DEPARTMENT OF CIVIL ENGINEERING
SONARGAON UNIVERSITY (SU), DHAKA
FACULTY: SCIENCE AND ENGINEERING

PROGRAM: B.Sc. in Civil Engineering

PROPOSED REVISED OBE SYLLABUS
By Departmental Syllabus Committee and recommended by
36th Academic Council (dated: 15-12-2025) for the approval of UGC

Duration (minimum): 4-Year (12 Semesters)
Maximum Period of Completion for the Program: 6 (six) Years
Admission Requirements: SU-rules or as suggested by UGC

Academic Calendar:
The academic year shall be divided into three regular Semesters (1st /Spring, 2nd /Summer and 3rd /Fall Semesters), each ordinarily having duration of not less than 14 (fourteen) weeks of classes. There shall be a Mid-Semester Examination at about middle of each Semester and a Semester Final Examination at the end of each Semester. The examination will be conducted as per Academic regulations.

Guideline for Classes and Examinations in a Semester:
Total Class in a Semester = 14 weeks
Recess before Mid-Semester and Semester Final Exams. = 2 weeks
Time for Mid-Semester and Semester Final Exams. = about 4 weeks
Publication of Results + Inter-Semester Recess = 2 weeks

Minimum Requirements for the Degree:
(i) Completion of 161.00 credits.
(ii) Passing all courses individually and maintaining min. CGPA of 2.25 out of 4.00.

Evaluation System: Continuous Assessment = 30%
Mid-Semester Exam. = 30%
Semester Final Exam. = 40%

***Continuous Assessment* = Class Tests + Assignments/Quiz + Attendance and Class Performance.**

Numerical grade	Letter Grade	Grade point
80% or above	A+ (A plus)	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A- (A minus)	3.50
65% to less than 70%	B+ (B plus)	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B- (B minus)	2.75
50% to less than 55%	C+ (C plus)	2.50
45% to less than 50%	C	2.25
40% to less than 45 %	D	2.00
Less than 40%	F	0.00

Course Designation and Course Code Numbering Systems:

Each course is designated by a two to four letter code (e.g. CE, EEE, ME, CSE, Arch, NAME, LAW, Hum, Math, Chem, Phy, Ban, etc.) identifying the course offering department or program followed by a four- digit number with the following criteria:

(i) CE defines the departmental identification code (Civil Engineering).

(ii) The first digit will correspond to the Year (e.g. 1 for 1st year, 2 for 2nd year, 3 for 3rd year, etc.) in which the students normally take the course.

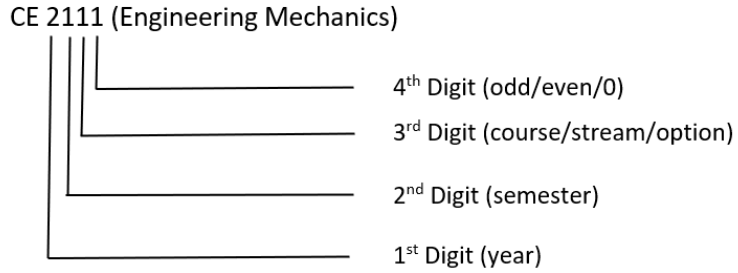
(iii) The second digit will correspond to the Semester (1 for 1st semester, 2 for 2nd semester and 3 for 3rd semester) in which the course is normally taken by the students.

(iv) The third digit will correspond the departmental course of any area/stream.

(v) The fourth or last digit designates the course type (odd digit for theory, even digit for sessional/design studio and 0 digit for the sessional course without theory course. If there are no sessional courses, then both odd and even digits can be used for theory courses).

(vi) There is a blank space between departmental code CE and first digit.

Example of a Typical Course Code No.:



N.B.:

(1) Project & Thesis/Thesis/Dissertation course shall be designated by the departmental identification code followed by 4000 (viz. CE 4000) for 4-year Engineering Programs applicable for last three semesters (minimum one-year duration) as per rules of UGC/BAC (Bangladesh Accreditation Council). For other Programs, the course code no. and placement of this course in syllabus should be fixed as per rules of UGC/BAC.

(2) Teaching for the courses is reckoned in credits and the credits allotted to various courses will be determined by the ACUG (Academic Committee of Undergraduate) with the following guidelines:

Sl.	Type of Course	Contact Hour/week	Credit
(i)	Theory/Lecture (Taught)/ Seminar (Discussion)	1.0	1.00
(ii)	Tutorial/ Practice/Technical Systems	1.0	1.00
(iii)	Independent Lab/Sessional/Design/ Special Study Elective (Studio)	1.5 2.0	0.75 1.00
(iv)	Project & Thesis/Thesis/ Dissertation	2.0	1.00
(v)	Design Studio	1.5	1.00
(vi)	Field Work/Field Survey	2 weeks of field work	1.00
(vii)	Industrial Attachment (after completed all courses)	One to Three months	As per approved by UGC
(viii)	Internship (after completed all courses)	As per approved by UGC	As per approved by UGC
(ix)	Internship (within study period) #	As per approved by UGC	Non-credit (For B. Arch)

N.B.: 1.0 contact hour = Lecture of 50 minutes.

For B. Arch.: Internship will start only after successful completion of 3rd year under a full IAB member or one recognized by the national architectural professional body in a foreign nation. Here total 40 contact hours = 7.5 weeks.

Outcome-Based Curriculum

Part A

1. **Title of the Academic Program:** B. Sc. in Civil Engineering
2. **Name of the University:** Sonargaon University (SU)
3. **Vision of the University:**

To become a Center of Excellence comparable to the best in the world for producing professionals who shall be leaders in technology, innovation, entrepreneurship and management.

4. **Mission of the University:**

Mission 1: The Sonargaon University's mission as a young research university is to achieve the highest standards of international excellence in research and teaching, while also fully meeting its distinctive responsibilities as the country's sole private institution of higher education.

Mission 2: The University students and staff have the opportunity to develop the skills, judgement and independence necessary to be engaged citizens and to assume active leadership roles in societal and economic life.

Mission 3: The production of knowledge, which will always remain the prime mission of a university, implies creativity enhancing conditions allowing a focus on the essentials, as it needs the freedom to experiment and to devise innovative, special and disruptive solutions.

Mission 4: It provides a unique forum for the development of the cultural, political and social dialogues that are the lifeblood of a mature democracy.

Mission 5: The University develops activities in fields that contribute to priority areas of national social and economic development, for the benefit of the competitiveness of Bangladesh.

5. **Name of the Program Offering Entity:** Department of Civil Engineering, Faculty of Science and Engineering

6. Vision of the Program Offering Entity:

The motion of civil engineers is “Anyone can dream it but only we can make it true”. Civil Engineers can create tomorrow’s world a better place to live in. The duties of civil engineers are not only constrained with the building of high-rise structures, but at the same time to use sustainable and environmentally friendly technologies. Civil engineers create, improve and protect the environment. They plan, design and oversee construction and maintenance of building structures and infrastructure, such as roads, railways, airports, bridges, harbors, dams, irrigation projects, power plants, water and sewerage systems. They also design and build structures that can withstand all weather conditions. Therefore, Department of Civil Engineering of “Sonargaon University” has very specific vision which is described below:

Vision: The Department of Civil Engineering of “Sonargaon University” aims to make the students compatible with modern technologies for construction and maintenance of the intended work and in order to achieve our target we follow nationally and internationally recognized curriculum and provide them with required practical knowledge to face the real world. The Civil Engineering Department will also excel in undergraduate instruction, research in all sub-areas of civil engineering, and in service to the public and private sector with the land-grant mission of the university. The Department will make significant contributions to the economic development of the country, nation and the region.

7. Mission of the Program Offering Entity:

The Department of Civil Engineering provides educational, professional, and intellectual experience that enables a diverse body of faculty, staff, students and alumni, to contribute to the society through teaching, research, practice, and service.

The mission of the Department of Civil Engineering is to develop highly competent professionals, preparing them for entry-level positions in civil engineering, further study in graduate school, life-long learning, and social leadership. Allied with both the School of Engineering’s and the College’s mission, the Department of Civil Engineering is proud of its public service mandate to educate leaders of the nation. The Department is dedicated to providing a learning environment that emphasizes open-ended design, problem-solving skills, team work, communication, and leadership skills.

Our faculties work together within the department, and other departments in the University, to provide multidisciplinary opportunities for both students and faculties. The Civil Engineering Program produces graduate's individual with high professional and ethical standards to work in government and private organizations. The faculty members are committed to increasing and improving the quality of our graduates.

The Department is committed to preparing its students for immediate entry into the engineering profession as well as into graduate programs of study. The Department is also committed to research in order to place its faculty and students at the forefront of development in the profession of civil engineering at the local and national levels. The latest advances are brought into classroom through continued research, thereby positioning the students to lead the profession into the twenty-first century. The Department reflects the university scope and mission by offering opportunities to students with previous limited access to education to be trained to make professional contributions to the civil engineering enterprise.

The Department offers a degree leading to the Bachelor of Science in Civil Engineering and provides basic courses in all the following areas:

a. Structural Engineering
b. Geotechnical Engineering
c. Environmental Engineering
d. Water Resources Engineering
e. Transportation Engineering

In addition, advanced courses in the above areas are offered as optional.

The department also encourages extracurricular activities and has established clubs to create space for them to explore their inner ingenuity. The university also offers training courses for the students to enable them to know more software outside their curriculum.

8. Objectives of the Program Offering Entity:

a. Teaching, inspiring and counseling upcoming leaders of our society that are prepared to encounter 21st-century challenges in a worldwide economy.
b. To produce Civil Engineers of high caliber, technical skills and ethical values to serve the society and nation.

c. To make the department a kernel of excellence in the field of civil engineering and allied research.
d. To provide knowledge base and consultancy services to the community in all areas of civil engineering.
e. To promote innovative and original thinking in budding engineers to face the challenges of the future.

9. Name of Degree: B. Sc. in Civil Engineering

10. Description of the Program

The department of Civil Engineering offers four-year undergraduate program titled Bachelor of Science (B. Sc.) in Civil Engineering. The program will make the students capable in identifying, formulating and solving civil engineering problems that meet specified performance, cost, time, safety and other quality needs and objectives with professional and ethical responsibility. This program also emphasizes industry and research-based projects, which would enhance their skills to become successful professionals for a holistic development.

11. Graduate Attributes

Graduate Attributes related to core knowledge:

a. **Engineering knowledge**

- Problem analysis
- Design/development of solutions
- Conduct investigations of complex problems

Graduate Attributes related to Skills:

- Modern tool usage
- Environment and sustainability
- Communication
- Project management and finance

Graduate Attributes related to behavior

- Ethics
- Engineering and society

- Individual and team work
- Lifelong learning

12. Program Educational Objectives (PEOs)

PEO 1: Prepare our graduates to achieve professional engineering licensure and productivity in civil engineering field.

PEO 2: Prepare our graduates to be future leaders and public sector employees in civil engineering fields.

PEO 3: Prepare our graduates to have lifelong learning and advance knowledge.

PEO 4: Prepare our graduates as someone who will be able to progress to the regional and international work environment.

13. Program Learning Outcomes (PLOs)

PLO 1: Ability to gather and apply knowledge of mathematics, science, and engineering

PLO 2: Ability to identify, create, and solve engineering problems

PLO 3: Ability to design, analyze and develop computing systems within realistic constraints

PLO 4: Ability to conduct, evaluate, and interpret experiments

PLO 5: Apply appropriate techniques, resources, modern engineering and IT tools

PLO 6: Ability to understand the impact of engineering solutions

PLO 7: Ability to design Civil and structural projects with in social constraints.

PLO 8: Practice behaving professionally and ethically

PLO 9: Ability to work on multidisciplinary teams and develop leadership

PLO 10: Ability to communicate effectively on complex engineering activities

PLO 11: Demonstrate knowledge and understand principles of engineering and management to manage projects

PLO 12: Able to engage in Lifelong learning

14. Mapping mission of the university with PEOs

PEOs	Mission 1	Mission 2	Mission 3	Mission 4	Mission 5
PEO 1	√		√		
PEO 2		√			
PEO 3	√			√	
PEO 4			√	√	√

15. Mapping PLOs with PEOs

PLOs	PEO1	PEO2	PEO3	PEO4
PLO 1	√	√		
PLO 2	√		√	
PLO 3	√			
PLO 4	√			√
PLO 5	√	√	√	√
PLO 6	√	√		
PLO 7	√	√		√
PLO 8		√		
PLO 9		√		√
PLO 10		√		√
PLO 11	√		√	√
PLO 12			√	

16. Mapping Courses with the PLOs

Course Code	Course Title	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CE 1101	Surveying	√	√										
Math 1101	Differential and Integral Calculus, Matrix	√	√	√									
Phy 1101	Physics I	√	√										
Chem 1101	Chemistry	√	√	√	√								
CE1100	Civil Engineering Drawing	√		√	√								
CE 1102	Field Surveying	√	√		√	√							
CE 1201	Engineering Materials	√	√	√		√							
Phy 1201	Physics II	√		√	√								
Math 1201	Vector Algebra, Vector Calculus, ODE	√	√	√									
Hum 1201	English										√		√
CE 1204	Computer Aided Drawing for Civil Engineers	√				√							
Phy 1202	Physics Sessional	√	√	√	√								
EEE 1365	Basic Electrical Engineering	√	√	√	√								
Math 1301	Laplace Transformation, Series, PDE	√	√	√									√
Ban 1301	Bengali Literature and Language								√				√
Hum 1302	English Skills Practices										√		√
CE 1302	Engineering Materials Sessional	√	√	√	√								
Chem 1302	Inorganic Quantitative analysis	√	√		√								
CSE 2101	Introduction to Computer Fundamentals and Programming	√	√	√		√							
Hum 2101	*বাংলাদেশের অভ্যুদয়ের ইতিহাস* (History of Bangladesh Independence)												√
CE 2121	Engineering Geology and Geomorphology	√	√	√	√								
CE 2111	Engineering Mechanics	√	√										
CE 2106	Quantity Surveying	√	√	√		√				√			
CSE 2102	Computer Programming Sessional	√	√	√		√							

Course Code	Course Title	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CE 2205	Professional Practices, Communication, Ethics								√			√	
Hum 2201	Principles of Accounting			√					√				
CE 2213	Mechanics of Solids I	√	√										
Math 2203	Probability and Statistics	√	√	√	√	√							
CE 2200	Details of Construction	√	√	√						√			
CE 2214	Mechanics of Solids Sessional	√	√		√	√							
CE 2303	Numerical Analysis	√	√										
CE 2341	Fluid Mechanics	√	√	√									
CE 2343	Open Channel Hydraulics	√	√	√									
CE 2313	Mechanics of Solids II	√	√										
CE 2342	Fluid Mechanics Sessional	√	√		√								
CE 2344	Open Channel Hydraulics Sessional	√	√		√								
CE 3131	Environmental Engineering I	√	√	√									
CE 3121	Geotechnical Engineering I	√	√	√									
CE 3111	Structural Analysis and Design I	√	√	√									
CE 3115	Design of Concrete Structures I	√	√	√									
CE 3112	Structural Analysis and Design I Sessional	√	√	√									
CSE 3102	Engineering Computation Sessional		√	√		√							
Hum 3201	Engineering Economics		√	√			√	√					
CE 3215	Design of Concrete Structures II		√	√			√						
CE 3231	Environmental Engineering II	√	√	√									
CE 3251	Transportation Engineering I	√	√				√						
CE 3232	Environmental Engineering I Sessional	√			√								
CE 3222	Geotechnical Engineering I Sessional		√		√								
CE 3341	Hydrology, Irrigation and Flood Control	√	√	√									
CE 3301	Project Planning and Construction Management	√		√								√	

Course Code	Course Title	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CE 3303	Socio-economic Aspects of Development Projects		√					√				√	
CE 3311	Structural Analysis and Design II	√	√	√									
CE 3312	Bridge Design Sessional	√	√	√		√							
CE 3314	Building Design Sessional	√	√	√									
CE 4115	Design of Steel Structures I	√	√	√									
CE 4151	Transportation Engineering II	√	√	√									
CE 4105	Business and Career Development								√	√	√		
CE 4152	Transportation Engineering I Sessional				√		√						
CE 4114	Computer Aided Analysis and Design of Structures Sessional I	√	√	√		√							
CE 4221	Geotechnical Engineering II	√	√	√	√								
CE 4231	Environmental Engineering III	√	√	√									
CE 4213	Prestressed Concrete	√	√	√									
CE 4223	Earth Retaining Structures		√	√									
CE 4251	Transportation Engineering III	√	√	√									
CE 4249	Ground Water Engineering	√	√										
CE 4216	Computer Aided Analysis and Design of Structures Sessional II	√	√	√		√							
CE 4232	Environmental Engineering Sessional II	√	√	√		√							
CE 4222	Geotechnical Engineering II Sessional			√	√	√							
CE 4246	Water Resource Engineering Sessional	√	√	√									
CE 4252	Transportation Engineering Sessional II			√		√							
CE 4337	Spatial Data Analysis and Remote Sensing	√	√			√							
CE 4339	Environmental and Social Impact Assessment	√	√					√				√	
CE 4311	Introduction to Composite Structures	√	√	√									

Course Code	Course Title	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CE 4333	Environmental Engineering IV	√	√										
CE 4327	Soil-water Interaction		√	√	√								
CE 4353	Transportation Engineering IV	√	√										
CE 4349	River and Coastal Engineering	√	√										
CE 4347	Hydraulic Structures	√		√									
CE 4000	Project and Thesis	√	√	√	√	√		√		√			√

Part B

17. Structure of the curriculum:

a) Duration of the program: Years: 4 Semester: 12

b) Admission Requirements:

(i) **General Academic Qualifications for Admission to Different Departments/Programs**:

A student should have minimum GPA of 3.00 out of 5.00 and 2.50 out of 4.00 (including additional subjects) in SSC and HSC/Diploma or equivalent examinations in case of CE, ME, CSE, EEE, TE, NAME and Arch programs.

