Syllabus

of

B. Sc in Civil Engineering

Department of Civil Engineering

Faculty of Science and Engineering

Dhaka International University

1. Objectives

The prime objective of our university is to offer high quality education at undergraduate and post graduate levels in coherence with the needs of the society of the 21st century. The aim of the University is not only just to go through the examination, but to train them to become productive members of the society.

The Department has a good number of full-time faculty members with best available exposures to ever-growing horizon of Civil Engineering. Besides, a number of part-time faculties from other well-reputed universities also teach in each trimester, and students have the opportunity to visit Research Organizations and Industrial Establishments for attaining experienced-rich education.

The courses are designed to enable the learners to enter into the fundamental and pragmatic skills needed to become a Civil Engineer. These courses are also designed for those who wish to pursue carriers specifically as structural engineer, geotechnical engineer, hydrologist, hydro-geologists, environmental engineer and transportation engineer at home and abroad.

The University organizes various co-curricular and extra-curricular activities. Most common co-curricular activity is programming contest where students from all the departments and outside the university's are also allowed, and the contest creates new developments in technological side. But for civil engineers it will create opportunity to develop new software's or simulation models for real time problems. The University Literary and Debating Club, comprising of teachers and students, organizes various competitions that upholds its objectives. Departmental Seminars are also organized regularly. Students and faculties attend national and international seminars, conferences at home and abroad.

The University is promising and already on the way of developing all laboratories such as Materials Lab, Structural Mechanics Lab, Hydraulics lab, Geotechnical Engineering Lab, Environmental Engineering Lab, Transportation Engineering Lab, and two highly facilitated Computer Lab which are consist of widely used software's and modeling tools. Out of that, The University has a well facilitated Physics and a Chemistry Lab, which have a promising role in Civil Engineering Study.

1.1 Eligibility for Admission

This section describes the necessary requirements for a student to get admission in Dhaka International University. The later section describes the application procedure for the admission.

1.1.1 Admission Requirement

1) The minimum GPA shall be 2.5 in both SSC & HSC/ Diploma in Engineering with Physics and Mathematics. An applicant must submit his/ her certificates and mark-sheets during the application.

2) For 'O' level & 'A' level systems an applicant must have completed at least 2 subjects in 'A' level and 5 subjects in 'O' level. In the 'A' level the student must have completed Physics or Chemistry and Mathematics. Minimum average GPA of combined 'O' level & 'A' level shall be 'B' or 'GPA-4.00' in 4 subjects and 'C' or 'GPA-3.50' in 3 subjects. An applicant must submit his/her certificates and mark sheets during the application.

3) For applicants from foreign countries equivalent standard shall be maintained. The applicant must have completed Physics, Chemistry and Mathematics in the 12th level.

1.1.2 Application Procedure

Application form is available in the Admission Office of the University. The completed Application form must be submitted to the Admission Office with the following documents:

- ❑ Attested copies of all academic certificates and mark sheets.
- ❑ Two copies of Passport-size & two copies of Stamp-size colored photographs.
- ❑ A certificate for break of study in case of irregular students.

1.2 Total Credits and Duration

These courses are to be completed within 12 trimesters in 4 years. So, to award the degree, total credits will be 163.00. It is mentioned that the students who have completed the 4(four) years in diploma program (CE) under the Technical Education Board are also eligible for admission under this program. In this regard they may be given some course waiver (17.50 credits), and they have to successfully accomplish 145.00 total credits for awarding the degree.

2. Grouping of Courses

The lists of courses offered to the undergraduate students of Civil Engineering (CE) are categorized into Core courses and Elective courses. Some of the core courses are offered by the Department of CE and other departments offer some of these. Elective courses are grouped based on major five divisions of civil engineering. Students have the flexibility to choose courses from the elective courses based on their major and minor.

