revision of the previous lecture at home c. Preparation for final examination1b. Revision of the previous lecture at home c. Preparation for final examination2Total60TotalContinuous Assessment a. Continuous Assessmenta. Continuous Assessment b. Final Examination/Quiz and Viva460Total60TACHING METHODOLOGYLecture and Discussion, Problem Based MethodCOURSE SCHEDULEWeekLectureTopics to be CoveredAssessment101Introduction202Study of Electric Arc welding process and various types of jointReport, Mid Quiz, Viva303Study on different types of joint by TIGReport, Mid Quiz, Viva	TEACHING AND LEARNING STRATEGY											
Lecture (3 hours/week × 12 weeks)36Guided Learning Tutorial/ Assignments (1 hours/week × 12 weeks)12Self- Directed Learning a. Non-face-to-face learning b. Revision of the previous lecture at home c. Preparation for final examination1b. Revision of the previous lecture at home c. Preparation for final examination2Formal Assessment a. Continuous Assessment b. Final Examination/Quiz and Viva4b. Final Examination/Quiz and Viva2Total60TEACHING METHODOLOGYLecture and Discussion, Problem Based MethodCOURSE SCHEDULEWeekLecture101Introduction202Study of Electric Arc welding process and various types of jointReport, Mid Quiz, Viva303Study on different types of joint by TIGReport, Mid Quiz, Viva				ing A	ctivities				Eng	agement (Ho	urs)	
Guided Learning       Tutorial/ Assignments (1 hours/week × 12 weeks)     12       Self- Directed Learning     1       a. Non-face-to-face learning     1       b. Revision of the previous lecture at home     2       c. Preparation for final examination     3       Formal Assessment     4       a. Continuous Assessment     4       b. Final Examination/Quiz and Viva     2       Total       60       TEACHING METHODOLOGY       Lecture and Discussion, Problem Based Method       COURSE SCHEDULE       Week       Lecture     Topics to be Covered       Assessment     1       01     Introduction       2     02     Study of Electric Arc welding process and various types of joint       3     03     Study on different types of joint by TIG	Face-to			√ 12 u	veeks)					36		
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a. Non-face-to-face learning       1         b. Revision of the previous lecture at home       2         c. Preparation for final examination       3         Formal Assessment       4         a. Continuous Assessment       4         b. Final Examination/Quiz and Viva       2         Total       60         Total         COURSE SCHEDULE         Veek         Lecture       Topics to be Covered         1       01       Introduction         2       02       Study of Electric Arc welding process and various types of joint         3       03       Study on different types of joint by TIG		0	ts (1 hours	s/week	$x \times 12$ we	eks)	12					
b. Revision of the previous lecture at home 2 c. Preparation for final examination 3 Formal Assessment 4 a. Continuous Assessment 4 b. Final Examination/Quiz and Viva 2 Total 60 TEACHING METHODOLOGY Lecture and Discussion, Problem Based Method COURSE SCHEDULE Week Lecture Topics to be Covered Assessment 1 01 Introduction 4 2 02 Study of Electric Arc welding process and various types of joint by TIG 3 03 Study on different types of joint by TIG												
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b. Final Examination/Quiz and Viva2Total60TEACHING METHODOGYLecture and Discussion, Problem Based MethodCOURSE SCHEDULEWeekLectureAssessment101IntroductionAssessment202Study of Electric Arc welding process and various types of jointReport, Mid Quiz, Viva303Study on different types of joint by TIGTIG		· · · · · · · · · · · · · · · · · · ·								-		
Total     60       TEACHING METHODOLOGY       Lecture and Discussion, Problem Based Method       COURSE SCHEDULE       Week     Lecture     Topics to be Covered     Assessment       1     01     Introduction							4					
TEACHING METHODOLOGY         Lecture and Discussion, Problem Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introduction       Assessment         2       02       Study of Electric Arc welding process and various types of joint       Report, Mid Quiz, Viva         3       03       Study on different types of joint by TIG       Report, Mid Quiz, Viva	b. Final Examination/Quiz and Viva						2					
Lecture and Discussion, Problem Based Method         COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introduction										60		
COURSE SCHEDULE         Week       Lecture       Topics to be Covered       Assessment         1       01       Introduction	-											
1       01       Introduction         2       02       Study of Electric Arc welding process and various types of joint         3       03       Study on different types of joint by TIG												
202Study of Electric Arc welding process and various types of jointReport, Mid Quiz, Viva303Study on different types of joint by TIG	Week	Lecture		Topics to be Covered					Assess	sment		
various types of jointReport, Mid Quiz, Viva303Study on different types of joint by TIG	1	01	Introduct	ion	on							
3 03 Study on different types of joint by TIG	2	02	-			ocess	and	Report, Mid Ouiz, Viva				
	3	03	Study on	differ	ent types		by TI	G				