(OR) A student should have at least Second Division or minimum GPA of 2.50 (including additional subjects) in both SSC and HSC/Diploma or equivalent examinations. If minimum GPA is 2.00 in any of the examinations SSC and HSC/Diploma or equivalent, then combined GPA of both SSC and HSC/Diploma or equivalent examinations must be at least 6.00 in case of FDT, AMT, BBA, Law, Bangla programs.

(OR) In case of CE, ME, CSE, EEE, TE, NAME and Arch programs, a student should have 4 (Four) subjects in O-Level and 3 (Three) subjects (namely, Mathematics, Physics and Chemistry) in A-Level with a minimum grade of 4.0 in any three subjects and a minimum grade of 3.0 in other four subjects (in the scale of A =5, B=4, C=3, D=2) are necessary. Subjects with E-grade will not be considered for admission.

(OR) In case of FDT, AMT, BBA, Law and Bangla programs, a student should have a 5 (Five) subjects in O-Level and 2 (two) subjects in A-Level with a minimum GPA of 3.0 at each level (in the scale of A =5, B=4, C=3, D=2) are necessary. Subjects with E-grade will not be considered for admission.

(ii) For the programs of Science, Engineering and Architecture, the candidates must pass in Physics, Chemistry and Mathematics at HSC/Alim/A-Level/Diploma examinations. No candidate from Arts/Business studies/Commerce at HSC/A-level/Diploma can get admission in undergraduate programs under Science and Engineering Faculty.

(iii) In case of children of Freedom Fighters, minimum combined GPA of two examinations SSC and HSC or equivalent must be at least 5.0. (Official Freedom Fighter Certificate must be submitted)

(iv) Candidate of GED diploma holders will not be allowed for admission.

However, the candidate must also fulfill all other requirements as may be prescribed by the Academic Council on the recommendation of the Admission Committee. In case of confusion regarding the equivalence, the case may be referred to Central Equivalence Committee.

(v) Normally students can apply for credit transfer at this University, fulfilling some criteria as mentioned in Academic Rules & Regulations of the University.

However, in case of diploma engineer if a student wants to get admission rather than his/her discipline/ technology they may be allowed but will not get any course waiver/credit transfer. They will be treated as H.S.C. (Science) equivalent and will have to fulfill the minimum requirements as mentioned in Art. 17b(i)-(iv).

(vi) The rules and conditions for admission into different departments/programs shall be framed by the Academic Council on the recommendation of the Admission Committee in each year (if modification is required).

(vii) All candidates for admission in any department/program must be citizens of Bangladesh unless the candidature is against the seats those are reserved for foreign students. Candidates for all seats except the reserved ones, if any, shall be selected on the basis of merit. The rules for admission into the reserved seats shall be framed by the Academic Council on the recommendation of the Admission Committee.

(viii) No student shall ordinarily be admitted in the first year class after the start of the corresponding classes or after the call goes out for the admission whichever is later. The date of commencement of classes for the newly admitted students will be announced in advance. Both the semesters in an academic year will remain open for admission.

Prior to admission to the University every student shall be examined by
a competent medical officer as prescribed in the admission rules.

(x) Foreign students must pass 12 education years and get the same grades (as mentioned for this University) in equivalent examinations from foreign-recognized Institutions. For more details, click su.edu.bd website to contact the Foreign Students' Service Cell.

Any prospective student having an overall GPA of 8.00 or above in SSC and
HSC or equivalent is eligible to get direct admission but needs to appear on the placement test for English Fundamental Course.

(xii) Documents Verification for GCE Applicants:

(a) Must be submitted attested copies of the Certificate and Grade sheets of O-Level & A-level issued by the appropriate authority like Cambridge, Pearson Edexcel, etc.

(b) Documents and Grade Sheets from School shall not be considered for admission.

(c) Results for Advanced Subsidiary Levels (AS Levels) will not be considered for admission.

c) Total minimum credit requirement to complete the program: 161

d) Total class weeks in a semester: 14

e) **Minimum CGPA requirements for graduation:** 2.20

f) Maximum academic years of completion: 6

g) Category of Courses:

Categories of Courses	Credits
Language	7.00
General Education	15.00
Basic Sciences	11.00
Mathematics	12.00
Other Engineering	9.00
Civil Engineering Core	91.50
Technical Elective	11.00
Project and Thesis	4.50
Total	161.00

18. SEMESTER-WISE SUMMARY OF COURSES TO BE OFFERED

1st Year 1st Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs/week	Credit	Contact hrs/week	Credit	
1	CE 1101	Surveying	3.0	2.00	--	--	2.00
2	Math 1101	Differential and Integral Calculus, Matrix	3.0	3.00	--	--	3.00
3	Phy 1101	Physics I	3.0	3.00	--	--	3.00
4	Chem 1101	Chemistry	3.0	3.00	--	--	3.00
5	CE 1100	Civil Engineering Drawing	--	--	3.0	1.50	1.50
6	CE 1102	Field Surveying	--	--	2.0	1.00	1.00
Total			12.0	11.00	5.0	2.50	13.50

Contact hours: 12.0 (T)+ 5.0 (S) = 17.0 hrs./week — No. of theory courses : 4

Total Credits: 13.50 — No. of sessional courses : 2

N.B.: Any student of 4-year diploma in engineering, willing to obtain exemption of the courses of 1st Year 1st Semester, will have to submit an application to the Head of the concerned department for approval.

1st Year 2nd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
1	CE 1201	Engineering Materials	3.0	3.00	---	--	3.00
2	Phy 1201	Physics II	3.0	3.00	--	--	3.00
3	Math 1201	Vector Algebra, Vector Calculus, ODE	3.0	3.00	--	--	3.00
4	Hum 1201	English	3.0	3.00	--	--	3.00
5	CE 1204	Computer Aided Drawing for Civil Engineers	--	--	3.0	1.50	1.50
6	Phy 1202	Physics Sessional			2.0	1.0	1.0
		Total	12.0	12.00	5.0	2.50	14.50

Contact hours: 12.0 (T)+ 5.0 (S) = 17.0 hrs./week

Total Credits: 14.50

No. of theory courses : 4

No. of sessional courses : 2

1st Year 3rd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
1	EEE 1365	Basic Electrical Engineering	3.0	3.00	--	--	3.00
2	Ban 1301	বাংলা ভাষা ও সাহিত্য (Bengali Literature and Language)	3.0	3.00	--	--	3.00
3	Math 1301	Laplace Transformation, Series, PDE	3.0	3.00	--	--	3.00
4	Hum 1302	English Skills Practices	--	--	2.0	1.0	1.00
5	CE 1302	Engineering Materials Sessional	--	--	3.0	1.50	1.50
6	Chem 1302	Inorganic Quantitative Analysis	--	--	2.0	1.00	1.00
		Total	9.0	9.00	7.0	3.50	12.50

Contact hours: 9.0 (T)+7.0 (S) = 16.0 hrs./week
Total Credits: 12.50

No. of theory courses : 3
No. of sessional courses : 3

2nd Year 1st Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
1	CSE 2101	Introduction to Computer Fundamentals and Programming	3.0	3.00	--	--	3.00
2	Hum 2101	History of Emergence of Bangladesh	3.0	3.00	--	--	3.00
3	CE 2121	Engineering Geology and Geomorphology	3.0	3.00	--	--	3.00
4	CE 2111	Engineering Mechanics	3.0	3.00	--	--	3.00
5	CE 2106	Quantity Surveying	--	--	3.0	1.50	1.50
6	CSE 2102	Computer Programing Sessional	--	--	3.0	1.50	1.50
		Total	12.0	12.0	6.0	3.00	15.00

Contact hours: 12.0 (T) +6.0 (S) = 18.0 hrs./week

Total Credit: 15.00

No. of theory courses : 4

No. of sessional courses : 2

2nd Year 2nd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs. /week	Credit	Contact hrs./week	Credit	
1	CE 2205	Professional Practices, Communication & Ethics	3.0	2.00	--	--	2.00
2	Hum 2201	Principles of Accounting	3.0	3.00	--	--	3.00
3	CE 2213	Mechanics of Solids I	3.0	3.00	--	--	3.00
4	Math 2203	Probability and Statistics	3.0	3.00	--	--	3.00
5	CE 2200	Details of Construction	--	--	3.0	1.50	1.50
6	CE 2214	Mechanics of Solids Sessional	--	--	3.0	1.50	1.50
		Total	12.0	11.00	6.0	3.00	14.00

Contact hours: 12.0 (T) + 6.0 (S) = 18.0 hrs./week

Total Credits: 14.00

No. of theory courses : 4

No. of sessional courses : 2

2nd Year 3rd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
1	CE 2303	Numerical Analysis	3.0	2.00	--	--	2.00
2	CE 2341	Fluid Mechanics	3.0	3.00	--	--	3.00
3	CE 2343	Open Channel Hydraulics	3.0	3.00	--	--	3.00
4	CE 2313	Mechanics of Solids II	3.0	3.00	--	--	3.00
5	CE 2342	Fluid Mechanics Sessional	--	--	3.0	1.50	1.50
6	CE 2344	Open Channel Hydraulics Sessional	--	--	3.0	1.50	1.50
		Total	12.0	11.00	6.0	3.00	14.00

Contact hours: 12.0 (T)+6.0 (S) = 18.0 hrs./week No. of theory courses : 4

Total Credits: 14.00 No. of sessional courses : 2

3rd Year 1st Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
1	CE 3131	Environmental Engineering I	3.0	3.00	--	--	3.00
2	CE 3121	Geotechnical Engineering I	3.0	3.00	--	--	3.00
3	CE 3111	Structural Analysis and Design I	3.0	3.00	--	--	3.00
4	CE 3115	Design of Concrete Structures I	3.0	3.00	--	--	3.00
5	CE 3112	Structural Analysis and Design I Sessional	--	--	3.0	1.50	1.50
6	CSE 3102	Engineering Computation Sessional	--	--	3.0	1.50	1.50
		Total	12.0	12.00	6.0	3.00	15.00

Contact hours: 12.0 (T)+6.0 (S) = 18.0 hrs/week

Total Credits: 15.00

No. of theory courses : 4

No. of sessional courses : 2

3rd Year 2nd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
1	Hum 3201	Engineering Economics	3.0	3.00	--	--	3.00
2	CE 3215	Design of Concrete Structures II	3.0	3.00	--	--	3.00
3	CE 3231	Environmental Engineering II	3.0	3.00	--	--	3.00
4	CE 3251	Transportation Engineering I	3.0	3.00	--	--	3.00
5	CE 3232	Environmental Engineering I Sessional	--	--	3.0	1.50	1.50
6	CE 3222	Geotechnical Engineering I Sessional	--	--	3.0	1.50	1.50
Total			12.0	12.00	6.0	3.00	15.00

Contact hours: 12.0 (T)+6.0 (S) = 18.0 hrs/week

Total Credits: 15.00

No. of theory courses : 4

No. of sessional courses : 2

3rd Year 3rd Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
1	CE 3341	Hydrology, Irrigation and Flood Control	3.0	3.00	--	--	3.00
2	CE 3301	Project Planning and Construction Management	3.0	3.00	--	--	3.00
3	CE 3303	Socio-economic Aspects of Development Projects	3.0	2.00	--	--	2.00
4	CE 3311	Structural Analysis and Design II	3.0	3.00	--	--	3.00
5	CE 3312	Bridge Design Sessional	--	--	3.0	1.50	1.50
6	CE 3314	Building Design Sessional	--	--	3.0	1.50	1.50
		Total	12.0	11.00	6.0	3.00	14.00

Contact hours: 12.0 (T)+6.0 (S) = 18.0 hrs/week

Total Credits: 14.00

No. of theory courses : 4

No. of sessional courses : 2

4th Year 1st Semester

Sl.	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
1	CE 4115	Design of Steel Structures	3.0	3.00	--	--	3.00
2	CE 4151	Transportation Engineering II	3.0	3.00	--	--	3.00
3	CE 4105	Business and Career Development	3.0	2.00	--	--	2.00
4	CE 4152	Transportation Engineering I Sessional	--	--	3.0	1.50	1.50
5	CE 4114	Computer Aided Analysis and Design of Structures Sessional I	--	--	3.0	1.50	1.50
6	CE 4000-1	Undergraduate Thesis-1	--	--	3.0	1.50	*1.50
		Total	9.0	8.00	9.0	4.50	12.50

Contact hours: 9.0 (T)+9.0 (S) = 18.0 hrs/week

Total Credits: 12.50

No. of theory courses : 3

No. of sessional courses : 3

*This credit in addition to 1.50 credits of 4th year 2nd semester for Undergraduate Thesis-2 and 1.50 credits of 4th year 3rd semester for Undergraduate Thesis will be assessed at the end of 4th year 3rd semester.

4th Year 2nd Semester

Option	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
	CE 4221	Geotechnical Engineering II	3.0	3.00	--	--	3.00
	CE 4000-2	Undergraduate Thesis-2	--	--	3.0	1.50	*1.50
I	CE 4231	Environmental Engineering III	3.0	2.00	--	--	2.00
	CE 4213	Prestressed Concrete	3.0	2.00	--	--	2.00
	CE 4223	Earth Retaining Structures	3.0	2.00	--	--	2.00
	CE 4251	Transportation Engineering III	3.0	2.00	--	--	2.00
	CE 4249	Ground Water Engineering	3.0	2.00	--	--	2.00
II	CE 4216	Computer Aided Analysis and Design of Structures Sessional II	--	--	3.0	1.50	1.50
	CE 4232	Environmental Engineering Sessional II	--	--	3.0	1.50	1.50
	CE 4222	Geotechnical Engineering II Sessional	--	--	3.0	1.50	1.50
	CE 4246	Water Resources Engineering Sessional	--	--	3.0	1.50	1.50
	CE 4252	Transportation Engineering Sessional II	--	--	3.0	1.50	1.50
		Total	9.0	7.0	6.0	3.00	10.00

Contact hours: 9.0 (T)+6.0 (S) = 15.0 hrs./week

No. of theory courses : 3

Total Credit: 10.00

No. of sessional courses : 2

*This credit in addition to 1.50 credits of 4th year 1st semester for Undergraduate Thesis-1 and 1.50 credits of 4th year 3rd semester for Undergraduate Thesis will be assessed at the end of 4th year 3rd semester.

#From optional courses, students shall take one optional thesis related theory course from I as major course, one more optional theory course from I as minor courses and one sessional course corresponding to major or minor.