Grouping of courses in B.Sc. in CE are given bellow with credits:

Group 1	Basic Science	15.00 credits
Group 2	Mathematics Courses	12.00 credits
Group 3	Basic Engineering Courses	39.50 credits
Group 4	Basic Civil Engineering Courses	57.00 credits
Group 5	Advance Civil Engineering Elective Courses	59.00 credits
Group 6	Civil Engineering Professional Practice Courses	12.00 credits
Group 7	Humanities and Social Science Courses	11.50 credits
	Total Offered Courses =	**206.00Credits**

3. List of Courses

Courses offered to the undergraduate students of Civil Engineering (CE) are listed below:

List of Courses for Undergraduate Students

SL	Code	Course Title	Cr.Hr.	Prerequisite
Basic Science Courses (15.00 Credits) – Minimum Req. D/E – 15/15				
01	CHEM 101	Chemistry I	3.0	
02	CHEM 102	Chemistry II	3.0	
03	CHEM 114	Inorganic Quantitative Analysis Lab	1.5	
04	PHY 101	Optics, Waves & Oscillation, Heat & Thermodynamics	3.0	
05	PHY 102	Engineering Physics Lab	1.5	
06	PHY 105	Structure of matter, Electricity and magnetism and Modern physics	3.0	
Mathematics Courses (12.00 Credits) – Minimum Req. D/E – 12/12				
07	MATH 131	Differential and Integral Calculus	3	
08	MATH 133	Differential Equations and Statistics	3	MATH 131
09	MATH 231	Matrices and Three Dimensional Coordinate Geometry	3	
10	MATH 235	Laplace Transform, Fourier and Vector Analysis	3	MATH 133
Basic Engineering Courses (39.50 Credits) – Minimum Req. D/E – 39.5/27.5				
11	CE 100	Engineering Drawing*	1.5	
12	CE 101	Engineering Mechanics	3	
13	CE 102	Computer Aided Drafting*	1.5	CE 100
14	CE 103	Geoinformatics: Surveying*	3	
15	CE 104	Computer Fundamental Applications Lab	1.5	
16	CE 105	Practical Surveying*	1.5	CE 103
17	Shop 132	Workshop Sessional *	1.5	
18	EEE 165	Basic Electrical Engineering	2	
19	EEE 166	Basic Electrical Engineering Lab*	1.5	
20	CE 203	Engineering Geosciences	3	

21	CE 205	Numerical Methods and Analysis	3	
22	CE 206	Computer Programming Sessional	1.5	
23	CE 207	Engineering Computation Sessional	1.5	CE 206
24	CE 208	Estimating and Costing*	1.5	CE 200
25	CE 211	Mechanics of Solids I	3	CE 101
26	CE 212	Structural Mechanics Sessional	1.5	CE 211
27	CE 213	Mechanics of Solids II	3	CE 211
28	CE 261	Fluid Mechanics	3	
29	CE 262	Fluid Mechanics Sessional	1.5	
Basic Civil Engineering Courses (57.00 Credits) Minimum Req. - D/R – 57/54				
30	CE 200	Details of Construction*	1.5	
31	CE 201	Construction Materials	3	
32	CE 202	Construction Materials Sessional	1.5	
33	CE 309	Advance Construction Technology and HES Sessional	1.5	CE 200
34	CE 311	Structural Analysis & Design I	3	CE 213
35	CE 312	Computer Aided Structural Analysis and Design Lab I	1.5	
36	CE 313	Structural Analysis and Design II	3	CE 311
37	CE 315	Design of Concrete Structures I	3	
38	CE 316	Concrete Structures Design Sessional	1.5	CE 315
39	CE 317	Design of Concrete Structures II	3	CE 315
40	CE 319	Design of Steel Structures	3	CE 311
41	CE 320	Steel Structure Design Lab	1.5	
42	CE 331	Environmental Engineering I	3	
43	CE 332	Environmental Engineering I Sessional	1.5	CE 331
44	CE 333	Environmental Engineering II	3	CE 331
45	CE 341	Geotechnical Engineering I	3	
46	CE 342	Geotechnical Engineering Sessional I	1.5	CE 341