4			ling, Gas cutting, Soldering						
5	05	and Brazing Study of Lathe Ma	achine and Its Various	-					
		Operations							
6	06	Study of Milling N	Aachine and Its Various						
		Operations							
7	07	Mid Quiz							
8	08		g Machine and Its Various	5					
		Operations							
9	09	•	Machine and Its Various	5					
		Operations							
10	10		g Machine and Its Various	5					
		Operations							
11	11	Study on Sand M	old Preparation using single						
		piece pattern		Report, Final Quiz, Viva					
12	12		ttern and Various Types of						
		Molding Sand Pro							
13	13	Study on singl	1						
		preparation and	5						
		defects							
14	14	Final Quiz							
		-							
ASSESS	SMENT STRA	TEGY		-					
Co	omponents	Grading	CO	Bloom's Taxonomy					
Continu	ous Assessme	nt							
· υ	ment/Test/ Mi	id 45%	CO1, CO2, CO3	C1					
Term	/ Active Class		01,002,003	CI					
Pa	rticipation)								
	Quiz	50%	C3						
	Viva	5%	C1						
	Total Marks 100%								
REFER	ENCE BOOI	KS							
1. Machine Shop Practice, Vol. 1- Moltrecht, Karl									
1.	Machine Shop	) I lactice, vol. 1-1	wonteent, Kan						

# 5.8. <u>Courses Offered by Department of Industrial and Production</u> <u>Engineering (IPE)</u>

COURSE INFORMATION

Course Code: GELM 275	Credit Hour: 2.0
Course Title: Leadership and Management	Contact Hour: 2.0
PRE-REQUISITE	

None

CURRICULUM STRUCTURE

Outcome Based Education (OBE)

SYNOPSIS/ RATIONALE

The course is designed to make students understand the overlapping connection between engineering and management in an organization through the study of varied management practices and leadership traits as an engineer.

#### OBJECTIVE

To introduce different management functions and approaches.

- 1. To expose students to different views and styles of leadership
- 2. To understand how an organization functions collaboratively with managers and engineers.
- 3. To understand various personality traits and its impact on leadership and management.
- 4. To solve real-world management problems as an engineer.

#### COURSE CONTENT

a. Main Contents: Introduction to Leadership and Management, Management Fundamentals, Leadership & Motivation, Organizational Management, Planning and goal setting, Control, Change and Innovation, Attitude, Personality, Perception and Individual Decision Making, Understanding Work Team, HR Management, Operations Management, Information Technology and Management, Case studies.

b. Detailed Contents: Introduction to Leadership and Management: Definition of leadership and management, basic difference between a leader and a manager, relation of leaders and managers with respect to efficiency and effectiveness, qualities of leader and managers with examples from history. Management Fundamentals: Definition of management & manager, levels of management, management functions and skills, Mintzberg's managerial roles, Henri Fayol's management principles, strategic management.

Leadership & Motivation: Motivation, Maslow's hierarchy needs, theory of X & Y, motivators and hygiene factors, goal setting theory, reinforcement theory, equity theory, expectancy theory, Leadership styles, leadership trait theory, managerial grid, contemporary leadership, conflicts negotiation, leadership issues in 21st century, cross cultural leadership, engineer as a leader and some simple case discussions on leadership (positive and toxic leadership) in the class (Interactive Learning).

Organizational Management: Organization, departmentalization, chain of command, unity of command, cross functional area, authority, centralization and decentralization, traditional & contemporary organization, matrix project structure, learning structure, organizing collaboration. Planning and goal setting: Foundation of planning, goals of plan, types of goal, types of goal & plan, goal setting, MBO, well written goal.

Control: Controlling process, controlling for organizational performance, types of control: (feed-forward, feedback & concurrent), balanced scorecard, contemporary issues in control, workplace concern & workplace violence.

Change and Innovation: Change and innovation, internal and external for change, changing process, creativity vs innovation. Attitude: Components of Attitude, behavior model and characteristics model, behavior vs. attitude, job attitude, job involvement, job satisfaction and customer satisfaction.

Personality: Personality determinants: heredity and environment, Myers-Briggs Type Indicator,Big five personality model, personality traits (core self-evaluation, Machiavellianism, narcissism, self-monitoring, risk taking, proactive personality).

Perception and Individual Decision Making: Factors influencing perception, attribution theory, errors/biases in attribution, Factors of individual decision making, rational decision making, bounded rationality, satisfice, common errors in decision making, creativity in decision making.

Understanding Work Team: Work group, work team, problem solving team, selfmanaged workteam, cross functional team, virtual team, team effectiveness, team challenges.

HR Management: Process of Human Resource Planning, forecasting demand for labor, staffing, internal supply of labor, performance appraisal.