4th Year 3rd Semester

Option	Course Code	Course Title	Theory		Sessional		Total Credits
			Contact hrs./week	Credit	Contact hrs./week	Credit	
	CE 4337	Spatial Data Analysis & Remote Sensing	3.0	2.00	--	--	2.00
	CE 4339	Environmental and Social Impact Assessment	3.0	2.00	--	--	2.00
	CE 4000	Undergraduate Thesis	--	--	3.0	1.50	1.50
I	CE 4311	Introduction to Composite Structures	3.0	2.00	--	--	2.00
	CE 4333	Environmental Engineering IV	3.0	2.00	--	--	2.00
	CE 4327	Soil-Water Interaction	3.0	2.00	--	--	2.00
	CE 4353	Transportation Engineering IV	3.0	2.00	--	--	2.00
	CE 4349	River and Coastal Engineering	3.0	2.00	--	--	2.00
	CE 4347	Hydraulic Structures	3.0	2.00	--	--	2.00
II	CE 4216	Computer Aided Analysis and Design of Structures Sessional II	--	--	3.0	1.50	1.50
	CE 4232	Environmental Engineering Sessional II	--	--	3.0	1.50	1.50
	CE 4222	Geotechnical Engineering II Sessional	--	--	3.0	1.50	1.50
	CE 4246	Water Resources Engineering Sessional	--	--	3.0	1.50	1.50
	CE 4252	Transportation Engineering Sessional II	--	--	3.0	1.50	1.50
Total			12.0	8.0	6.0	3.00	11.00

Contact hours: 12.0 (T)+6.0 (S) = 18.0 hrs./week

No. of theory courses : 4

Total Credit: 11.00

No. of sessional courses : 2

#From optional courses, students shall take one optional thesis related theory course from I as major course, one more optional theory course from I as minor courses and one sessional course corresponding to major or minor.

19. Description of all courses of the program

CE 1101: Surveying

Credits: 2.00 **Contact hours: 3.0 hrs. /week.**

Rationale of the Course:

Build and create maps, by observing and recording topography, control points as landmarks. Site mapping by knowing the elevation differences of points, source of water and reservoirs, social points and people sentiment about historical places. Overall, to establish legal boundaries, create maps for navigation, coastlines and construction. To execute hydrographic and oceanographic charting and mapping.

Course Content:

Reconnaissance Survey; Linear and Angular Measurements; Traverse Survey; Levelling and Contouring; Areas and Volumes; Heights and Distances; Curves (Horizontal, Transition, Vertical); Tacheometry; Astronomical Surveying; Photogrammetry; Project Surveying; Errors in Surveying.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Explain fundamental principles of surveying, including reconnaissance, linear and angular measurements, and traverse surveying.
CLO 2: Apply theoretical concepts to determine elevations, contours, areas, volumes, heights, distances, and curves.
CLO 3: Describe advanced surveying methods such as tacheometry, astronomical surveying, photogrammetry, and analyze errors in surveying measurements.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2	√	√										
CLO 3	√	√										
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Book, PPT, WB, Handout	Class Test, Mid-Semester Exam
CLO 2- CLO 3	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

Math 1101: Differential and Integral Calculus, Matrix

Credits: 3.00 **Contact hours: 3.0 hrs. /week.**

Rationale of the Course:

This is a basic mathematics course which will help students to improve basic knowledge about differential calculus, integral calculus and matrices.

Course Content:

Differential Calculus: Limit, Continuity and differentiability; Successive differentiation and Leibnitz's theorem; Rolle's and Mean Value theorem; Expansion of functions using Taylor's and Maclaurin series; Indeterminate forms; Partial differentiation; Maxima and minima of functions of single variables.

Integral Calculus: Indefinite integrals; Method of substitution; Integration by parts; Standard integrals; Definite integrals; Beta function; Gamma function.

Matrices: Definition of different kinds of matrices; Algebra of matrices; Inverse of matrix; Rank and elementary transformation of matrices; Solution of system of linear equations; Eigenvalues and Eigen vectors.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To apply knowledge to define the limit, continuity and differentiability of functions
CLO 2: To apply the concept to evaluate indefinite and definite integrals
CLO 3: To evaluate maxima and minima, radius of curvature, the length, area, volume
CLO 4: To learn different types of matrices and their properties

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√	√										
CLO 2	√	√										
CLO 3	√	√	√									
CLO 4	√	√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 4	Reference Books, PPT, WB, Handout	Continuous Assessment, Assignments, mid semester exam, final semester exam

Phy 1101: Physics I

Credits: 3.00 **Contact hours: 3.0 hrs. /week.**

Rationale of the Course:

Physics is called the mother of science. So, the importance of physics in case of Engineering Department cannot be described in words. To understand the basic structure or Transportation engineering or in case of Environment or Geotechnical field, Physics will help you to construct new equation and leads to a new dimension.

Course Content:

Physical optics: Young's double slit experiment, displacement of fringes and its uses, Newton's rings, interferometers; diffraction of light; Fresnel and Fraunhoffer diffraction, diffraction by single slit, diffraction from a circular aperture, resolving power of optical instruments, diffraction at double slit and n-slits-diffraction grating; polarization; production and analysis of polarized light, Brewster's law, Malus law, polarization by double refraction

Waves and oscillations: simple harmonic oscillator and its differential equation, total energy and average energy, combination of simple harmonic oscillations, Lissajous figures, spring-mass system, calculation of time period of torsional pendulum, damped oscillation, determination of damping co-efficient; forced oscillation, resonance, two-body oscillations, reduced mass, differential equation of a progressive wave, power and intensity of wave motion, stationary wave, Heat and Thermodynamics: Temperature and Zeroth Law of Thermodynamics, Calorimetry, Thermal Equilibrium and Thermal Expansion, First Law of Thermodynamics, Specific Heat, Heat Capacities, Equation of State, Change of Phase, Heat Transfer, Second Law of Thermodynamics, Carnot Cycle, Efficiency, Entropy, Kinetic Theory of Gases., thermodynamic functions, Maxwell relations, Clausius Clapeyron equation, Gibbs phase rule, third law of thermodynamics

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To analyse physical optics and physical significance
CLO 2: To understand the differential equation of simple harmonic oscillator
CLO 3: To understand different laws of thermodynamics and Maxwell distributions

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2		√										
CLO 3	√	√										
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

PLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	PPT, WB, Handout	Assignment, Class Test, Viva, Mid Semester Exam
CLO 2- CLO 3	PPT, WB, Handout	Assignment, Class Test, Viva, Final Semester Exam

Chem 1101: Chemistry

Credits: 3.00 **Contact hours: 3.0 hrs. /week.**

Rationale of the Course:

This course offers the theoretical understanding and study of materials and substances and the transformations they undergo through interactions and the transfer of energy to the students. The course develops students' understanding of the key chemical concepts and models of structure, bonding, and chemical change, including the role of chemical, electrical and thermal energy. Students learn how models of structure and bonding enable chemists to predict properties and reactions and to adapt these for particular purposes. The knowledge of corrosion engineering and polymer is essential to engineers for practical purposes.

Course Content:

Acids and bases; cements, silicates and limes; thermochemistry; electrochemistry; electronic configurations and properties of molecules; atomic structure and quantum theory; water and water pollution; polymer science; corrosion engineering.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To understand atomic structures, electronic configurations and properties of different elements.
CLO 2: To analyze chemical bonding, thermochemistry and electrochemistry.
CLO 3: To understand acid-base theories and water pollution.
CLO 4: To understand reaction kinetics.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1:	√											
CLO 2		√		√								
CLO 3	√			√								
CLO 4	√		√									
Overall	√	√	√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 4	Class Lectures, Workbook, Handout, Discussion with the students, Question and Answer Session, Problems solving in the class, Interactive teaching, Assignment submission/ report writing, Video Lecture	Continuous Assessment, Assignments, Exam (class test, Mid-Semester, Final Semester), Attendance

CE 1100: Civil Engineering Drawing

Credits: 1.50 **Contact hours: 3.0 hrs. /week.**

Rationale of the Course:

This course teaches the very basics of how to draw 2D drawings in Civil Engineering. It goes through choosing the scale of different drawings for Elevations, Side Views and Plans. It shows how to draw Earth Works and Structures in contact with Earth and The Soil.

The course also shows different 2D views and the interaction between. Concrete, Masonry and the earth is clearly shown. This course is usually taught at the first year for civil engineering students. Hoping that the course will make us better civil Engineers. This course offers a very good base for Engineering students as well as for practicing Engineers who like to review Civil Engineering subjects. Finally, even if students are using AutoCAD or any other drawing software this course will be very beneficial to them.

Course Content:

Orthographic projection and multi-view drawings, Isometric and oblique projections, Sectional views and cutting planes, Dimensioning, tolerancing and annotation, Reinforcement detailing for beams and columns, Foundations and footing drawings, Site layout, plans and contour representation, Drawing standards, scales and sheet organization, Drawing submission, printing and presentation.

Mapping Course Learning Outcomes (CLOs) with PLOs:

Course Learning Outcomes (CLO)

CLO 1: To develop the skills to use drawing instruments, create letters and lines, and design solid geometric figures accurately.

CLO 2: To assemble the information on perspective projections.

CLO 3: To acquire knowledge on building plan, elevation and section drawing.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2	√											
CLO 3			√	√								
Overall	√		√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 1102: Field Surveying

Credits: 1.00 **Contact hours: 2.0 hrs. /week**

Rationale of the Course:

This course will help the students to apply the knowledge of theoretical surveying in practical field. Practical surveying is essential for the success of many construction projects, from residential and commercial buildings to infrastructure. It gives project managers and engineers the geographical information they need to build a structure that will stand up reliably in the local terrain and helps them map out how their project should unfold.

Course Content:

Chain Surveying, Plane Table Surveying, Theodolite Traverse Surveying, Levelling / Route Surveying, House Setting, Setting Out Simple Curves (Circular), Height Measurement, Tacheometry (Stadia), Contouring, GPS Surveying, Total Station Surveying.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Apply fundamental surveying techniques to measure distances, elevations, and positions.
CLO 2: Perform surveying computations and field procedures for traversing, contouring, and curve setting.
CLO 3: Utilize modern surveying instruments for site layout and spatial data collection

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2		√		√								
CLO 3					√							
Overall	√	√		√	√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Assignment Field Work, Viva, Final Quiz

CE 1201: Engineering Materials

Credits: 3.00 **Contact hours: 3.0 hrs. /week.**

Rationale of the Course:

This course will help the students to specify, design and manufacture the materials with which they construct their structures. Through this course students will be able to gain knowledge on various engineering materials including bricks, cement, sand, lime, coarse aggregate, mortar, concrete, steel, wood, timber, geo- textiles, composites, FRP etc. Studies in construction materials are intended to make structural, transportation and foundation engineers aware of the fundamental properties of the materials they use.

Course Content:

Mechanical properties: stress, strain and toughness, Aggregates: properties, grading and testing, Cement: chemistry and physical properties, Concrete: fresh properties and mix design basics, Steel: types, mechanical properties and uses, Masonry, timber and bituminous materials overview, Durability: deterioration and protection measures, Quality control and sampling, Sustainable and alternative construction materials.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To explain the mechanical properties of engineering materials, including stress, strain, and toughness, and their significance in construction applications.
CLO 2: To analyze the properties, grading, testing methods, and quality control procedures of key construction materials such as aggregates, cement, concrete, and steel.
CLO 3: To evaluate the suitability, durability, and sustainability of conventional and alternative construction materials for engineering projects.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO1	√											
CLO 2	√	√										
CLO 3	√	√	√			√						
Overall	√	√	√			√						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout, Industrial Tour	Assignment, Class Test, Viva

Phy 1201: Physics II

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course will develop basic knowledge of students about structure of matter, solid state physics and modern physics.

Course Content:

Structure of Matter: crystalline and non-crystalline solids, single crystal and polycrystalline solids, unit cell, crystal systems, co ordinations number, crystal planes and directions, packing factor, miller indices, relation between inter planar spacing and Miller indices

Solid state physics: Bragg's law, methods of determination of inter planar spacing from diffraction patterns; defects in solids: point defects, line defects, bonds in solids, interatomic distances, calculation of cohesive and bonding energy; introduction to band theory.

Electricity and Magnetism:
Electric charge, Coulomb's law. the electric field: calculation of the electric field strength, E; a dipole in an electric field, electric flux and Gauss's law, some application of Gauss's law; electric potential V, electric potential energy. Capacitors; capacitance, current and resistance: current and current density, Ampere's law, Faraday's law, Lenz's law, self-inductance and mutual inductance. Magnetic properties of matter: magneto motive force, magnetic field intensity, classifications of magnetic materials, magnetization curves.

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

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To be able to describe the crystal structure and system of the materials and to apply Bragg's law.

CLO 2: To describe and explain the introductory electricity and magnetism principles and different types of laws.

CLO 3: To understand the basic concepts of special theory of relativity, atomic model, nuclear and solid-state physics.

CLO 4: To analyze and solve problems with the aids of mathematics.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2	√			√								
CLO 3	√			√								
CLO 4			√									
Overall	√		√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1, CLO 2, CLO 4	Reference Book, PPT, WB, Handout, Videos	Class Test, Mid Semester Exam
CLO 2-CLO 4	Reference Book, PPT, WB, Handout, Videos	Assignment, Final Semester Exam

Math 1201: Vector Algebra, Vector Calculus, ODE

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a mathematics course which will help to develop basic knowledge about ordinary differential equation, partial differential equation and statistics.

Course Content:

Ordinary Differential Equations: Formation of differential equation; Solution of first order differential equations by various methods; Solution of general linear equations of second and higher orders with constant coefficients; Solution of Euler's homogeneous linear differential equations.

Vector Analysis: Scalars and vectors, equality of vectors; Addition and subtraction of vectors; Multiplication of vectors by scalars; Position vector of a point; Scalar and vector product of two vectors and their geometrical interpretation; Triple products and multiple products of vectors; Linear dependence and independence of vectors; Vector Differentiation; Gradient, divergence and curl of point functions; Definition of line, surface and volume integral; Gauss's theorem, Stoke's theorem, Green's theorem and their applications.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To identify and solve ordinary differential equations.

CLO 2: To learn to explain differentiation and integration of vector valued functions in Cartesian, cylindrical and spherical geometry.

CLO 3: To learn to calculate length, area and volume of objects related to engineering using vector.

CLO 4: To recognize the statements of Stokes' Theorem and the Divergence Theorem and understand how they are generalizations of the Fundamental Theorem of Calculus. Be aware of applications of these theorems in Physics and Civil Engineering.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√	√										
CLO 2	√	√										
CLO 3			√									
CLO 4			√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 2	Reference Book, PPT, WB, Handout	Assignment, Group work, Class Test, Mid Exam, Final Semester Exam

Hum 1201: English
Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This theory course of English is introduced to develop students' command over English language. Through this basic course of English students get opportunity for critical thinking, comprehending and analyzing using English language. It also helps to enhance abilities of English language to imply on civil engineering applications and for any other purpose as well. This course is necessary to increase basic knowledge in English language and to improve language competence.

Course Content:
Analytical reading and critical thinking of chosen stories, comprehension. Letter writing: formal and informal. Syntax: vocabulary, diction and English sentence; sentence variety and style; use of punctuation marks and some grammatical problems. Free hand writing, various academic writing such as paragraph writing, composition writing, summary writing, analysis and interpretation of famous poems.

Mapping Course Learning Outcomes (CLOs) with PLOs
CLO 1: To be able to comprehend and use English language.
CLO 2: To be able to communicate in English to meet up various demands.
CLO 3: To be proficient to analyze and solve problems using English language.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1										√		√
CLO 2										√		√
CLO 3										√		√
Overall										√		√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 5	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 3- CLO 5	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 1204: Computer Aided Drawing for Civil Engineers

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a professional subject to gain and practice the knowledge of Computer Aided Design (CAD) in the field of Civil Engineering.

Course Content:

CAD fundamentals: interface, layers and units, drawing setup: templates, blocks and symbols, Orthographic and isometric drawing using CAD, Dimensioning, annotation and hatching in CAD, Detailing: reinforcement, footings, and sections, Plotting, scales and layout viewports, Drawing exchange formats and standards (DWG/DXF/PDF), Simple plan and elevation generation from sketches, CAD for site layout and utility plans, Drawing management and version control.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To explain the fundamental concepts and tools of computer-aided design (CAD), including interface navigation, layers, units, templates, blocks, and drawing standards.

CLO 2: To create engineering drawings using CAD software, including orthographic and isometric drawings with proper dimensioning, annotation, hatching, and detailing of structural elements.

CLO 3: To prepare and manage complete CAD drawings such as plans, elevations, site layouts, and utility drawings, and produce properly scaled and formatted outputs for plotting and sharing.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√				√							
CLO 2	√				√							
CLO 3	√				√							
Overall	√				√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, Tutorial	Practice and performance, Viva-voce, Final Quiz

Phy 1202: Physics Sessional

Credits: 1.0 ***Contact hours: 2.0 hrs. /week.***

Rationale of the Course:

This is a physics sessional course. In this course students will be able to learn about the practical application of various matters, medium and their characteristics.