47	CE 343	Geotechnical Engineering II	3	CE 341
48	CE 351	Transportation Engineering I	3	
49	CE 353	Transportation Engineering II	3	CE 351
50	CE 354	Transportation Engineering I Sessional	1.5	CE 351
51	CE 361	Hydraulic Engineering	3	
52	CE 362	Hydraulic Engineering Sessional	1.5	CE 361
53	CE 363	Engineering Hydrology	3	CE 261
Advance Civil Engineering Elective Courses (59.00 Credits) – Minimum Req. D/E - 22/22				
55	CE 400	Project & Thesis	4.5	
56	CE 402	Application of GIS in Civil Engineering	1.5	
57	CE 410	Concrete Structures Design Sessional II	1.5	
58	CE 412	Computer Aided Structural Analysis and Design Lab II	1.5	CE 317
59	CE 413	Introduction to Steel-Concrete Composite Structures	2.0	
60	CE 415	Prestressed Concrete	2.0	
61	CE 416	Computer Aided Structural Analysis and Design Lab III	1.5	
62	CE 419	Introduction to Finite Element Method	2.0	
63	CE 421	Dynamics of Structures	2.0	
64	CE 431	Design of Water Supply, Sanitation and Sewerage Systems	2.0	
65	CE 432	Environmental Engineering Sessional II	1.5	
66	CE 433	Solid and Hazardous Waste Management	2.0	
67	CE 435	Environmental Pollution Management	2.0	
68	CE 437	Sustainable Development and Environmental Impact Assessment	2.0	
69	CE 441	Foundation Engineering	2.0	
70	CE 442	Geotechnical Engineering Sessional II	1.5	
71	CE 443	Earth Retaining Structures	2.0	
72	CE 445	Elementary Soil Dynamics	2.0	
73	CE 451	Traffic Planning & Management	2.0	

74	CE 452	Transportation Engineering II Sessional	1.5	
75	CE 453	Pavement Management, Drainage and Management	2.0	
76	CE 455	Urban Transportation Planning and Management	2.0	
78	CE 461	Irrigation and Flood Control	3.0	
79	CE 465	Flood Mitigation and Management	2.0	
80	CE 467	Ground Water Engineering	2.0	
81	CE 469	River Engineering	2.0	
82	CE 471	Hydraulic Structures	2.0	
83	CE 472	Water Resources Engineering Sessional I	1.5	
84	CE 473	Coastal Engineering	2.0	
85	CE 474	Water Resources Engineering Sessional II	1.5	
Civil Engineering Professional Practice Courses (12.00 Credits) Minimum Requirement D/E – 8/8				
86	CE 301	Professional Practice and Business Communication	3.0	
87	CE 401	Project Planning and Management	3.0	
88	CE 403	Socio-economic Aspects of Development Projects	2.0	
89	CE 405	Business and Career Development	2.0	
90	CE 406	Law and Ethics for Engineers	2.0	
Humanities and Social Science Courses (11.50 Credits) – Minimum Requirement D/E - 9.5 /5.5				
91	ENG 101	English Fundamentals	2.0	
92	ENG 102	Developing English Language Skills	1.5	
93	HUM 113	Economics	2.0	
94	SOC 113	Bangladesh Studies and Government*	2.0	
95	HUM 213	Principles of Accounting*	2.0	
96	SOC 255	Sociology*	2.0	

Note: (*) means the courses which are exempted for diploma/evening group students.

Individual Group Wise Minimum Credit Requirement for Day Batch Student to Complete the Degree in enlisted below. But Minimum total Credit requirement is 163.00 (No upper limit)

Group	Course Title	Credit Hours	Minimum Requirement
Group 1	Basic Science	15.0 credits	15 credits
Group 2	Mathematics Courses	12.0 credits	12 credits
Group 3	Basic Engineering Courses	39.5 credits	39.5 credits
Group 4	Basic Civil Engineering Courses	57.0 credits	57 credits
Group 5	Advance Civil Engineering Elective Courses	59.0 credits	22 credits
Group 6	Civil Engineering Professional Practice Courses	12.0 credits	8 credits
Group 7	Humanities and Social Science Courses	11.5 credits	8 credits

Individual Group Wise Minimum Credit Requirement for Evening Batch Student to Complete the Degree in enlisted below. But Minimum total Credit requirement is 145.00 (No upper limit)

Group	Course Title	Credit Hours	Minimum Requirement
Group 1	Basic Science	15.0 credits	15 credits
Group 2	Mathematics Courses	12.0 credits	12 credits
Group 3	Basic Engineering Courses	39.5 credits	27.5 credits
Group 4	Basic Civil Engineering Courses	57.0 credits	54 credits
Group 5	Advance Civil Engineering Elective Courses	59.0 credits	22 credits
Group 6	Civil Engineering Professional Practice Courses	12.0 credits	8 credits
Group 7	Humanities and Social Science Courses	11.5 credits	5.5 credits

4. Trimester-wise Course Distribution of CE

4.1 Course Requirements for Undergraduate Students of Day Batch:

Day batch students have to complete 163.00 credit hours in 12 trimesters. They have to complete following orientation courses: trimester wise courses and credit hours distribution for Day batch students are presented here:

1st Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	Phy 101	Optics, Waves & Oscillation, Heat & Thermodynamics	3.0	3.0		C
2	Chem 101	Chemistry I	3.0	3.0		C
3	Math 131	Differential and Integral Calculus	3.0	3.0		C
4	CE 100	Engineering Drawing I	1.5	3.0		C
5	CE 101	Engineering Mechanics	3.0	3.0		C
6	CE 105	Computer Fundamental Application Lab	1.5	3.0		C
		Total	**15.00**	**18.0**		

2nd Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	Math 133	Differential Equations and Statistics	3.0	3.0	Math 131	C
2	Eng 101	English Fundamentals	2.0	2.0		C
3	CE 103	Geoinformatics: Surveying	3.0	3.0		C
4	Phy 102	Engineering Physics Lab	1.5	3.0	Phy 101	C
5	Chem 104	Inorganic Quantitative Analysis Lab	1.5	3.0	Chem 101	C
6	Phy 105	Structure of Matter, Electricity and Magnetism and Modern Physics	3.0	3.0	Phy 101	C
		Total	**14.00**	**17.00**		

3rd Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	Math 231	Matrices and Three Dimensional Coordinate Geometry	3.0	3.0		C
2	Chem 102	Engineering Chemistry II	3.0	3.0	Chem 101	C
3	EEE 165	Basic Electrical Engineering	2.0	2.0		C
4	CE 201	Construction Materials	3.0	3.0		C
5	CE 102	Computer Aided Drafting	1.5	3.0	CE 100	C
6	Eng 102	Developing English Language Skills	1.5	3.0		C
		Total	**14.00**	**17.00**		

4th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	Math 235	Laplace Transform, Fourier and Vector Analysis	3.0	3.0	Math 133	C
2	CE 203	Engineering Geosciences	3.0	3.0		C
3	CE 211	Mechanics of Solid I	3.0	3.0	CE 101	C
4	CE 202	Construction Materials Sessional	1.5	3.0	CE 201	C
5	Shop 132	Workshop Sessional	1.5	3.0		C
6	CE 200	Details of Constructions	1.5	3.0	CE 100	C
7	CE 206	Computer Programming Sessional	1.5	3.0		C
		Total	**15.00**	**21.00**		

5th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 261	Fluid Mechanics	3.0	3.0		C
2	CE 205	Numerical Methods and Analysis	3.0	3.0		C
3	CE 213	Mechanics of solid II	3.0	3.0	CE 211	C
4	CE 104	Practical Surveying	1.5	3.0	CE 103	C
5	CE 212	Structural Mechanics Sessional	1.5	3.0	CE 211	C
6	CE 207	Engineering Computation Sessional	1.5	3.0	CE 206	C
7	CE 262	Fluid Mechanics Sessional	1.5	3.0	CE 261	C
		Total	**15.0**	**21.00**		

6th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 311	Structural Analysis and Design I	3.0	3.0	CE 213	C
2	CE 315	Design of Concrete Structure I	3.0	3.0		C
3	CE 341	Geotechnical Engineering I	3.0	3.0		C
4	CE 208	Estimating & Costing	1.5	3.0	CE 200	C
5	CE 342	Geotechnical Engineering Sessional I	1.5	3.0		C
6	SOC 113	Bangladesh Studies and Government	2.0	2.0		C
		Total	**14.00**	**17.00**		

7th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 316	Concrete Structures Sessional I	1.5	3.0	CE 317	C
2	CE 313	Structural Analysis and Design II	3.0	3.0	CE 311	C
3	CE 317	Design of Concrete Structure II	3.0	3.0	CE 315	C
4	CE 331	Environmental Engineering I	3.0	3.0		C
5	CE 312	Computer aided Structural Analysis and Design Lab I	1.5	3.0	CE 311	C
6	Hum 213	Principles of Accounting	2.0	2.0		C
7	SOC 255	Sociology	2.0	2.0		(Anyone)
		Total	**14.00**	**17.00**		

8th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 343	Geotechnical Engineering II	3.0	3.0	CE 341	C
2	CE 332	Environmental Engineering Sessional I	1.5	3.0	CE 331	C
3	CE 351	Transportation Engineering I	3.0	3.0		C
4	CE 333	Environmental Engineering II	3.0	3.0	CE 331	C
5	Hum 113	Economics	2.0	2.0		C
6	CE 342	Geotechnical Engineering Sessional II	1.5	3.0	CE 341	C
		Total	**14.00**	**18.00**		