Operations Management: Project managing basics, goals and boundary of project, WBS, scheduling a project, Demand and supply forecasting, inventory control. Information.

Technology and Management: Management Information System (MIS), Enterprise Resource Planning (ERP) - For introductory knowledge.

ŠKII	LL MAPPING (CO – PO MAI	PPINC	j)											
No	Course Outcome				OUTCOMES (POs)									
		1	2	3	4	5	6	7	8	9	10	11	12	
1	CO1: Be able to familiarize													
	with the fundamental													
	concepts of leadership													
2	and management skills						-							
2	CO2: Be able to understand the role and contribution of													
	a leader inachieving													
	organizational goals													
3	CO3: Be able to understand													
_	the contribution of													
	leadership traits and									,	7		Г	
	management skills in								V	V	$\checkmark$	V	V	
	decision making and													
	solving real life problems													
	IRSE OUTCOMES & GENER	RIC SI	KILL	S		-			-		-			
No	Course Outcome	00												
		din			s *v								ent S	
			Corresponding POs		Bloom's Taxonomy*		5	CA		KP		Assessment Methods		
												Aetl		
		jon (	DI QI		Ta B							As A		
		0												
CO1	Be able to familiarize with													
	the fundamental concepts												lass Test,	
	of leadership and	9,1	0	(	C1, C	2	-	-		1	R	Repor	t, Final Exam	
	management skills													
CO2	Be able to understand the											C	lass Test,	
	role and contribution of a	9,10,11 C			~		-	_			R		, Assignment,	
	leader in achieving			C1, C	2				1			nal Exam		
CO3	organizational goals			+		_	-+		-+					
												C	loss Tost	
	contribution of leadership traits and management	8,9,1	0 1 1					_			P		lass Test, , Assignment,	
	skills in decision making	8,9,1 ,1		(	C1, C	2	-	-		1		Fi	nal Exam	
	and solving real life	,1	4											
L	and solving real file													

r	oroblems			
		ington Accord Complex Problem Solv	ing/ CP= Complex P	roblem Solving: EA=
		Activities/ CA= Complex Activities;		
I	Profile/ KP=	Knowledge Profile	C C	C
		loom's Taxonomy:		
	C1 –	C2 – C3- C4 –	C5 -	C6 –
H	Remember	Understand Apply Analyze	Evaluate	Create
		– Project, Q – Quiz, M – Mid Term E	xam, Asg – Assignm	ient, Pr – Presentation, R –
		Final Exam)		
IEA		ID LEARNING STRATEGY	Enco	a and (Hauna)
Face t		ning and Learning Activities	Enga	gement (Hours)
r ace-t	o-face Lea	0		29
	Lecture (2	2 hours/week $\times$ 14 weeks)		28
Solf D	viracted Lag	mina		
Sell-D	Directed Lea	0		10
•		-to-face learning		10 14
•		of the previous lecture at home		14
•	Preparatio	on for the final examination		14
Formal	l Assessmer	at		14
		s Assessment		2
	Final Exam			3
0)	FIIIAI EXAII	Ination		5
		Total		80
TEACU	INC METT	Total HODOLOGY		80
	SE SCHED	ion, Problem-Based Method		
	Lecture	Topics to be Covered		Assessment
1	01		nd Management:	
	-	Definition of leadership and n		
		difference between a leader and a		
		of leaders and managers with re-	0	
		and effectiveness, qualities of le		
		with examples from history.		
	02	Management Fundamentals: Definit	ion of management	
		& manager, levels of manager	-	
		functionsand skills, Mintzberg's		
		Henri Fayol's management p		
		management.	1 2 0	
2	03	Leadership & Motivation: Mot	vation, Maslow's	CT 1
	04	hierarchy needs, theory of X &		
		hygiene factors, goal setting the		
		theory, equity theory, expectancy t		
3	05	Leadership: Leadership styles, lead		
1		managerial grid, contemporary le		
	06	managenai gnu, comemporary ic		
	00		-	
	00	negotiation, leadership issues in 2	21st century, cross	
	06	negotiation, leadership issues in 2 cultural leadership, engineer as a	21st century, cross leader and some	
	06	negotiation, leadership issues in 2	21st century, cross leader and some ship (positive and	
4	00 07 08	negotiation, leadership issues in a cultural leadership, engineer as a simple case discussions on leader	21st century, cross leader and some ship (positive and ctive Learning).	