Course Content:

Determination of the specific heat of a liquid by the method of cooling, Determination of the thermal conductivity of a bad conductor by Lee's method, Determination of the pressure co-efficient of air by constant volume air thermometer, Determination of the frequency of a tuning fork by Melde's apparatus, Determination of the focal length of concave lens by auxiliary lens method, Measurement of unknown resistance and verification of the laws of resistance by P.O. (Post Office) box, Comparison of the EMF's of two cells by potentiometer, Determination of the mechanical equivalent of heat by electrical method, Determination of the radius of curvature of a plano-convex lens by Newton's ring method, Determination of threshold frequency for the photoelectric effect of a photocathode and the value of the Planck's constant, To plot thermo-electromotive force-temperature (calibration) curve for a given thermocouple, Determination of the melting point of a solid using the calibration curve, Determination of the specific rotation of sugar solution by a polarimeter, Determination of the temperature co-efficient of the resistance of the material of a wire, Determination of the refractive index of the material of a prism using spectrometer and Determination of the spring constant and the effective mass of a loaded spring.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO1: To determine the specific and mechanical equivalent of heat of a liquid and the specific rotation of sugar solution.

CLO2: To determine the melting point of a solid and the thermal conductivity of a bad conductor.

CLO3: To determine the pressure co-efficient of air and temperature co-efficient of the resistance.

CLO4: To determine the spring constant, effective mass, frequency, threshold frequency and the value of Planck's constant.

CLO5: To determine the focal length of concave lens, radius of curvature of a plano-convex lens and the refractive index of the material of a prism.

CLO6: To measure the unknown resistance and verify the laws of resistance by Post Office box.

CLO7: To compare the E.M.F of two cells and plot thermo-electromotive force-temperature (calibration) curve.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√			√								
CLO 2	√			√								
CLO 3	√			√								
CLO 4				√								
CLO 5				√								
CLO 6	√		√									
CLO 7			√									
Overall	√		√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 7	Reference book, PPT, WB, Handout, Interactive discussion and videos, Demonstration and Feedback, Group work	Sessional reports and Performance, Quiz, Viva-Voce, Final Quiz

EEE 1365: Basic Electrical Engineering

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course introduces students to the fundamentals regarding electrical technology. The course is designed to teach about fundamental concepts, solution techniques, and different practical applications of DC and AC circuits. Students can understand the basic terms and related issues in electrical systems.

Course Content:

Electrical units and standards, Electrical network and circuit solution series, parallel and mesh current methods. Instantaneous current, voltage and power, effective current and voltage, average power. Sinusoidal single phase RLC circuits: phasor algebra, balanced three phase circuits. Electrical wiring for residential and commercial loads. Introduction to transformers and induction motors.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To acknowledge students about charge, current & basic electrical laws**.**
CLO 2: To apply the knowledges of series, parallel, node & mesh analysis to measure voltage, current & resistance in electrical circuits & networks.
CLO 3: To apply the concept of AC circuit analysis to find instantaneous current, voltage & power.
CLO 4: To recognize the electric wiring for residential & commercial loads.
CLO 5: To learn about basic principles & applications of transformers & induction motors.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2		√	√	√								
CLO 3			√	√								
CLO 4		√										
CLO 5	√	√										
Overall	√	√	√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 5	Reference Book, PPT, WB, Handout	Assignment, Group work, Class Test, Mid-Semester Exam, Final Semester Exam

Math 1301: Laplace Transformation, Series, PDE

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course will help students to develop basic knowledge about Laplace transform and vector analysis.

Course Content:

Laplace Transforms: Definition of Laplace transform; Laplace transform of some elementary functions; Some important properties of Laplace transform; Laplace transforms of derivatives; Definition of inverse Laplace transforms; Some important properties of inverse Laplace transform; Convolution theorem; Applications of Laplace transforms to differential equations.

Series: Definition of infinite series; Convergence and divergence of series; Power series; Series solution of differential equations; Fourier series; The Fourier cosine and sine series.

Partial Differential Equations: Introduction, Linear and non-linear first order differential equations; Standard forms; Linear equations of higher order; Equations of the second order with variable coefficients.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To learn to define Laplace transform and inverse Laplace transform.

CLO 2: To use the knowledge of Laplace transforms and inverse Laplace transform to determine general or complete solutions to linear ODEs.

CLO 3: To identify and solve partial differential equations**.**

CLO 4: To apply series methods to solve engineering problems such as heat conduction, vibration and fluid flow problems.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2	√	√	√									
CLO 3	√	√										
CLO 4	√	√										√
Overall	√	√	√									√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 2	Reference Book, PPT, WB, Handout	Class Test, Assignment, Mid Semester Exam
CLO 3- CLO 5	Reference Book, PPT, WB, Handout	Class Test, Assignment, Final Semester Exam

Ban 1301: বাংলা ভাষা ও সাহিত্য (Bengali Language and Literature)

Credits: 3.00 ***Contact hours: 3.0 hrs. /week***

Rationale of the Course:

This is a high-level Bengali Language and Literature Course for all classes of student. Because as a Bengali Student it is necessary to acquire knowledge about Bengali Language and Literature. Not only that, Bengali Language and Literature occupies one of the most important places in the world. As a result, we have to have an idea about Bengali Language and Literature.

Course Content:

প্রথম খণ্ড-ভাষা
১। বাংলা ধ্বনি/ বাগ ধ্বনি (Phone/Speech Sound); বর্ণ (Letter); অক্ষর (Syllable)
২। বাংলা ধ্বনির উচ্চারণ স্থান ও রীতি (Point of Articulation and Manner of Articulation)

৩। বাংলা উচ্চারণ -প্রমিত (Standard); আঞ্চলিক (Dialectal); বৈচিত্র (Variation)
৪। অপিনিহিত, অভিশ্রুতি, স্বরসঙ্গতি, শ্বাসাঘাত (Stress Accent) স্বরভঙ্গি/ স্বরতরঙ্গ (Intonation)
৫। বাংলা ও ইংরেজির তুলনা
৬। বাংলা লিখন দক্ষতা; সাধু/চলিত রীতি; বিরাম চিহ্ন প্রয়োগ। প্রমিত বাংলা বানানের নিয়ম (বাংলা একাডেমি)
৭। ব্যবহারিক বাংলা সংক্ষিপ্ত আলোচনা

একুশে ফেব্রুয়ারি, মুক্তিযুদ্ধ, বাংলাভাষা, বিশ্বায়ন বাংলায় উৎসব, ষড়ঋতু, বাংলা নববর্ষ, আধুনিক তথ্য-প্রযুক্তি, বাংলার লোক সংস্কৃতি, মানবতা ও নৈতিকতা।

দ্বিতীয় খণ্ড-সাহিত্য

কবিতা

১। আবদুল হাকিম-নুরনামা
২। মাইকেল মধুসুধন দত্ত – বঙ্গভাষা
৩। লালন সাই – খাঁচার ভেতর অচিন পাখি
৪। ববীন্দ্রনাথ ঠাকুর- নির্ঝরের স্বপ্নভঙ্গ
৫। কাজী নজরুল ইসলাম- আজ সৃষ্টি সুখের উল্লাসে
৬। জীবনানন্দ দাশ- রূপসী বাংলা
৭। হাসান হাফিজুর রহমান – অমর একুশে
৮। আলাউদ্দিন আল আজাদ – স্মৃতি স্তম্ভ
৯। শামসুর রাহমান- তোমাকে পাওয়ার জন্য হে স্বাধীনতা
১০। সৈয়দ শামসুল হক- পরিচয়

<u>প্রবন্ধ</u>

১। বঙ্কিম চন্দ্র চট্টোপাধ্যায়- বাঙ্গালা ভাষা
২। রবীন্দ্রনাথ ঠাকুর- সভ্যতার সংকট
৩। হরপ্রসাদ শাস্ত্রী- তৈল
৪। প্রমথ চৌধুরী- যৌবনে দাও রাজটিকা
৫। কাজী নজরুল ইসলাম- বর্তমান বিশ্বসাহিত্য
৬। মুহম্মদ আবদুল হাই – আমাদের বাংলা উচ্চারণ
৭। কবীর চৌধুরী – আমাদের আত্মপরিচয়

<u>ছোটগল্প/অন্যান্য রচনা</u>

১। রবীন্দ্রনাথ ঠাকুর- পোস্ট মাস্টার
২। রোকেয়া সাখাওয়াত হোসেন – অবরোধ বাসিনী
৩। বিভূতিভূষণ বন্দোপাধ্যায় – পুঁইমাচা
৪। সৈয়দ ওয়ালীউল্লাহ- নয়নচারা
জাহানারা ইমাম- একাত্তরের দিনগুলি
৬। হাসান আজিজুল হক – ঘরগেরস্থি
৭। আখতারুজ্জামান ইলিয়াস- অপঘাত

<u>নাটক</u>

১। কবর- মুনির চৌধুরী

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO1: Analyze skills in Bengali language and literature.
CLO2: Ability of speech sound, letter, syllable, standard, dialectal and variation linguistic literature.
CLO3: Ability of reading, writing and critique poetry.
CLO4: To develop the skills to analyze essay, novels, plays and short stories.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1								√				√
CLO 2								√				√
CLO 3								√				√
CLO 4								√				√
Overall								√				√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture discussion with multimedia, White board (WB), Handout	Assignment, Oral Test, Mid Semester Exam
CLO 2	Reference Book, Lecture discussion with multimedia, WB, Handout	Assignment, Class Test, Mid Semester Exam
CLO 3	Reference Book, Lecture discussion with multimedia, PPT, WB, Handout	Assignment, Class Test, Mid Semester Exam, Semester Final Exam
CLO 4	Reference Book, Lecture discussion with multimedia, WB, Handout	Oral Test, Semester Final Exam

Hum 1302: English Skills Practices

Credits: 1.00 ***Contact hours: 2.0 hrs. /week.***

Rationale of the Course:

This is a foundational course for the civil engineering program. Through this course student are introduced to the four skills of English language, reading, writing, listening and speaking. It helps students to develop their ability regarding skills of English language. It also enhances skills of English language to apply in

civil engineering applications and also for other necessities. This course is essential to improve students' English language skills.

Course Content:

Rapid reading: skimming and scanning, predicting, inferring, analysis and interpretation of different types of texts; comprehension from various texts. Report writing, business letter writing, essay writing; free hand writing, poster making, short story writing. Listening test: learning to take useful notes and answering questions; oral presentation, documentary review. Speech delivering, role playing, dialogue in peer task. Pronunciation: phonetics and phonology, IPA transcript.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To be able to use the four skills of English language according to need.
CLO 2: To be able to converse without difficulty by using English language.
CLO 3: To be able to discover and resolve complications by using the skills of English language.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1										√		√
CLO 2										√		√
CLO 3										√		√
Overall										√		√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 5	Reference Book, PPT, WB, Handout	Assignment, Viva-Voce, Class Performance, Quizzes, Semester Final Performance

CE 1302: Engineering Materials Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a basic material testing course for the civil engineering program. This course introduces students to the basic testing procedure of brick, stone, sand, cement, and concrete. From this segment the student should be able to test different components of concrete.

Course Content:

Determination of initial and final setting times (Vicat), Test for compressive strength of cement mortar cubes, Sieve analysis of fine and coarse aggregates, Bulk density, unit weight and voids in aggregate, Specific gravity and water absorption of aggregates, Workability tests of fresh concrete (slump, compaction), Compression test of cylindrical and cubical concrete specimens, Concrete mix preparation and curing procedures.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To perform standard laboratory tests to determine the physical and mechanical properties of cement and aggregates, including setting time, sieve analysis, bulk density, specific gravity, and water absorption.

CLO 2: To conduct workability and strength tests of concrete, including slump tests and compression tests of cylindrical and cubical specimens.

CLO 3: To prepare concrete mixes and demonstrate proper specimen casting, curing procedures, and interpretation of laboratory test results.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√	√		√								
CLO 2	√	√		√								
CLO 3	√	√	√	√								
Overall	√	√	√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 3	Reference Book, PPT, WB, Handout, Lab work	Quizzes, Viva-Voce conducted in lab classes, Sessional reports and Performance, Final Quiz

Chem 1302: Inorganic Quantitative analysis

Credits: 1.0 ***Contact hours: 2.0 hrs. /week.***

Rationale of the Course:

The purpose of the Inorganic Quantitative Analysis course is several-fold. It reinforces the topics the students have learned in class and it gives them a chance to apply knowledge. Students will learn some important experimental techniques that are necessary for them to become effective in professional life. The lab allows them to delve more deeply in some topics and perhaps to cover others that might not have time to touch upon during class. It will require them to learn how to deal with complexity, both in experimentation and data analysis, which is an important component of any engineer's expertise.

Course Content:

Acids and bases; titration and its classification; volumetric titration; titrimetric experiments; water pollution and purification.

Course Learning Outcomes (CLOs)

CLO 1: To understand volumetric analysis & standardization and carry out titration experiments
CLO 2: To learn about molarity, normality, molality & acidimetry- alkalimetry.
CLO 3: To understand complexometric and precipitation titration.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√		√								
CLO 2	√											
CLO 3		√		√								
Overall	√	√		√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Class Lecture, Experiment demonstration, Workbook, Handout, Discussion with the students, Question and Answer Session, Project/ report writing, Video lecture	Continuous Assessment of performance, Attendance, Assignments (Lab reports and projects), Exam (Quiz, Spot test, Viva and Final)

CSE 2101: Introduction to Computer Fundamentals and Programming

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

In this course students will be given basic knowledge on computer systems, operating, software package and programming which will enable them to learn problem solving technique and apply them in civil engineering problems.

Course Content:

Basic components of computer systems, Operating systems for computers, Introduction to Microsoft office package, Programming concepts and algorithms, internal representation of data; elements of structured programming language; data types; operators, expressions, control structures, functions, pointers and arrays, input and output, concept of object-oriented programming (OPP); encapsulation, inheritance, polymorphism and abstraction, development of programs related to civil engineering.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To operate computers system and Microsoft software package
CLO 2: To write clear, elementary programming language
CLO 3: To understand algorithmic thinking, problem solving techniques and apply it

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√				√							
CLO 2	√		√		√							
CLO 3		√	√									
Overall	√	√	√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Assignment, Group work, Class Test, Mid Exam, Final Semester Exam

Hum 2101: History of Emergence of Bangladesh

Credits: 3.00 ***Contact hours: 3.0 hrs. /week***

Rationale of the Course:

Student knows the history of the rise of Bangladesh. Students to understand that culture is a broad concept so that they can develop a clear idea about the cultural identity, religion, philosophy and literature of Bengalis perfectly.

Course Content:

The establishment of the rule of the East India Company; social, cultural, and political transformations in Bengal during British rule; the Partition of Bengal and its reactions; the emergence of independent India and Pakistan in 1947; Pakistani rule in East Bengal; the Language Movement (1948–1952) and 21 February; the United Front and the election of 1954; the Six-Point Movement and the rise of Bengali nationalism; the Agartala Conspiracy Case; the Mass Uprising of 1969; the election of 1970; conspiracies of the Pakistani rulers; the Liberation War of 1971 and the emergence of independent Bangladesh.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO1: To achieve the capability to get a complete idea of the social, cultural and political transformation of Bengal during the British and Pakistani rule.

CLO2: To develop a clear idea about the history of Bangladesh from nationalist movement, language movement, six-point movement to great liberation war fluently.

CLO3: To enable students to understand that culture is a broad concept so that they can develop a clear idea about the cultural identity, religion, philosophy and literature of Bengalis perfectly.

CLO4: To remember and understand the history of the rise of Bangladesh.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1												√
CLO 2												√
CLO 3												√
CLO 4												√
Overall												√

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Lecture discussion with multimedia, White board (WB), Handout	Assignment, Oral Test, Mid Semester Exam
CLO 2	Reference Book, Lecture discussion with multimedia, WB, Handout	Assignment, Class Test, Mid Semester Exam
CLO 3	Reference Book, Lecture discussion with multimedia, PPT, WB, Handout	Assignment, Class Test, Mid Semester Exam, Semester Final Exam
CLO 4	Reference Book, Lecture discussion with multimedia, WB, Handout	Oral Test, Semester Final Exam

CE 2121: Engineering Geology and Geomorphology

Credits: 3.0 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course will provide students with basic geology and the principles of site investigation for civil engineering students. Students should develop an appreciation of geologic processes and influence on civil engineering works and acquire knowledge of the most important rocks and minerals and to identify them and interpret geological maps with an emphasis on making construction decisions.