9th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 353	Transportation Engineering II	3.0	3.0	CE 351	C
2	CE 401	Project Planning and Management	3.0	3.0		C
3	CE 361	Hydraulic Engineering	3.0	3.0	CE 261	C
4	CE 354	Transportation Engineering Sessional I	1.5	3.0	CE 353	C
5	CE 309	Advance Construction Technology & HES Sessional	1.5	3.0	CE 200	C
6	CE 402	Application of GIS in Civil Engineering	1.5	3.0		C
		Total	**13.50**	**18.00**		

10th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 301	Professional Practice and Business Communication	3.0	3.0		C
2	CE 363	Engineering Hydrology	3.0	3.0		C
3	CE 410	Concrete Structures Design Sessional II	1.5	3.0		C
4	CE 412	Computer Aided Structural Analysis and Design Lab II	1.5	3.0	CE 316	C
5	CE 403	Socio-economic Aspects of Development Projects	2.0	2.0		C (Anyone)
6	CE 405	Business and Career Development	2.0	2.0		
7	CE 406	Law and Ethics for Engineers	2.0	2.0		
8	CE 400	Project & Thesis	1.5	3.00		
		Total	**12.50**	**17.00**		

11th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 461	Irrigation & Flood Control	3.0	3.0		C
2		Major I	2.0	2.0		C
3		Major II	2.0	2.0		C
4	CE 362	Hydraulic Engineering Sessional	1.5	3.0	CE 361	C
5	CE 320	Steel Structure design Lab	1.5	3.0		C
6	CE 400	Project and Thesis	1.5	3.0		C
		Total	**11.50**	**16.00**		

12th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1		Minor I	2.0	2.0		C
2		Major III	2.0	2.0		C
3		Minor II	2.0	2.0		C
4		Minor Sessional	1.5	3.0		C
5		Major Sessional	1.5	3.0		C
6	CE 400	Project & thesis	1.5	3.0		C
		Total	**10.50**	**15.00**		

4.2 Course Requirements for Undergraduate Students of Evening Batch

Evening batch students have to complete 145.00 credit hours in 10 trimesters with credit hours exemption as follows:

Sl. No.	Course Code	Course Title	Cr. Hour
1	Hum 111	Bangladesh Studies and Government	2.00
2	Hum 213	Principles of Accounting	2.00
3	CE 103	Geoinformatics: Surveying	3.00
4	CE 100	Engineering Drawing I	1.50
5	CE 102	Computer Aided Drafting	1.50
6	CE 104	Practical Surveying	1.50
7	CE 200	Details of Construction	1.50
8	CE 208	Estimating and Costing	1.50
9	EEE 165	Basic Electrical Engineering	2.00
10	Shop 132	Workshop Sessional	1.50
		Total Exemption	**18.00**

Trimester wise course and credit distribution for evening batch students are presented here:

1st Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	Phy 101	Optics, Waves & Oscillation, Heat & Thermodynamics	3.0	3.0		C
2	Chem 101	Chemistry I	3.0	3.0		C
3	Math 131	Differential and Integral Calculus	3.0	3.0		C
4	Eng 101	English Fundamentals	2.0	2.0		C
5	Phy 102	Engineering Physics Lab	1.5	3.0	Phy 101	C
6	CE 105	Computer Fundamental Application Lab	1.5	3.0		C
		Total	**14.00**	**17.00**		

2nd Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	Math 133	Differential Equations and Statistics	3.0	3.0	Math 131	C
2	CE 201	Construction Materials	3.0	3.0		C
3	CE 101	Engineering Mechanics	3.0	3.0		C
4	Eng 102	Developing English Language Skills	1.5	3.0		C
5	Chem 104	Inorganic Quantitative Analysis Lab	1.5	3.0	Chem 101	C
6	Phy 105	Structure of matter, Electricity and magnetism and Modern physics	3.0	3.0	Phy 101	C
		Total	**15.00**	**18.00**		

3th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	Math 231	Matrices and Three Dimensional Coordinate Geometry	3.0	3.0		C
2	Chem 102	Chemistry II	3.0	3.0	Chem 101	C
3	CE 203	Engineering Geosciences	3.0	3.0		C
4	CE 211	Mechanics of Solid I	3.0	3.0	CE 101	C
5	CE 202	Construction Materials Sessional	1.5	3.0	CE 201	C
6	EEE 166	Basic Electrical Engineering Lab	1.5	3.0	EEE 165	C
		Total	**15.00**	**18.00**		