5	00		1
5	09	Organizational Management: Organization,	
		departmentalization, chain of command, unity of	
		command, cross functional area, authority,	
		centralization and decentralization, traditional &	
		contemporary organization, matrix project structure,	
	10	learning structure, organizing collaboration	
	10	Planning and goal setting: Foundation of planning,	
		goalsof plan, types of goal, types of goal & plan, goal	
6	11	setting, MBO, well written goal.	
0	11	Control: Controlling process, controlling for	
		organizational performance, types of control: (feed-	
		forward, feedback & concurrent), balanced scorecard,	
		contemporary issues in control, workplace concern &	
	12	workplace violence.	
	12	Change and Innovation: Change and innovation,	
		internal of change, changing process,	
7	13	creativity vs innovation	
/	15	Case Study – II: Planning and Goal Setting, A	
		Managerial Approach: Engineer as Great Managers (InteractiveDiscussions in the Class)	
	14	Attitude: Components of Attitude, behavior model and	
	14	characteristics model, behavior vs. attitude, job	
		attitude, job involvement, job satisfaction and customer satisfaction.	
8	15	Personality: Personality determinants: heredity and	
0	15	environment, Myers-Briggs Type Indicator, Big five	
		personality model, personality traits (core self-	
		evaluation, Machiavellianism, narcissism, self-	
		monitoring, risk taking, Proactive personality).	
	16	Perception and Individual Decision Making:	
		Factors influencing perception, attribution theory,	
		errors/biases inattribution	Mid Term Exam/Project
9	17	Perception and Individual Decision Making: Factors of	10j00t
		individual decision making, rational decision making,	
		bounded rationality, satisfice, common errors in	
		decision making, creativity in decision making.	
	18	Case Study – III : A Case on Decision Making –	
		Involves both leadership and managerial skills	
		(Interactive Discussion in the Class)	
10	19	Understanding Work Team: Work group, work team,	
		problem solving team, self-managed work team, cross	
		functional team, virtual team, team effectiveness, team	
		challenges.	
	20	HR Management: Process of Human Resource	
		Planning, Class Test 2 Forecasting demand for labor,	СТ 2
		staffing.	CT 3
11	21	HR Management: Internal supply of labor,	
		performance Appraisal.	
	22	Operations Management: Project managing basics,	
		goals and boundary of project, WBS, scheduling a	
		project.	

10					
12			gement: Demand and	supply	
		recasting, inventor			
			f Microsoft Project (M	(SP) for	
		heduling a project			
13	25 C	ase Study – IV:	relevant		
	26 th	eories taught through	ries taught throughout the course and involves both		
	16	dership and management issues, e.g., Columbia's			
	F	nal Mission. (Th	is may be given as	group	
		$\mathcal{C}$	wed by in class	short	
		resentations/discuss	sions)		
14				gement:	
	Ν	lanagement Information	ation System (MIS), En	terprise	
	R	esource Planning	g (ERP) - For intro	ductory	
		knowledge.			
		evision			
ASSES	SMENT STRA	TEGY			
Components		Grading	СО	<b>Bloom's Taxonomy</b>	
Continu	ious Assessmer	ıt			
(01					
(Class a	ssignments/ C	.7			
	ssignments/ C rm/ Active Cla		CO1, CO2, CO3	C1, C2	
	rm/ Active Cla		CO1, CO2, CO3	C1, C2	
Mid Ter	rm/ Active Cla		CO1, CO2, CO3	C1, C2	
Mid Ter Particip	rm/ Active Cla		CO1, CO2, CO3 CO1, CO2, CO3	C1, C2 C1, C2	
Mid Ter Particip	rm/ Active Cla ation)	s 40%			
Mid Ten Particip	rm/ Active Cla ation) Final Exam	ss 40% 60% 100%			
Mid Ter Particip I REFER	rm/ Active Cla ation) Final Exam Fotal Marks <b>RENCE BOO</b>	ss 40% 60% 100% <b>XS</b>		C1, C2	
Mid Ter Particip I REFEF 1. St	rm/ Active Cla ation) Final Exam Fotal Marks <b>RENCE BOO</b> udents must be	s 40% 60% 100% <b>CS</b> provided with SOI	CO1, CO2, CO3	C1, C2 ad of referring text books.	
Mid Ten Particip I REFEH 1. Str 2. Ho	rm/ Active Cla ation) Final Exam Total Marks RENCE BOO udents must be owever, course	s 40% 60% 100% S provided with SOI teacher may select	CO1, CO2, CO3	C1, C2 ad of referring text books.	
Mid Ten Particip	rm/ Active Cla ation) Final Exam Total Marks <b>RENCE BOO</b> udents must be owever, course agineering Mar	<ul> <li>40%</li> <li>60%</li> <li>100%</li> <li><b>XS</b></li> <li>provided with SOI teacher may select agement (Revised</li> </ul>	CO1, CO2, CO3 LID reading material instea any text book as per his ch	C1, C2 ad of referring text books. noice.	

Leadership in Organizations – Gary Yukl.
 Developing Management Skills – David A. Whetten and Kim S. Cameron.