Course Content:

Minerals: identification of minerals, common rock-forming minerals, physical properties of minerals, mineraloids; Rocks: types of rocks, cycle of rock change, earthquake and seismic map of Bangladesh; Structural geology: faults, types of faults, folds and fold types, domes, basins, erosional processes, quantitative analysis of erosional landforms; Fluvial features: channel development, channel widening, valley shape, stream terraces, alluvial flood plains, deltas and alluvial fans, channel morphology, channel patterns and the river basin, geology and geomorphology of Bangladesh; Coast and coastal features, tides and currents, and forces due to waves.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Describe the importance of geology and geomorphology in civil engineering projects
CLO 2: Analyze geological information for assessment of geological hazards
CLO 3: Discuss basic concepts of geomorphological formation for better understanding
CLO 4: Evaluate the bed load on a river channel and stream order analysis

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2			√									
CLO 3	√		√									
CLO 4		√	√	√								
Overall	√	√	√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 - CLO 2	Reference Book, PPT, WB, Handout	Class Test, Assignment, Mid Semester Exam
CLO 3 - CLO 4	Reference Book, PPT, WB, Handout	Class Test, Assignment, Semester Final Exam

CE 2111: Engineering Mechanics

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course provides students with the fundamental principles of engineering mechanics related to particles and rigid bodies. It develops competency in force analysis, equilibrium, truss analysis, centroids, moments of inertia, and the basic concepts of dynamics and vibrations, which are essential for advanced studies in strength of materials, structural analysis, and other core civil engineering courses.

Course Content:

Force vectors: Vector operations and addition of forces, force systems, force resultant systems, cross product and moment; Equilibrium: Equilibrium of particles and rigid bodies, free body diagrams, coplanar forces systems and equations of equilibrium; Structural analysis of trusses: Joint method and section method; Center of gravity: Center of gravity, center of mass and centroids of single and composite bodies and resultants of distributed loadings; Moments of inertia of areas and masses: Definition, parallel-axis theorem, radius of gyration, moments of inertia for composite bodies and moments of inertia about inclined axes; Work; energy; momentum; Dynamics; kinematics and vibrations.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Explain the concept of forces and draw free body diagrams

CLO 2: Develop and solve equations of equilibrium to determine unknown forces in a two-dimensional force system

CLO3: Identify the forces acting on members of a truss and solve the unknown forces acting on the members of simple statically determinate trusses

CLO4: Locate the center of gravity and centroid for a composite or non-composite two-dimensional body of any shape and determine moments of inertia of areas and masses for the body

CLO5: Explain and discuss fundamental kinetic and kinematic parameters such as velocity, acceleration, momentum, work and energy

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2	√	√										
CLO 3	√	√										
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam, Final Semester Exam

CE 2106: Quantity Surveying

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course provides practical knowledge and hands-on experience in quantity estimation and cost analysis for a wide range of civil engineering works. It enables students to develop the ability to accurately compute quantities from drawings and field data, which is essential for effective project planning and resource management. Through exercises on residential buildings, earthwork, retaining structures, and other components, students gain familiarity with standard estimation practices and construction specifications.

Course Content:

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

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLOS)

CLO 1: To perform quantity estimation for various civil engineering works including roadway earthwork, residential building components, water reservoirs, retaining walls, and steel trusses.

CLO 2: To analyze rates, specifications, and cost components for preparing detailed cost estimates of construction projects.

CLO 3: To apply computer-aided tools and site survey data for accurate quantity takeoff and preparation of construction estimates.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2		√										
CLO 3			√		√							
Overall	√	√	√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 3	Reference book, PPT, WB, Handout, Interactive discussion and videos, Demonstration and Feedback, Group work	Sessional reports and Performance, Quiz, Viva-Voce, Final Quiz

CSE 2102: Computer Programming Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

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

Course Content:

Programming concepts and algorithms; internal representation of data; elements of structured programming language: data types, operators, expressions, control structures, functions, pointers and arrays, input and output; concept of Object-Oriented Programming (OOP): encapsulation, inheritance, polymorphism and abstractions, development of programs related to civil engineering.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To gain knowledge about programming languages, its type, concepts and algorithms.
CLO 2: To be able to write clear, elementary Python programs.
CLO 3: To be able to understand the algorithmic thinking, problem-solving techniques and apply it to programming.
CLO 4: To be able to code with Python arithmetic, increment, decrement, assignment, relational, equality and logical operators.
CLO 5: To be able to code with Python control structures (if, if/else, switch, while, do/while, for) and use built-in data types.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2			√		√							
CLO 3	√	√			√							
CLO 4			√		√							
CLO 5			√		√							
Overall	√	√	√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 5	Computer Lab, PPT, WB, Handout, Videos, Group work	Assignment, Viva-voce and Final Quiz

CE 2205: Professional Practices, Communication and Ethics

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course provides students with an understanding of the overall professional practices, communication, ethics and environmental protection. Maintaining integrity along with the professional practices and ethics is one of the most vital parts for any kind of civil engineering projects whether it is required for design or construction.

Course Content:

Project, its characteristic feature, project life cycle; type of contracts; procurement regulations and law; documents for procurement of works, goods and services and their application; contract risk and contract responsibility; insurances; Industrial and Labor Relations tender procedure; claims, disputes and arbitration procedure; measures for reducing fiduciary risks.

Introduction to communication concepts, modes of communication, methods of effective communication; writing reports; oral presentation of reports; writing proposals; preparing effective business messages; conducting meetings; strategies for effective speaking and successful inter personal communication; job application process; Curriculum Vitae writing; interviews and follow-ups;

Introduction to the code of ethics for engineers. History and Development of Engineering Ethics: Study of Ethics in Engineering. Applied Ethics in engineering. Human qualities of an engineer, Ethical Expectations: Employers and Employees inter-professional relationship, maintaining a commitment of Ethical standards. Desired characteristics of a professional code. Institutionalization of Ethical conduct.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLOS)

CLO 1: Understand the characteristics of construction projects, engineering ethics, and professional policies related to project management.

CLO 2: Identify contract risks, responsibilities, procurement processes, and tender procedures used in construction projects.

CLO 3: Develop effective professional communication skills through preparation of reports, proposals, and project-related documents.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1								√			√	
CLO 2								√			√	
CLO 3												
Overall								√			√	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1, CLO 2	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 2- CLO 3	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

Hum 2201: Principles of Accounting

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course introduces accounting in general, then covers the basics of financial accounting through the accounting cycle for engineering project. The main objective of this course is to introduce the theoretical foundation of financial accounting (concepts, assumptions, and principles) and the financial statements of an enterprise. The course prepares the student to be capable of performing the different steps of the accounting cycle for engineering projects.

Course Content:

Accounting definition, accounting history, accounting elements, accounting ethics & principles the accounting equation, accounts, event and transactions, and the double entry mechanism. Accounting procedure: Preparing Journal, Ledger, Trial Balance, Adjusted Trial Balance, preparing financial statements, Cash flow statement, adjusting entries, cost in general: Cost sheet, objectives and classifications of cost. Variable, Semi variable cost& Fixed cost, Overhead costs: allocation and apportionment. Product costing: cost sheet under job costing, operating costing and process costing. Costing by products and joint products. Marginal costing: tools and techniques, cost volume- profit analysis. Designing the optimal product mix. Relevant costing: analysis, profitability within the firm. Guidelines for decision-making: short-run decisions. Long-run planning and control: capital budgeting. The master budget, flexible budget and standard cost. Variance analysis.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To understand the basic language of business and relate information about engineering purpose.

CLO 2: To describe Outline the purpose, use, and limitations of accounting measurements and reporting for civil engineering purpose.

CLO 3: To learn about business accounting elements and prepare financial statements.

CLO 4: To calculate Overhead costing, process costing, product costing, marginal costing, and cost-volume profit relationship, to understand long term & time-oriented decisions in project.

CLO 5: To analyze and interpret accounting information for decision purposes.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1:			√									
CLO 2:			√									
CLO 3:			√									
CLO 4:			√					√				
CLO 5:			√					√				
Overall			√					√				

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 4- CLO 5	Reference Book, PPT, WB, Handout	Assignment, Semester Final Exam

CE 2213: Mechanics of Solids I

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

The course will introduce students to the fundamentals regarding Mechanics of Solids. Students will gain knowledge to develop their ability to carry out analysis of complex state of stress. It also enhances skills of utilizing materials of appropriate strength for civil engineering applications.

Course Content:
Fundamental concept of Stress and strain, Hooke's law, Poisson's ratio and constitutive relations mechanical properties like elasticity, stresses and strains subjected to tension, compression, shear and temperature change. Shear Force and Bending moment diagrams of beams and frames, flexure and shear stress in the beams, Shear center, Axial load and deformation of bars (thermal effects).

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To explain the fundamental concepts of stress, strain, elasticity, and constitutive relations in solid materials subjected to external loads.

CLO 2: To analyze the behavior of structural members under axial load, torsion, and bending using appropriate mechanical principles and formulas.

CLO 3: To Shear Force and Bending moment diagrams of beams and frames, flexure stress in the beams.

CLO 4: To Shear Force and Bending moment diagrams of beams and frames, flexure and shear stress in the beams.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2	√	√										
CLO 3	√	√										
CLO 4	√	√										
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 4	Reference Book, PPT, WB, Handout, Videos	Class Test, Mid Semester Exam, Final Exam, Assignment

Math 2203: Probability and Statistics

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

Students will learn the fundamentals of numerical solution techniques and calculations in this course. This will be valuable for students in their later years of education as well as in their professional lives.

Course Content:

Probability: Theory of probability; Random variable; Probability distributions of a discrete random variable and a continuous random variable; Standard normal distribution.

Statistics: Measures of central tendency; Measures of dispersion; Moments, Skewness and Kurtosis; Correlation Analysis; Linear regression analysis.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Understand the basic concepts of probability, random variables and probability distributions.

CLO 2: Apply discrete and continuous probability distributions and standard normal distribution to solve engineering problems.

CLO 3: Calculate and interpret measures of central tendency and dispersion for civil engineering data.

CLO 4: Analyze statistical data using moments, skewness and kurtosis.

CLO 5: Apply correlation and linear regression analysis for modeling and prediction of engineering data.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√	√										
CLO 2	√	√			√							
CLO 3		√		√								
CLO 4				√								
CLO 5		√	√	√	√							
Overall	√	√	√	√	√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 3- CLO 6	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 2200: Details of Construction

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a core subject to gain fundamental knowledge of the systems and processes of construction, details of work and working environment, safety and security of construction and built environment.

Course Content:

Architectural vs structural drawings and interpretation, Concrete detailing: reinforcement layout and anchorage, Masonry and brickwork detailing (joints & bonding), Roof, floor and staircase construction details, Expansion joints, control joints and movement provisions, Waterproofing, damp-proofing and flashing details, Doors, windows and fenestration details in structures, Construction sequencing and temporary works detailing, Construction specification notes and as-built records.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To interpret architectural and structural drawings for understanding construction details and design intent.

CLO 2: To explain and prepare detailing of structural and building components such as reinforcement in concrete, masonry bonding, roofs, floors, staircases, doors, and windows.

CLO 3: To evaluate construction detailing practices related to joints, waterproofing, damp-proofing, construction sequencing, and preparation of construction specifications and as-built records.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√	√							√			
CLO 2	√	√	√						√			
CLO 3	√	√	√						√			
Overall	√	√	√						√			

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1-CLO 3	Reference Book, PPT, WB, Handout	Spot test, Report, Quiz test and Final Semester Exam

CE 2214: Mechanics of Solids Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a hand on training course for the civil engineering program. This course introduces students to basic testing procedure for steel, timber, helical spring, slender column, impact and shear test of metals etc.

Course Content:

Torsion test on circular shafts, Bending tests on beams: load-deflection measurement, Shear test apparatus and shear strength checks, Determination of elastic modulus and Poisson's ratio, Hardness testing and material property correlation, Fatigue or cyclic loading demonstration (if available), Data recording, plotting stress–strain curves and reporting.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To perform laboratory experiments to determine the mechanical properties of materials through torsion, bending, shear, and hardness tests.

CLO 2: To determine material properties such as modulus of elasticity, Poisson's ratio, and shear strength from experimental data.

CLO 3: To record, analyze, and present experimental results by plotting stress–strain curves and preparing structured laboratory reports.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√			√								
CLO 2		√		√								
CLO 3				√	√							
Overall	√	√		√	√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, Handout	Class Test, Assignment, Viva, Semester Final Exam

CE 2303: Numerical Analysis

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

Numerical Analysis is designed for its applications in engineering and technology. The student shall learn various techniques in integration and differential equations and use these techniques to their related Engineering problems.

Course Content:

Systems of linear algebraic equations; interpolation and curve fitting; roots of equations; numerical differentiation; numerical integration; initial value problems; two-point boundary value problems; finite differences.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Understand and apply numerical methods for solving systems of linear algebraic equations and finding roots of nonlinear equations.

CLO 2: Apply numerical techniques such as interpolation, curve fitting, numerical differentiation, and numerical integration to engineering problems.

CLO 3: Analyze and solve initial value problems and boundary value problems using numerical methods including finite difference techniques.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2		√										
CLO 3		√										
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, Handout	Class Test, Assignment, Viva, Semester Final Exam

CE 2341 Fluid Mechanics

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course is a basic course of Civil Engineering program in which students will learn about properties of fluid, construction of structures in water, flow measuring instruments details and design of pipe networks.

Course Content:

Development and scope of fluid mechanics, Fluid properties, Fluid statics, Kinematics of fluid flow: Fluid flow concepts and basic equations—continuity equation, energy equation, momentum equation and forces in fluid flow, Similitude and dimensional analysis, 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, Fluid measurement: Pitot tube, orifice, mouthpiece, nozzle, venturi meter, weir.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To understand the fluid mechanics fundamentals, including concepts of mass and momentum conservation.

CLO 2: To apply the Bernoulli equation to solve problems in fluid mechanics.

CLO 3: To gain knowledge of laminar and turbulent boundary layer fundamentals & ability to perform dimensional analysis for problems in fluid mechanics

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2		√										
CLO 3	√	√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Book, PPT, WB, Handout	Class test, Assignment, Mid Semester Exam
CLO 2- CLO 3	Reference Book, PPT, WB, Handout	Class test, Assignment, Final Semester Exam

CE 2343 Open Channel Hydraulics

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

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

Course Content:

Introduction to open channel flows: Description, Classification, Geometric properties of channel sections, Velocity distribution coefficients, Pressure distribution in a channel section, The energy and momentum principle in open channel flows, Specific energy and computation of critical flow, Channel transitions, control and flow measurement, Uniform flow and its computations, Analysis of non-uniform flow and computation of flow profiles: Gradually varied flow, Rapidly varied flow, Hydraulic jump analysis, Conceptual design of channels.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To learn about basic concepts of fluid flow, conservation of mass, energy and momentum.

CLO 2: To acquire knowledge about specific energy, flow conditions, including critical, subcritical, and supercritical flows and the behaviour of uniform, non-uniform, and gradually varied flows in Open Channel Flow.

CLO 3: To understand water surface profile, Hydraulic jump and the design of open channels.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2	√	√										
CLO 3			√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Book, PPT, WB, Handout	Class test, Assignment, Mid Semester Exam
CLO 2- CLO 3	Reference Book, PPT, WB, Handout	Class test, Assignment, Final Semester Exam

CE 2313: Mechanics of Solids II

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a basic mechanics course for the civil engineering program. This course will introduce students to the fundamentals regarding the Mechanics of Solids. Students will gain knowledge to develop their ability to analyze the complex state of torsional stresses in shafts and tubes, deflection of any beam, buckling of columns. It will also enhance skills of utilizing materials of appropriate strength for civil engineering applications

Course Content:

Stability of columns: Euler buckling and column curves, Torsion of circular shafts and power transmission, helical springs, thin-walled pressure container. Shear stress distribution in beams; shear center and shear flow, Combined stresses and principal stresses, Transformation of stress and Mohr's circle, Deflection of beams: double-integration and area-moment.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To analyze the stability of structural columns by applying Euler's buckling theory and column behavior concepts.

CLO 2: To understand behavior of shafts under torsion and power transmission.

CLO 3: To understand helical springs, thin-walled pressure container under loads and stresses.

CLO 4: To determine Shear stress distribution in beams; shear center and shear flow

CLO 5: To understand and determination of combined stresses and principal stresses, transformation of stress and use of Mohr's circle

CLO 6: To determine Deflection and slope of beams by double-integration and conjugate method.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2	√	√										
CLO 3	√	√										
CLO 4		√										
CLO 5	√	√										
CLO 6		√										
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Assignment, Class Test, Mid Semester Exam, Final Semester Exam

CE 2342 Fluid Mechanics Sessional

Credits: 1.5 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a sessional course in which students will learn about the centre of pressure, proof of Bernoulli's theorem, flow through a Venturi meter, flow through an orifice, coefficient of velocity by the coordinate method, flow through a mouthpiece, flow over a V-notch, flow over a sharp-crested weir, and fluid friction in pipes. This course will help students in their practical life in the future.