4th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 206	Computer Programming Sessional	1.5	3.0		C
2	Math 235	Laplace Transform, Fourier and Vector Analysis	3.0	3.0	Math 133	C
3	CE 205	Numerical Methods and Analysis	3.0	3.0		C
4	CE 213	Mechanics of solid II	3.0	3.0	CE 211	C
5	CE 261	Fluid Mechanics	3.0	3.0		C
6	CE 262	Fluid Mechanics Sessional	1.5	3.0	CE 261	C
		Total	**15.00**	**18.00**		

5th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 311	Structural Analysis and Design I	3.0	3.0	CE 213	C
2	CE 315	Design of Concrete Structure I	3.0	3.0		C
3	CE 331	Environmental Engineering I	3.0	3.0		C
4	CE 207	Engineering Computation Sessional	1.5	3.0	CE 206	
5	CE 212	Structural Mechanics Sessional	1.5	3.0	CE 211	C
6	Hum 113	Economics	2.0	2.0		C
7	CE 332	Environmental Engineering Sessional I	1.5	3.0	CE 331	C
		Total	**15.50**	**20.00**		

6th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 342	Geotechnical Engineering Sessional I	1.5	3.0	CE 341	C
2	CE 341	Geotechnical Engineering I	3.0	3.0		C
3	CE 313	Structural Analysis and Design II	3.0	3.0	CE 311	C
4	CE 317	Design of Concrete Structure II	3.0	3.0	CE 315	C
5	CE 309	Advance Construction Technology & HES Sessional	1.5	3.0	CE 200	C
6	CE 333	Environmental Engineering II	3.0	3.0	CE 331	C
		Total	**15.00**	**18.00**		

7th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 343	Geotechnical Engineering II	3.0	3.0	CE 341	C
2	CE 301	Professional Practice and Business Communication	3.0	3.0		
3	CE 361	Hydraulic Engineering	3.0	3.0	CE 261	C
4	CE 402	Application of GIS in Civil Engineering	1.5	3.0		C
5	CE 351	Transportation Engineering I	3.0	3.0		C
6	CE 312	Computer Aided Structural Analysis and Design Lab I	1.5	3.0	CE 311	C
		Total	**15.00**	**18.00**		

8th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 353	Transportation Engineering II	3.0	3.0	CE 351	C
2	CE 354	Transportation Engineering Sessional I	1.5	3.0	CE 353	C
3	CE 401	Project Planning and Management	3.0	3.0		C
4	CE 363	Engineering Hydrology	3.0	3.0		C
5	CE 316	Concrete Structures Sessional I	1.5	3.0	CE 317	C
6	CE 400	Project & thesis	1.5	3.0		C
		Total	**13.50**	**18.00**		

9th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1	CE 412	Computer Aided Structural Analysis and Design Lab II	1.5	3.0	CE 316	C
2	CE 320	Steel Structure design Lab	1.5	3.0		C (Anyone)
3	CE 362	Hydraulic Engineering Sessional	1.5	3.0	CE 361	
4		Major I	2.0	2.0	CE 313	C
5	CE 461	Irrigation & Flood Control	3.0	3.0		C
6		Minor I	2.0	2.0		C
7	CE 403	Socio-economic Aspects of Development Projects	2.0	2.0		C (Anyone)
8	CE 405	Business and Career Development	2.0	2.0		
9	CE 406	Law and Ethics for Engineers	2.0	2.0		
10	CE 400	Project & thesis	1.5	3.0		C
		Total	**13.50**	**21.00**		

10th Trimester

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course	Status of Course
1		Major II	2.0	2.0		C
2		Minor II	2.0	2.0		C
3		Major III	2.0	2.0		C
4		Minor Sessional	1.5	3.0		C
5		Major Sessional	1.5	3.0		C
6		Major/Minor Sessional	1.5	3.0		C
7	CE 410	Concrete Structures Design Sessional II	1.5	3.0		C
8	CE 400	Project & thesis	1.5	3.0		C
		Total	**13.50**	**21.00**		

4.3 Summery of Course Distribution for Day and Evening Batch:

Trimester	Credit Allocation – Day batch	Credit Allocation – Evening batch
Trimester 1:	15.00	14.00
Trimester 2:	14.00	15.00
Trimester 3:	14.00	15.00
Trimester 4:	15.00	15.00
Trimester 5:	15.00	15.50
Trimester 6:	14.00	15.00
Trimester 7:	14.00	15.00
Trimester 8:	14.00	13.50
Trimester 9:	13.50	13.50
Trimester 10:	12.50	13.50
Trimester 11:	11.50	--
Trimester 12:	10.50	--
Grand Total:	**163.00 Credits**	**145.00 Credits**

4.4 Courses offer for specialization as Major and Minor in Under Graduate Level

Group A: Structural Engineering

Theoretical

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 319	Design of Steel Structures	3.0	3.0	CE 311
2	CE 413	Introduction to Steel-Concrete Composite Structures	2.0	2.0	
3	CE 415	Prestresses Concrete	2.0	2.0	
4	CE 419	Introduction to finite elements method	2.0	2.0	
5	CE 421	Dynamics of Structures	2.0	2.0	

Sessional

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 412	Computer Aided Structural Analysis and Design Lab II	1.50	3.0	
2	CE 416	Computer Aided Structural Analysis and Design Lab III	1.50	3.0	

Group B: Environmental Engineering

Theoretical

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 431	Design of Water Supply, Sanitation and Sewerage Systems	2.00	2.00	
2	CE 433	Solid and Hazardous Waste Management	2.00	2.00	
3	CE 435	Environmental Pollution Management	2.00	2.00	
4	CE 437	Sustainable Development and Environmental Impact Assessment	2.00	2.00	

Sessional

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 432	Environmental Engineering Sessional II	1.50	3.0	

Group C: Geotechnical Engineering

Theoretical

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 441	Foundation Engineering	2.00	2.00	
2	CE 433	Earth Retaining Structures	2.00	2.00	
3	CE 445	Elementary Soil Dynamics	2.00	2.00	

Sessional

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 442	Geotechnical Engineering Sessional II	1.50	3.0	

Group D: Transportation Engineering

Theoretical

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 451	Traffic Engineering Design and Management	2.00	2.00	
2	CE 453	Pavement Management, Drainage and Airport	2.00	2.00	
3	CE 455	Urban Transportation Planning and Management	2.00	2.00	

Sessional

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 452	Transportation Engineering Sessional II	1.50	3.0	

Group E: Water Resource Engineering

Theoretical

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 465	Flood Mitigation and Management	2.00	2.00	
2	CE 467	Ground Water Engineering	2.00	2.00	
3	CE 469	River Engineering	2.00	2.00	
4	CE 471	Hydraulic Structures	2.00	2.00	
5	CE 473	Coastal Engineering	2.00	2.00	

Sessional

Sl. No.	Course Code	Course Title	Credits Hrs.	Weekly teaching load (Hrs)	Prerequisite Course
1	CE 472	Water Resource Engineering Sessional I	1.50	3.0	
2	CE 474	Water Resource Engineering Sessional II	1.50	3.0	

5. Examinations and Grading System

The total performance of a student in a given course will be based on:

- Continuous assessment (attendance, class performance, quizzes and assignments).
- Mid-Term examination.
- Trimester final examination.
- Improvement examination, if any.

The continuous assessment and the Trimester final examinations will form the regular examination system, but the improvement examinations will provide additional opportunities to improve the results of the students.

Marks distribution of each course is as follows:

1. Attendance	5%
2. Behavior	5%
3. Class Performance	10%
4. Assignment	10%
5.Mid-Term Exam	20%
6.Course Final Exam	50%
Total	**100%**

Grading system (UGC's uniform grading) of THE UNIVERSITY:

Numerical Grade	Letter Grade		Grade Point
80% and above	A+	(A Plus)	4.00
75% to less than 80%	A	(A Regular)	3.75
70% to less than 75%	A-	(A Minus)	3.50
65% to less than 70%	B+	(B Plus)	3.25
60% to less than 65%	B	(B Regular)	3.00
55% to less than 60%	B-	(B Minus)	2.75
50% to less than 55%	C+	(C Plus)	2.50
45% to less than 50%	C	(C Regular)	2.25
40% to less than 45%	D		2.00
less than 40%	F		0.00

Note: "F" is the failing grade.

Student's performance will be evaluated on the basis of Grade Point Average (GPA) in each trimester and Cumulative Grade Point Average (CGPA) is the Average Grade   Point of all trimesters.