Course Content:

Centre of pressure, Proof of Bernoulli's theorem, Flow through Venturi meter, Flow through orifice, Coefficient of velocity by coordinate method, Flow through mouthpiece, Flow over V-notch, Flow over sharp-crested weir, Fluid friction in pipe.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To learn about the Centre of Pressure and how to locate the center of pressure.
CLO 2: To prove the Bernoulli's theorem and calculate the Coefficient of velocity by Coordinate method.
CLO 3: To measure and evaluate fluid flow through devices such as a venturimeter, orifice, mouthpiece, V-notch, and sharp-crested weir, and analyze fluid friction in pipes.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√	√										
CLO 2		√		√								
CLO 3				√								
Overall	√	√		√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 3	Reference book, PPT, WB, Lab manual	Class participation, Viva-voce, Final Quiz and sessional report.

CE 2344 Open Channel Hydraulics Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a practical course on open channel hydraulics sessional where students will be trained and practiced on measurement of discharge in an open channel. Experience gained from this course will be used in latter semesters and in professional life.

Course Content:

Determination of State of Flow in Open Channel, Flow Over a Broad Crested Weir, Flow Through a Venturi Flume, Flow Through a Parshall Flume, Flow Through a Cut-Throat Flume, Flow Beneath a Sluice Gate, Hydraulic Jump, Development of Generalized Specific Energy and Specific Force Curves, Velocity Distribution Profile in Laboratory Flume, Measurement of Discharge using Area Velocity Method.

Mapping Course Learning Outcomes (CLOs) with PLOs
Course Learning Outcomes (CLO):

CLO 1: To learn about the state of flow, discharge and critical depth.
CLO 2: To acquire knowledge about calibrating the weir, venture flume and Parshall Flume.
CLO 3: To learn about the total energy loss, kinetic energy loss, efficiency of the jump and compare them with theoretical values and develop a characteristic curve of the hydraulic jump.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2		√		√								
CLO 3	√			√								
Overall	√	√		√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 3	Reference Book, PPT, WB, Laboratory Manual	Class participation, Viva, Final Quiz and sessional report.

CE 3131: Environmental Engineering I

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

The course introduces students to the knowledge of water supply system, surface water collection, conventional and specific water treatment process, water supply transmission and distribution and distribution networks, rainwater harvesting, and low-cost water supply system for rural and venerable areas. This learning course is very useful for professional life.

Course Content:

Introduction to environmental engineering according to Sustainable Development Goal

Water quality requirement; water treatment- plain sedimentation, coagulation, flocculation, filtration, disinfection, miscellaneous treatment processes; low-cost treatment process for rural communities; rain water harvesting.

Water supply engineering: introduction, water demand; water supply sources; groundwater exploration; aquifer properties and ground water flow; well hydraulics, water well design, drilling, construction and maintenance; shallow hand tube well, deep tube well

Surface water collection and transportation; head works; pumps and pumping machineries; water distribution systems- analysis and design of distribution network; fire hydrant; water meter, leak protection; unaccounted for water.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLOs):

CLO 1: To know SDG related to water supply, identify water supply sources and evaluate demand analysis on water quantity

CLO 2: To understand problems related to ground water and rain water harvesting.

CLO 3: To choose different water treatment methods according to practical field necessity and water quality

CLO 4: To select different water transmission and distribution according to necessity and evaluate water distribution networking problems

CLO 5: To choose different low-cost water supply technology.

Course Learning Outcomes (CLOs)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2	√	√										
CLO 3	√	√										
CLO 4	√	√	√									
CLO 5	√	√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Book, PPT, WB, Handout	Mid Semester Exam
CLO 2	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 3	Reference Book, PPT, WB, Handout	Class Test, Assignment, Final Semester Exam
CLO 4	Reference Book, PPT, WB, Handout	Quiz, Assignment, Final Semester Exam
CLO 5	Reference Book, PPT, WB, Handout	Final Semester Exam

CE 3121: Geotechnical Engineering I

Credits: 3.00 ***Contact hours:3.0 hrs. /week.***

Rationale of the Course:

The course familiarizes students with the basics regarding geotechnical engineering. Students can gain knowledge to develop their ability on type and identification of soil, soil properties and theories on soil mechanics. It also improves skills of practical application of geotechnical engineering.

Course Content:

Introduction to geotechnical engineering, Formation, type, and identification of soils, Soil composition, Soil structure and fabric, Index properties of soils, Engineering classification of soils, Soil compaction, Principles of total and effective stresses, Permeability and seepage, Stress–strain–strength characteristics of soils, Compressibility and settlement behavior of soils, Lateral earth pressure, Stress distribution.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Understand the properties and classification of soil
CLO 2: Analyze compaction and shear strength parameters of soil
CLO 3: Estimating settlement and strength behavior of soil
CLO 4: Perform analysis based on hydraulic conductivity and seepage
CLO 5: Determine stresses acting on retaining structures and foundations

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2		√										
CLO 3		√	√									
CLO 4	√	√										
CLO 5		√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 - CLO 2	Reference Book, PPT, WB, Handout	Class Test, Assignment, Mid Semester Exam
CLO 3 - CLO 5	Reference Book, PPT, WB, Handout	Class Test, Assignment, Semester Final Exam

CE 3111: Structural Analysis and Design I

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is the first structural analysis course. Students will learn how to analyze a variety of structural components that are subjected to both static and dynamic stresses in this course. Later classes will teach students how to design various structural components, and the analysis techniques learned here will be beneficial.

Course Content:

Statical determinacy and indeterminacy of structures, Analysis of determinate beams, frames and trusses, Influence lines for beams and moving load effects, Approximate methods for indeterminate structures (three-moment), Slope-deflection and moment distribution methods, Introduction to stiffness/matrix

methods (assembly concepts), Deflection methods and energy approaches (virtual work), Design philosophy and introduction to relevant codes.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To determine the statical determinacy and analyze determinate structures such as beams, frames, and trusses under various loading conditions.

CLO 2: To apply analytical methods including influence lines, three-moment equation, slope-deflection, and moment distribution for the analysis of indeterminate structures.

CLO 3: To explain structural analysis approaches using stiffness concepts, energy methods, and basic structural design philosophy in accordance with relevant design codes.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√	√										
CLO 2	√	√	√									
CLO 3	√	√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam, Assignment

CE 3115: Design of Concrete Structures I

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This an analysis and design course of reinforced concrete structures. In this course students will learn about fundamental behavior of reinforced concrete, analysis and design of a reinforced concrete beams and one way slabs and shear behavior and its design.

Course Content:

Materials and fundamental behavior of reinforced concrete; loads and design philosophies; analysis of beam section under various stages of loading; design of singly reinforced, doubly reinforced and T-beams according to USD methods; shear and diagonal tension; bond and anchorage; reinforced concrete floor

and roof systems, design of one way slabs; two way slab design by ACI coefficients, column supported slab design by direct design and equivalent frame methods; strip method for slabs

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1. To understand material properties and behavior of reinforced concrete

CLO 2. Develop skills on analysis and design of different types of reinforced concrete beams by USD method including shear, bond and anchorage.

CLO 3. Develop skills on analysis and design of one-way reinforced concrete slabs.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2		√	√									
CLO 3		√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Class Test, Assignment Mid Semester Exam, Final Semester Exam

CE 3112: Structural Analysis and Design I Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a basic structural course for the civil engineering program. In this course students will learn how to analyze and design various structural components subjected to different types of loads. It enhances their ability to design any structural member.

Course Content:

Analysis of steel structures, elements of steel structures, design of plate girder, design of members and joints.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To analyze the behavior of steel structural elements and systems under different loading conditions.

CLO 2: To design steel structural members, plate girders, and joints in accordance with relevant design principles and codes.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2		√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 & CLO 2	PPT, Handout, WB	Class Performance, Assignment, Viva, Final Quiz

CSE 3102: Engineering Computation Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

In this course students will be able to learn basic knowledge of algorithms, problem solving techniques and application of high-level computational programming tools to numerical analysis.

Course Content:

Introduction to hi-level computational programming tools, Basic matrix computation, solving systems of linear equations, non-linear equations, and differential equations, Interpolation and curve fitting, Numerical differentiation and integration, Application of numerical solution to engineering problems related to mechanics.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Explain the fundamentals of high-level computational programming tools used for numerical analysis.
CLO 2: Apply numerical methods to solve mathematical problems, including matrix operations, systems of linear and non-linear equations, differential equations, interpolation, differentiation, and integration.
CLO 3: Utilize computational techniques to analyze and solve engineering problems such as mechanics and equations of motion.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1					√							
CLO 2		√										
CLO 3		√	√		√							
Overall		√	√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Books, Lab Manual, PPT, WB, Handout, Computer lab	Viva-voce, Quiz
CLO 2 - CLO 3	Reference Books, Lab Manual, PPT, WB, Handout, Computer lab	Assignment, Viva-voce, Final Quiz

Hum 3201: Engineering Economics

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a basic course for the civil engineering program. This course introduces students to the fundamentals regarding engineering economics. Students can gain knowledge to develop their ability to analyze and select the most economical alternative among several design alternatives. It also enhances skills of utilizing economic knowledge for civil engineering applications and also for any other purposes. This course is necessary to make proper decision regarding civil engineering tasks.

Course Content:

Economics and engineering; microeconomics and macroeconomics; theory of demand and supply and their elasticity's; demand estimation; price determination; indifference curve technique; theory of production; theory of cost and cost estimation; market structure; national income accounting, depreciation; circular flow of income and expenditure; cost-benefit analysis; payback period, NPV, IRR, inflation; economic feasibility of engineering undertakings.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To understand the basic concepts of economics and its relation with engineering.
CLO 2: To be able to explain time-value of money concepts and the criteria for making economic based decisions.
CLO 3: To make students to be able to incorporate economic analysis into their creative efforts.
CLO 4: To make students to will be able to select and implement from multiple alternatives.
CLO 5: To evaluate the design requirement of various engineering projects.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√				√						
CLO 2		√										
CLO 3			√			√						
CLO 4		√	√									
CLO 5						√	√					
Overall		√	√			√	√					

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 2- CLO 5	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 3215: Design of Concrete Structures II

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course is an advanced continuation of reinforced concrete design that develops students' competency in analyzing, designing, and detailing major RC structural components such as two-way slabs, columns, foundations, and retaining walls in accordance with relevant design codes. It also enables students to address practical structural

design problems with considerations of safety, serviceability, and durability for professional civil engineering practice.

Course Content:

Design of two-way slabs, Design of slender and short columns with ties/shear reinforcement, Details of designing different type of foundations, Retaining wall design and soil–structure interaction basics, Strengthening and rehabilitation methods for RC members, Advanced detailing and design checks per code.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To analyze and design reinforced concrete two-way slabs

CLO 2: To analyze and design of different type of reinforced concrete short and slender column including design for shear steel.

CLO 3: To design basic foundation systems and retaining walls, and apply detailing, strengthening, and rehabilitation techniques for reinforced concrete structures.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1		√	√									
CLO 2		√	√									
CLO 3		√	√			√						
Overall		√	√			√						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 3	Reference Book, PPT, Handout	Class Test, Assignment, Mid Semester Exam, Final Semester Exam

CE 3231: Environmental Engineering II

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a second course on environmental engineering for the civil engineering program. This course introduces students to the waste water technology and sanitation, design and construction of treatment plant and sanitation systems. Student will be able use the knowledge of this semester in other semester and their professional life.

Course Content:

Wastewater Engineering: introduction according Sustainable Development Goals; sanitation and health; design, construction and maintenance of on-site sanitation technology; estimation of wastewater and its characteristics; plumbing system; wastewater collection systems; sanitary sewer and storm drainage system; wastewater treatment and disposal; treatment and disposal of industrial effluents; sludge treatment and disposal;

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To identify SGD target related to waste water engineering
CLO 2: To design and construct different onsite sanitation system
CLO 3: To design and construct sanitary sewer, storm sewer, and sewerage system
CLO 4: To understand different method of sewage treatment methods and design of treatment unit
CLO 5: To understand sludge management and treatment facilities.
CLO 6: To know design and construction of Effluent Treatment Plant specially textile, leather and paper and pulp industries and Waste Stabilization Pond

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2	√	√	√									
CLO 3	√	√	√									
CLO 4	√	√	√									
CLO 5	√											
CLO 6		√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 2	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 3- CLO 7	Reference Book, PPT, WB, Handout, Field / industry visit	Assignment, Final Semester Exam

CE 3251: Transportation Engineering I

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course introduces students to the detailed knowledge about the importance of transportation engineering, Transportation planning, Alignment and geometric design of highway, highway materials; subgrade, sub base and base course. This course also develops skills in traffic engineering, traffic volume study, parking study, traffic capacity, street lighting, traffic operation, Road accident.

Course Content:

Introduction to transportation engineering; development and elements of transportation systems; Intelligent transportation system: components and applications; transport planning: concepts, scope and hierarchy, process, goals and objectives, inventories, socio-economic activities, land use-transport interaction, travel demand forecasting; road safety and accident analysis.

Transportation in Bangladesh; transportation modes and networks, constraints and challenges, transport demand and modal share; transportation planning concepts: collection, study and analysis of basic data; highway location and surveys; geometric design of highways: elements of design, cross-section elements, curves and sight distances; road intersections; traffic engineering: the road/traffic system, vehicle and traffic characteristics, traffic control devices, traffic Studies, parking and roadway lighting; waterways and terminals.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Understand the fundamental concepts of transportation engineering, development of transportation systems, elements of transportation systems, and transportation networks in Bangladesh.
CLO 2: Analyze transportation planning concepts including data collection, travel demand forecasting, land use–transport interaction, and intelligent transportation systems.

CLO 3: Apply principles of highway geometric design and traffic engineering including road alignment, traffic characteristics, traffic control devices, traffic studies, parking, roadway lighting, and road safety analysis.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2	√											
CLO 3	√					√						
Overall	√	√				√						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 2	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 2-CLO 3	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 3232: Environmental Engineering I Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a practical course on environmental engineering where students will be trained and practiced on various water and waste water sampling and testing methods. Experience gained from this course will be used in latter semesters and also in professional life.

Course Content:

Techniques for sampling water and wastewater, methods for sample preservation, and the physical, chemical, and biological testing of water and wastewater; principles of breakpoint chlorination and alum coagulation; procedures for sampling and laboratory analysis of air, as well as sampling and laboratory analysis of soil and solid waste.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To learn about the water and wastewater sampling techniques
CLO 2: To gain knowledge about sample preservation, physical, chemical and biological tests of water and wastewater
CLO 3: To acquire knowledge about breakpoint chlorinating and its details
CLO 4: To learn about alum coagulation

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√			√								
CLO 2	√			√								
CLO 3	√											
CLO 4	√											
Overall	√			√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 4	Reference Book, PPT, WB, Laboratory Manual	Laboratory test, Assignment, Sessional Final Exam

CE 3222: Geotechnical Engineering I Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a geotechnical engineering sessional course. Students will be able to learn about the practical application of various soil tests, soil characteristics, and soil consistencies in this course.

Course Content:

Field Identification Test, Specific Gravity Test, Grain Size by Sieve & Hydrometer, Atterberg Limit Test, Direct Shear Test, Unconfined Compressive Strength Test, Permeability Test, Compaction Test, Relative Density Test, Consolidation Test.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Classify different types of soil through field identification test and laboratory testing
CLO 2: Determination of strength, permeability, consolidation and other characteristics of soil through experimental investigation

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√		√								
CLO 2				√								
Overall		√		√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 - CLO 2	SU Lab Manual, PPT, WB, Handout	Sessional reports and Performance, Final Quiz, Viva-Voce

CE 3341 Hydrology, Irrigation and Flood Control

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a basic course of civil engineering in which students will learn about Hydrologic cycle; hydrologic measurement: precipitation, evaporation and Stream flow; hydrographs Plant-soil-water relationship; consumptive use and estimation of irrigation water requirements; methods of irrigation; quality of irrigation water; problems of irrigated land; flood and its management.

Course Content:

Hydrologic cycle, Hydrologic measurement: precipitation, evaporation, transpiration and stream flow, Rainfall-runoff relations, Hydrographs, Unit hydrographs, Plant-soil-water relationship, Consumptive use and estimation of irrigation water requirements, Quality of irrigation water, Design of irrigation canal systems, Flood and its causes, Methods of flood management: Structural and non-structural measures, Direct and indirect losses of flood, Flood damage assessment

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Explain the fundamental principles of hydrology, including the hydrologic cycle and hydrologic measurements such as precipitation, evaporation, transpiration, and streamflow.

CLO 2: Apply hydrological concepts to analyze rainfall–runoff relationships, hydrographs, unit hydrographs, plant–soil–water relationships, and irrigation water requirements.

CLO 3: Evaluate irrigation and flood management practices, including irrigation water quality, canal design, flood causes, flood management measures, and flood damage assessment.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2	√	√										
CLO 3	√		√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Book, PPT, WB, Handout	Class Test, Mid-Semester Exam
CLO 2- CLO 3	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 3301: Project Planning and Construction Management

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course is professional field-oriented in which students will learn about project planning, construction site management, financial project evaluation, and other topics. This course will help students build project management abilities in the future.

Course Content:

Principles of construction management; Construction contracts and specifications; Inspection and quality control; Construction safety; Construction planning and scheduling: PERT, CPM, case studies, Feasibility Studies; Resource scheduling; PERT: a cost accounting system, linear programming. Psychology in administration; Human factors in management; Human resource management; Materials management; Demand forecasting; Inventory control; Stores management; Procurement. Project planning and evaluation; Feasibility reports, cash flow, pay-back period, internal rate of return. Benefit-cost ratio, construction equipment and plants. Replacement studies. Legal issues in construction; Environmental regulations.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Understand the principles of project planning and management including activity scheduling, network diagrams, CPM and PERT techniques for timely completion of construction projects.

CLO 2: Analyze project execution aspects including construction safety, resource scheduling, cash flow management, and administrative and motivational factors in construction projects.

CLO 3: Understand construction contracts, specifications, and professional responsibilities involved in construction project management.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√										√	
CLO 2			√									
CLO 3											√	
Overall	√		√								√	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 2	Reference Book, PPT, WB, Handout	Assignment, Class Test, Mid Semester Exam
CLO 2- CLO 3	Reference Book, PPT, WB, Handout	Class Test, Presentation, Final Semester Exam

CE 3303: Socio-economic Aspects of Development Projects

Credits: 2.0 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course will provide students with the goal, principles, and levels of public participation, as well as the various participatory decision-making instruments and approaches used in development projects. Students will be introduced to the ideas of development, sustainable development (SD), and the socioeconomic and environmental components of SD.

Course Content:

Economics and social structure; development and economic growth; Socio-economic indicators; Concept of human development, human development index; Gender related human development index; Human poverty and human poverty index; Poverty reduction strategies in Bangladesh; Concepts of sustainable development; MDGs. Characteristics of development projects; Human interest related aspects; population displacement; resettlement and rehabilitation strategy; Productivity; Land loss, land use and land ownership patterns; Fisheries and aquaculture; Deforestation and afforestation; Communication, commerce, industries and other economic benefits; Water supply, sanitation, health and nutrition; Inequalities in distribution of benefits and losses; Socio-economic impact assessment.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Evaluate the requirement of development projects from different social and economic viewpoints
CLO 2: Develop strategies for population displacement and rehabilitation in a certain city or country
CLO 3: Analyze the effects of development projects on social and economic conditions
CLO 4: Evaluate the requirement of development projects from different social and economic viewpoints

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√										
CLO 2												
CLO 3		√					√					
CLO 4		√									√	
Overall		√					√				√	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 - CLO 2	Reference Book, PPT, WB, Handout	Class Test, Assignment, Mid Semester Exam
CLO 3 - CLO 4	Reference Book, PPT, WB, Handout	Class Test, Assignment, Semester Final Exam

CE 3311: Structural Analysis and Design II

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

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

Course Content:

Advanced indeterminate analysis using matrix methods, Flexibility and stiffness method applications to frames, Influence line and moving load analysis for indeterminate systems, Stability and second-order effects (P–Δ and geometric stiffness), Dynamic effects, Design considerations for seismic and wind loads (intro), Design integration

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To analyze indeterminate structures using advanced analytical methods including flexibility, stiffness, and matrix methods.

CLO 2: To evaluate structural behavior under moving loads, stability effects, and dynamic actions using concepts of influence lines, second-order analysis, and basic structural dynamics.

CLO 3: To apply finite element concepts and integrate structural analysis results into design considerations for wind and seismic loads in accordance with relevant design codes.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2			√									
CLO 3		√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 - CLO 3	Reference Books, PPT, WB, Handout	Class Test, Assignment, Mid Semester Exam, Final Semester Exam

CE 3312: Bridge Design Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a classroom design sessional in which students will be guided through the design and detail of various components of a different type of bridges.

Course Content:

Load testing models or scaled span demonstrations, Design checks for simple beam/plate bridge elements (mini-project), Shear and bending verification experiments or software exercises, Detailing of joints and bearings (drawings/CAD exercises), Prestressing lab demo or simple prestress calculation exercises, Field visit report (if possible) / bridge inspection checklist activity.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To perform analysis and design checks of basic bridge elements through model testing, calculations, or software-based exercises.

CLO 2: To prepare bridge detailing drawings and technical reports based on laboratory demonstrations, CAD exercises, and field inspection activities.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√			√							
CLO 2	√		√		√							
Overall	√	√	√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 2	Reference book, Lab manual, WB, Study tour	Report, Viva, performance, presentation, Final quiz

CE 3314: Building Design Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a classroom design sessional in which students will be guided through the design and detail of various components of a building structure.

Course Content:

Small-scale design project: column–beam–slab coordination, Architectural–structural integration and drawing production, Construction sequence and detailing workshop, Foundation layout and footing detailing exercises, Structural drawing set preparation and presentation critique.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLOs)

CLO 1: To develop integrated structural design solutions for building components including columns, beams, slabs, and foundations through small-scale design projects.

CLO 2: To prepare and present complete structural drawing sets demonstrating architectural–structural coordination, construction sequencing, and detailing.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√	√									
CLO 2	√		√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 2	Reference Book, Interactive discussion, PPT, WB, Handout	Assignment, Class performance, Design assignment, Final Quiz Exam, Viva

CE 4115: Design of Steel Structures

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a design course of steel structures for the civil engineering program. This course introduces students to the design procedure of tension and compression members, welded and bolted connections. Students can also gain knowledge about the concept of buckling, flexural and shear strength, sway and non-sway frame etc.

Course Content:

Tension members, Compression members, Flexural members, Plate girders and built-up sections design basics, Beam–column connections, Stability considerations and bracing systems, Steel design codes, detailing and fabrication considerations.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To design steel structural members including tension members, compression members, and flexural members considering strength and stability requirements.

CLO 2: To analyze and design steel structural components such as plate girders, built-up sections, and beam–column connections using welded and bolted detailing concepts.

CLO 3: To apply steel design codes and evaluate stability, bracing systems, and fabrication considerations in the design of steel structures.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√									
CLO 2		√	√									
CLO 3			√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam, Assignment, Final Semester Exam

CE 4151: Transportation Engineering II

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is the second course on transportation engineering for the civil engineering program. This course introduces students to different design methods of rigid and flexible pavement. Students can gain knowledge on characteristics, functions, and types of pavements including the latest development. It also enhances the ability to specify requirements for various elements of railway tracks, signals, stations, and yards.

Course Content:

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

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Analyze and design flexible and rigid pavements including determination of pavement thickness and reinforcement requirements such as steel and dowel bars.
CLO 2: Evaluate the engineering properties and stability of soil for road construction and determine the need for subgrade improvement.
CLO 3: Apply principles of railway engineering for selection of suitable railway station locations and design of railway track geometry.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1			√									
CLO 2		√										
CLO 3	√		√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 3	Reference Book, PPT, WB, Handout, Interactive Discussion & Videos	Class Test, Mid Semester Exam
CLO 2, CLO 3	Reference Book, PPT, WB, Handout, Interactive Discussion & Videos	Assignment, Final Semester Exam

CE 4105: Business and Career Development

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

In this course, students will be able to learn the basics of communication in professional environment. After this course, they will become skilled in writing techniques of modern business letters, memos and reports, different methods of selection and recruitment, market analysis, marketing strategies and use of marketing tools.

Course Content:

Techniques of effective communication in professional environment; writing techniques of modern business letters, memos and reports; human resource management: source of manpower, methods of selection and recruitment, development and motivating the workforce, appraisal procedures, employee compensation and benefits; basic marketing management, segmentation and market analysis, marketing strategies and use of marketing tools; branding, choosing brand elements, brand extension and its advantages and disadvantages; introduction to operations management, basic production decisions of an organization, quality control within operations process.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Develop effective professional communication skills including writing business letters, memos, and reports.
CLO 2: Understand principles of human resource management including workforce motivation, appraisal procedures, compensation, and benefits.
CLO 3: Apply basic marketing and organizational management concepts including market segmentation, branding, operational processes, and decision-making.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1										√		
CLO 2								√				
CLO 3									√			
Overall								√	√	√		

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 2	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 2-CLO 3	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 4152: Transportation Engineering Sessional I

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course is designed to make the student understand about transportation engineering. This is done by requiring the students to have a good knowledge about Tests of bituminous materials, tests on subgrade, sub-base and base materials; bituminous mix design; roadway capacity analysis; application of analytical, simulation and statistical packages.

Course Content:

Testing and quality control of highway materials; bituminous mix design; roadway capacity analysis; application of analytical, simulation and statistical packages.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLOs)
CLO 1: To conduct and assess the quality control tests for aggregates and bitumen.
CLO 2: To determine the design bitumen content by Marshall mix design method
CLO 3: To determine capacity and saturation flow of road way.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1				√								
CLO 2						√						
CLO 3				√		√						
Overall				√		√						

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Report, class performance, Final Quiz Exam, Viva

CE 4114: Computer Aided Analysis and Design of Structures Sessional I

Credits: 1.5 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a Computer Aided analysis and design course different structural element and RCC building. This course will introduce students with the structural analysis and design software called ETABS. Students will gain knowledge about the software and can use the software to analyze and design a Reinforced Concrete Building.

Course Content:

Introduction to ETABS interface and structural modeling; creation of beam, frame, and simple truss models with load and boundary condition assignments; linear static analysis and load combinations; basic modal analysis for natural frequency extraction; reinforced concrete design checks using software output; interpretation of results including stresses, deflections, and support reactions; preparation of analysis reports and export of structural drawings.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To create structural models using ETABS by defining nodes, elements, supports, and loading conditions.

CLO 2: To perform static and modal analysis of beams, frames, and trusses and interpret results such as stresses, deflections, and support reactions.

CLO 3: To evaluate reinforced concrete member design using software output and prepare analysis reports and design drawings.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√				√							
CLO 2		√	√		√							
CLO 3		√	√		√							
Overall	√	√	√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1-CLO 3	BNBC, Dhaka Imarat Nirman Bidhimala, ETABS Manual, ETABS Software	Class Performance, Viva-Voce, Sessional report, Final Exam

CE 4221: Geotechnical Engineering II

Credits: 3.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a basic course of civil engineering in which students will learn about Soil investigation techniques; settlement computation; types of foundations; bearing capacity of shallow and deep foundations; settlement and distortion of foundations; design and construction of footings, rafts and piles.

Course Content:

Soil investigation techniques, Settlement computation, Types of foundations, Bearing capacity of shallow foundations, Bearing capacity of deep foundations, Settlement and distortion of foundations, Design and construction of footings, Design and construction of rafts, Design and construction of piles, Slope stability.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Understand properties of soil from subsoil explorations
CLO 2: Determine settlement and distortion of foundations
CLO 3: Analyze stability of soil slopes under different conditions
CLO 4: Determine bearing capacity of soils for shallow and deep foundations

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2		√	√									
CLO 3			√									
CLO 4			√	√								
Overall	√	√	√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 - CLO 2	Reference Book, PPT, WB, Handout	Class Test, Assignment, Mid Semester Exam
CLO 3 - CLO 4	Reference Book, PPT, WB, Handout	Class Test, Assignment, Semester Final Exam

CE 4231: Environmental Engineering III

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course offers students with an overview of solid waste management. Inadequate or incorrect management of solid waste generated by human activities is likely to have major public health consequences as well as negative environmental effects. As a result, this course covers engineering and scientific concepts and principles used in solid waste management to preserve human health and the environment.

Course Content:

Solid Waste Management: sources and types of solid wastes; physical and chemical properties of solid wastes; solid wastes generation; on-site handling, storage and processing; collection of solid wastes; transfer stations and transport; ultimate disposal methods; resources and energy recovery; soil pollution.
Industrial solid waste collection and disposal; hazardous waste management.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To examine various types of solid waste and their associated management techniques.
CLO 2: To analyze the health and environmental implications of solid waste management.
CLO 3: To design different waste collection systems that optimize routes, time, cost, and resource recovery (energy and materials).
CLO 4: To develop various solutions for the implementation of solid waste source reduction, on-site processing, treatment, re-use, and recycling possibilities.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√										
CLO 2	√	√										
CLO 3	√	√	√									
CLO 4	√	√										
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 4	Reference Book, PPT, WB, Handout, Interactive Discussion, Group Work, Site visit	Class Test, Assignment, Mid Semester Exam, Final Semester Exam

CE 4213: Prestressed Concrete

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is an introductory course on Prestressed concrete structures. In this course, students learn how to analyse and design prestressed concrete members and connections.

Course Content:

Prestressed Concrete: concepts of prestressing; materials; anchorage systems; loss of prestress; analysis of sections for flexure, shear, bond and bearing; analysis of end block and composite sections; beam deflections; cable layout; partial prestress. Design of prestressed concrete beams for simple and continuous spans; ideas about use of AASHTO – PCI sections for standard spans; design considerations for prestressed concrete pipes, piles, poles and railway sleepers.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To explain the principles, methods, and materials used in prestressed concrete systems and the behavior of prestressed structural members.

CLO 2: To solve prestressed concrete sections by considering transformed section properties and estimating losses in prestress.

CLO 3: To design prestressed concrete beams for flexure and shear and evaluate serviceability requirements, including deflection, cracking, and anchorage detailing, according to relevant standards.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2		√										
CLO 3		√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1-CLO 3	Reference Book, PPT, WB, Handout	Assignment, Class Test, Mid Semester Exam, Final Semester Exam

CE 4223: Earth Retaining Structures

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course is the advanced part of Geotechnical Engineering. It helps to understand the approach to retaining structure design, and their classifications, loads on the structure impulse by earth and pore water. It also deals with the knowledge of effects of cohesion, adhesion and wall friction on earth pressure. This course also helps to analyze the stability of the different structures by studying bearing capacity of soil beneath, overturning, sliding, tilting and settlement of structures.

Course Content:

Foundations of structures subjected to lateral loads, Rigid earth retaining structures, Flexible earth retaining structures, Dewatering methods, Slurry-wall construction, Braced excavation, Sheet piles, Cofferdams, Caissons.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Apply basic concepts of lateral earth pressure theory for analysis and design of flexible and rigid earth retaining structures
CLO 2: Understand basic principles of construction of braced excavation, dewatering and slurry trench wall construction
CLO 3: Analyze and design of cofferdams, caissons and sheet piles.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1		√	√									
CLO 2		√	√									
CLO 3			√									
Overall		√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 - CLO 2	Reference Book, PPT, WB, Handout	Class Test, Assignment, Mid Semester Exam
CLO 3	Reference Book, PPT, WB, Handout	Class Test, Assignment, Semester Final Exam

CE 4251: Transportation Engineering III

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course is all about the urban transportation planning and management. This course introduces students to the steps in urban planning process. Students can gain an understanding of current transportation planning issues and policies. It also provides a working knowledge of transportation planning skills, especially relating to travel demand analysis. It helps to understand the overall process of transportation planning and its role within the wider context of transportation decision-making.

Course Content:

Analysis of traffic flow characteristics; Introduction to micro simulation and ITS; NMT issues and road safety. The urban transport problems and trends; road network planning; characteristics and operation of different transit and para-transit modes, planning transit network; Estimating system costs and benefits, pricing and financing, evaluation, transit users attitude, policies and strategies for transit development in metropolitan cities; Freight traffic planning and management; Selected transport case studies, congestion management; Safety management; Environmental issues and sustainable transport.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Understand the fundamental concepts of road network planning, road safety, and urban traffic congestion.
CLO 2: Analyze and apply advanced tools and techniques such as micro-simulation and Intelligent Transportation Systems (ITS) for urban traffic management.
CLO 3: Evaluate and recommend practical, economically viable solutions to transportation problems and improvement alternatives in the context of Bangladesh.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√		√									
CLO 2	√											
CLO 3		√										
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1, CLO 2	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 2- CLO 3	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 4249: Ground Water Engineering

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course provides fundamental knowledge of groundwater occurrence, movement, and extraction from aquifers. It introduces the principles of groundwater hydraulics and resource evaluation. The course also addresses key issues such as groundwater depletion, contamination, saline intrusion, and recharge. The objective is to develop the ability to assess, utilize, and manage groundwater resources in a sustainable manner.

Course Content:

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

Mapping Course Learning Outcomes (CLOs) with PLOs:

Course Learning Outcomes (CLO)

CLO 1: To explain groundwater occurrence in the hydrologic cycle and the physical principles governing groundwater flow and well hydraulics.

CLO 2: To understand groundwater movement, aquifer characteristics, and groundwater resource potential using appropriate engineering methods.

CLO 3: To learn about groundwater-related environmental issues and propose suitable recharge and management strategies for sustainable use.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2	√	√										
CLO 3	√	√										
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Book, PPT, WB, Handout	Assignment, Mid-Semester Examination,
CLO 2-CLO 3	Reference Book, PPT, WB, Handout	Class Test, Final Semester Exam

CE 4216: Computer Aided Analysis and Design of Structures Sessional II

Credits: 1.5 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is a Computer Aided analysis and design course different structural element and steel structures. This course will introduce students with the structural analysis and design software called STAAD.Pro. Students will gain knowledge about the software and can use the software to analyze and design a Reinforced Concrete Building.

Course Content:

Introduction to STAAD.Pro interface and modeling environment; creation of beam, frame, and simple truss models with material properties, loads, and support conditions; linear static analysis and load combinations; basic dynamic (modal) analysis for natural frequency extraction; design and code-based checks for reinforced concrete members using software output; interpretation of results including forces, stresses, deflections, and support reactions; preparation of analysis reports and export of structural drawings..

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To develop structural models (beams, frames, and trusses) in STAAD.Pro with appropriate material properties, loads, and support conditions.

CLO 2: To perform linear static and basic modal analysis, and interpret structural responses such as forces, stresses, deflections, and reactions.

CLO 3: To evaluate reinforced concrete member design using STAAD.Pro output and prepare professional reports with drawings.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√		√		√							
CLO 2		√	√		√							
CLO 3			√		√							
Overall	√	√	√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1-CLO 3	BNBC, Dhaka Imarat Nirman Bidhimala, STAAD.Pro Manual, STAAD.Pro Software	Class Performance, Viva-Voce, Sessional report, Final Exam

CE 4232: Environmental Engineering Sessional II

Credits: 1.5 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course provides students the fundamental knowledge of water supply and sewerage system and the basic design procedure of these systems. This course will allow students to get the idea of efficiency in the design procedure and allow them to design much more efficient water supply and sewerage system.

Course Content:

Design of sewerage system; design of water treatment plant; computer application in environmental engineering (EPANET and Bentley SewerGems).

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To be able to understand and predict fresh water supply requirement, waste water discharge and sanitation requirement in the rural and urban area.
CLO 2: To be able to design sanitary sewers, storm water sewer and septic tanks
CLO 3: To be able to design waste water treatment plants and sewage.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√	√	√									
CLO 2			√									
CLO 3		√			√							
Overall	√	√	√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy		
CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1	Reference book, Lab Manual, PPT, WB, Handout	Sessional report, Viva-Voce, Class Performance, Final Exam
CLO2-CLO 3	Reference book, Lab Manual, PPT, WB, Handout	Sessional report, Class Performance, Final Exam

CE 4222: Geotechnical Engineering II Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course will provide students with analyzing the performance of existing foundations, as well as constructing new footings, rafts and pile foundations in various subsoil conditions. Students will be introduced to types of foundations used for structures based on bearing capacity of soil and their designing.

Course Content:

Computer-aided design of foundations, Computer-aided design of retaining walls, Computer-aided design of reinforced soils, Slope stability analysis, Techniques of soil improvement, Use of computers in geotechnical engineering.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Design of foundations and retaining walls using CAD Software
CLO 2: Apprehension of the techniques of soil improvement
CLO 3: Application of computer in geotechnical engineering problem solutions

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1					√							
CLO 2				√								
CLO 3			√		√							
Overall			√	√	√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 - CLO 3	Reference Book, PPT, WB, Handout, Demonstration and feedback, Tutorials, Lab, Interactive discussion & videos	Sessional reports and Performance, Final Quiz, Viva-Voce

CE 4246: Water Resources Engineering Sessional

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course covers river training and bank protection works and enables the design of various structures, such as spur and guide banks. In addition, the course provides a basic understanding of groundwater resource assessment and water well design to support efficient groundwater development and management. The course aims to develop students' ability to analyze and design structures related to water resources engineering.

Course Content:

Design of river training works: guide bank, spur and revetment, Groundwater resource assessment and water well design.

Mapping Course Learning Outcomes (CLOs) with PLOs:

Course Learning Outcomes (CLO)

CLO 1: To understand river training and bank protection works.
CLO 2: To design river training works, including guide banks, spurs, and revetments for riverbank protection and flow control.
CLO 3: To assess groundwater resources and design water wells for efficient and sustainable groundwater extraction.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2			√									
CLO 3		√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Lab Manual, WB, Handout	Assignment, Final Semester Exam

CE 4252: Transportation Engineering Sessional II

Credits: 1.50 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course provides students with an understanding of rigid and flexible highway pavement and air field pavements. The other part of this course syllabus is geometric design of road intersections and interchanges; capacity calculation; traffic studies and design.

Course Content:

Design of rigid and flexible highway and air field pavements; geometric design: road intersections and interchanges; capacity calculations; traffic studies and design.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Design highway and airfield pavements using conventional methods and engineering principles.
CLO 2: Analyze traffic flow parameters and design intersections using computer simulation and software tools.
CLO 3: Prepare professional laboratory reports with proper calculations, results, and discussions.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1			√									
CLO 2			√		√							
CLO 3												
Overall			√		√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1- CLO 3	Reference Book, PPT, WB, Handout	Continuous Assessment, Assignments, Mid semester exam, Final semester exam

CE 4337: Spatial Data Analysis & Remote Sensing

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course introduces students to the fundamental concepts and analytical techniques of Geographic Information Systems (GIS) and Remote Sensing for spatial data analysis. It provides knowledge on spatial data structures, database management, map interpretation, and geospatial data processing. This allows students to apply spatial analysis techniques for solving real-world engineering and environmental problems.

Course Content:

Definition of GIS, Definition of data, database, and information, Techniques of data input, Digitizing geographical features, Database management in a GIS environment, Data manipulation techniques, Sub-model formation, Weighting and multi-criteria evaluation for site selection, GIS applications for environmental safeguarding, Definition of a map and map features, Characteristics of maps, Concept of layers, Topographical maps, Thematic maps, Attribute information and display information, Image enhancement, Image classification, GIS applications for resource identification, GIS applications in environmental planning and management.

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLOs):

CLO 1: Explain the fundamental concepts of GIS, spatial data, databases, and remote sensing and their role in geospatial analysis.

CLO 2: Demonstrate the techniques of spatial data input, digitization, database management, and data manipulation in a GIS environment.

CLO 3: Analyze spatial datasets using GIS tools, including layer concepts, thematic and topographical mapping, and attribute information management.

CLO 4: Evaluate the applications of GIS and remote sensing in environmental safeguarding, resource identification, and environmental planning and management.

Course Learning Outcomes (CLOs)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2	√				√							
CLO 3	√	√										
CLO 4	√	√										
Overall	√	√			√							

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Book, PPT, WB, Handout	Mid Semester Exam
CLO 2	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 3	Reference Book, PPT, WB, Handout	Class Test, Assignment, Final Semester Exam
CLO 4	Reference Book, PPT, WB, Handout	Quiz, Assignment, Final Semester Exam

CE 4339: Environmental and Social Impact Assessment

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course introduces the concepts and methodologies of Environmental and Social Impact Assessment (EIA and SIA) in development projects. It focuses on identifying, predicting, and evaluating environmental and social impacts and preparing Environmental Management Plans (EMP). The course also examines stakeholder participation and case studies of major development projects in Bangladesh.

Course Content:

Definition, aims and objectives of Environmental Impact Assessment (EIA), EIA Methodologies, Environmental issues in development projects, Initial Environmental Examination (IEE), Impact identification, prediction, analysis and evaluation, Environmental Management Plan (EMP), EIA Guidelines, Organization of EIA, Definition of social impact assessment, aims and objectives, social impact in development project, Impact identification assessment, Key informant interview, Focus group discussion, Case studies (Mega projects of Bangladesh).

Mapping Course Learning Outcomes (CLOs) with PLOs

Course Learning Outcomes (CLOs):

CLO 1: Explain the concepts, objectives, and significance of Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA) in development planning.

CLO 2: Apply EIA methodologies to predict, analyze, and evaluate environmental impacts.

CLO 3: Develop Environmental Management Plans (EMP) and understand EIA guidelines and institutional frameworks.

CLO 4: Analyze case studies of major development projects in Bangladesh to evaluate environmental and social implications and recommend mitigation measures.

Course Learning Outcomes (CLOs)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2	√	√										
CLO 3	√											
CLO 4	√						√				√	
Overall	√	√					√				√	

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1	Reference Book, PPT, WB, Handout	Mid Semester Exam
CLO 2	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 3	Reference Book, PPT, WB, Handout	Class Test, Assignment, Final Semester Exam
CLO 4	Reference Book, PPT, WB, Handout	Quiz, Assignment, Final Semester Exam

CE 4311: Introduction to Composite Structures

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course provides students with a fundamental understanding of the behavior of steel concrete composites and how they are designed. Also, the behavior of different types of composite columns.

Course Content:

Behavior of composite beams and slabs; shear connectors, Design of composite beams for bending and shear, Composite columns and stability considerations, Long-term effects, Connection detailing and fabrication considerations, Case studies, Codes and design recommendations for composite structures.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To explain the behavior of composite structural systems including composite beams, slabs, and columns with emphasis on shear connectors and load interaction.

CLO 2: To analyze and design composite beams for bending and shear while considering stability and long-term effects such as shrinkage and creep.

CLO 3: To evaluate connection detailing, fabrication considerations, and code provisions through case studies of composite bridges and building structures.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2		√	√									
CLO 3		√	√									
Overall	√	√	√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1-CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam, Assignment, Final Semester Exam

CE 4333: Environmental Engineering IV

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course helps the students to understand about water and air pollution. Types and sources of pollutants, their effects on environment and human body have been discussed heir. Data collection and analysis method of the pollutants are also illustrated in this course.

Course Content:

Environment Pollution and Its Control: water pollution – sources and types of pollutants; waste assimilation capacity of streams; dissolved oxygen modelling; ecological balance of streams; industrial pollution; heavy metal contamination; detergent pollution and eutrophication; ground-water pollution; marine pollution; pollution control measures -water quality monitoring and management.

Air pollution – sources and types of pollutants; effects of various pollutants on human health, materials and plants; air pollution meteorology; air pollution monitoring and control measures.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To learn about types and sources of pollutants of water and air pollution.
CLO 2: To learn effects of pollutants on environment and human body.
CLO 3: To learn dissolved oxygen modelling
CLO 4: To learn Air Quality Index (AQI) calculation and report writing.
CLO 5: To learn mitigation methods of air pollution.

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1	√											
CLO 2	√											
CLO 3	√	√										
CLO 4	√	√										
CLO 5	√											
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1, CLO 2, CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam
CLO 1, CLO 2, CLO 4, CLO 5, CLO 6	Reference Book, PPT, WB, Handout	Assignment, Final Semester Exam

CE 4327: Soil-Water Interaction

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course introduces students regarding fundamental reactions of soil and water for foundation design. Students can gain knowledge to develop their ability to analyze various properties of soil, especially in contact with water. This course is necessary for the foundation engineers to gain knowledge on revetment design and geotechnical design of landfills.

Course Content:

Introduction to soil–water interaction problems, Permeability, Capillarity, Soil suction, Seepage analysis, Effects of water currents, Effects of wave action, Theories of filter design, Revetment design, Geotechnical design of landfills.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: Determine laboratory and field permeability of soils and seepage quantity for earth dam
CLO 2: Design the cover layer of revetment for riverbank protection
CLO 3: Assess the factor of safety of slopes subjected to seepage
CLO 4: Design granular and geotextile filters for seepage control

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12
CLO 1			√	√								
CLO 2		√	√									
CLO 3		√										
CLO 4			√									
Overall		√	√	√								

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO 1 – CLO 2	Reference Book, PPT, WB, Handout	Class Test, Assignment, Mid Semester Exam
CLO 3 – CLO 4	Reference Book, PPT, WB, Handout	Class Test, Assignment, Semester Final Exam

CE 4353: Transportation Engineering IV

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This is one of the major courses of Transportation Engineering. In this course students will learn about pavement management systems and Importance of highway drainage. They will also learn the importance of airports, planning and design of airports, elements of airport planning studies, geometric design of the landing area, terminal area, heliports, design of airport pavements and airport drainage.

Course Content:

Pavement management systems; Evaluation and strengthening of pavements; Drainage: Highway drainage and drainage structures; Airports: Importance, advantages and trends in air transportation, planning and design of airports, aircraft characteristics related to airport design, types and elements of airport planning studies, airport configuration, geometric design of the landing area, terminal area, heliports, design of airport pavements, lighting, marking and signing, airport drainage.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To be able to discuss on advanced concepts of pavement management system and management strategies.

CLO 2: To be able to apply the concept of surface and sub-surface drainage system and cross-drainage structures to reduce the water related damage to highway.

CLO 3: To be able to apply the concepts of aircraft characteristics, airport configuration, geometric design criteria, standards of airport lighting, marking, drainage in planning of airports.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2	√	√										
CLO 3	√	√										
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1 – CLO 2	Reference book, PPT, WB, Handout, Videos	Class Test, Mid Semester Exam
CLO 3	Reference book, PPT, WB, Handout, Videos	Assignment, Final Semester Exam

CE 4349: River and Coastal Engineering

Credits: 2.00 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

In this course, students will learn the basics of river engineering and the basics of the coast and coastal features: deltas and estuaries; tides; waves; storm surges; tsunamis; ports, docks, and harbours; wave forces on coastal structures; and coastal sedimentation processes. After completing this course, students will develop a clear understanding of river and coastal processes, sediment movement, delta formation, and key engineering practices such as navigation, dredging, and shore protection works

Course Content:

Behavior of alluvial rivers; river channel pattern and fluvial processes; aggradation and degradation, local scours, navigation and dredging, sediment movement in river channels, bed form and flow regimes. Coast and coastal features; tides and currents; tidal flow measurement; waves and storm surges; docks and harbours; forces of waves and tides in the design of coastal and harbour structures; coastal sedimentation processes; deltas and estuaries; shore protection works; dredging and dredgers.

Mapping Course Learning Outcomes (CLOs) with PLOs

CLO 1: To demonstrate the understanding of the basics of river engineering.
CLO 2: To understand coastal processes, including waves, tides, and to calculate forces on coastal structures.
CLO 3: To understand deltas and delta management plans, as well as estuaries and estuarine control.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2	√	√										
CLO 3	√											
Overall	√	√										

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1-CLO 3	Reference Book, PPT, WB, Handout	Class Test, Mid Semester Exam, Assignment, Final Semester Exam

CE 4347 Hydraulic Structures

Credits: 2.0 ***Contact hours: 3.0 hrs. /week.***

Rationale of the Course:

This course provides fundamental knowledge on the planning and design of hydraulic structures used in water resources engineering. It helps students understand the principles behind dams, barrages, weirs, spillways, and cross-drainage works for effective water control, storage, and distribution. The course prepares students to design safe and efficient hydraulic structures for flood control, irrigation, and river management.

Course Content:

Principles of hydraulic structures design, Types of hydraulic structures, Design of dams, barrages, weirs, spillways, energy dissipators, and spillway gates, Cross drainage works.

Mapping Course Learning Outcomes (CLOs) with PLOs:

Course Learning Outcomes (CLO)

CLO 1: To explain the fundamental principles and types of hydraulic structures used in water resources engineering.

CLO 2: To analyze hydraulic design parameters of structures such as dams, barrages, weirs, spillways, and cross-drainage works.

CLO 3: To design basic hydraulic structures for safe water control, storage, and distribution in irrigation, flood control, and river management.

Course Learning Outcomes (CLO)	**PLO 1**	**PLO 2**	**PLO 3**	**PLO 4**	**PLO 5**	**PLO 6**	**PLO 7**	**PLO 8**	**PLO 9**	**PLO 10**	**PLO 11**	**PLO 12**
CLO 1	√											
CLO 2			√									
CLO 3			√									
Overall	√		√									

Mapping Course Learning Outcomes (CLOs) with the Teaching-Learning and Assessment Strategy

CLOs	**Teaching-Learning Strategy**	**Assessment Strategy**
CLO 1- CLO 2	Reference Book, PPT, WB, Handout	Assignment, Mid Semester Examination
CLO 3	Reference Book, PPT, WB, Handout	Class test, Final Semester Exam