Project Works and Evaluation:

Project work on B. Sc in CE is carried out for 4 months in the last trimester. A group of students works for one project under one supervisor. They take project works in the different fields of CE available in the Department. After completion of the project work the students submit the project report to the department after fully reviewed by the supervisor. A panel of Examiners comprising of one External Examiner from a recognized University and three Internal Examiners conduct the defense of the project work. The students individually present their project work in front of the panel of the Examiners. Total of 200 marks are allocated for the project work, out of which 120 marks are allocated for project defense and remaining 80 marks are allocated for project report.

Degree Requirements:

Minimum CGPA for graduation is as follows:

- Passing CGPA shall not be less than 2.50

Student who fails to maintain this minimum rate of progress may be placed on academic probation.

6. Course Descriptions

6.1 Basic Science Courses
Phy 101: Optics, Waves & Oscillation, Heat & Thermodynamics
3.00 Credit, 3 hrs/week.

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

Waves and oscillations (vibrations): differential equation of a simple harmonic oscillator, total energy and average energy, combination of simple harmonic oscillations, Lissajous figures, spring-mass system, calculation of time period of torsional pendulum, equations of motion for single degree-of-freedom systems and rigid body assemblies: free vibration (simple harmonic oscillator) damped oscillation; forced oscillation, equations of motion for harmonic excitation: transient and steady-state vibrations: illustration of MDOF systems concepts with two degree-of-freedom systems resonance, two-body oscillations, reduced mass, differential equation of a progressive wave, power and intensity of wave motion, stationary wave, group velocity and phase velocity, architectural acoustics, reverberation and Sabine's formula.

Heat and thermodynamics: principle of temperature measurements, pyrometer; kinetic theory of gases: Maxwell's distribution of molecular speeds, mean free path, equipartition of energy, Brownian motion, Vander Waal's equation of state, law of thermodynamics and its application, Carnots theorem, entropy and disorder, thermodynamic functions, Maxwell relations, Clausius-Clapeyron equation, Gibbs phase rule.

Suggested Readings:
1) Optics, Ajoy Ghatak, TATA McGraw Hill Publishing Co. Ltd.
2) Fundamentals of Classical Thermodynamics, Richard E. Sonntag, Claus Borgnakke and Gordon V. Van Wylen., 6th ed., John Wiley & Sons, 1998.
3) Fundamentals of Engineering Thermodynamics, Michael J. Moran and Howard N. Shapiro, John Wiley & Sons. (any edition).
4) Introduction to Solid State Physics, Charles Kittle.
5) Fundamental of Solid State Physics, Gupta & P.N. Saxena.
6) Sound – N Subrahmanyam & Brij Lal; Vikas Publishing House Private Ltd.
7) Waves and Oscillations - N Subrahmanyam & Brij Lal; Vikas Publishing House Private Ltd
8) Heat and Thermodynamics - N Subrahmanyamand Brij Lal; S. Chand & Company Ltd.
9) A Text Book of Optics - N Subrahmanyamand Brij Lal; S. Chand & Company Ltd.
10) Fundamentals of Optics - Jen Kins & E. White; McGraw-Hill Book Company.
11) Fundamentals of Physics - Halliday, Resnick & Walker; John Wiley & Sons Inc.
12) Physics Part-I - David Halliday &Robert Resnick; Wiley Eastern Ltd & New Age Int. Ltd.

Phy 102: Engineering Physics Lab
1.5 Credit, 3 hrs/week.

Determination of line frequency by Lissajous figures using an oscilloscope and a function generator and verification of the calibration of time/div knob at a particular position for different frequencies; determination of frequency of a tuning fork by Melde's apparatus; determination of the spring constant and the effective mass of a loaded spring; to draw magnetic induction versus current curve for a circular coil using Biot-Savart law and hence to verify tangent law; determination of the moment of inertia of a fly-wheel about its axis of rotation; determination of rigidity modulus of the material of a wire by static method; determination of the pressure-coefficient of air by constant volume air thermometer; determination of the thermal conductivity of a bad conductor by lee's method; to plot the thermo-electromotive force vs temperature (calibration) curve for a given thermocouple (e5); determination of the melting point of a solid using the calibration curve obtained in experiment-e5; determination of the mechanical equivalent of heat by electrical method; determination of the focal length of (i) a convex lens by displacement method and (ii) a concave lens by an auxiliary lens method; determination of the radius of curvature of a plano-convex lens by Newton's ring method; determination of specific rotation of sugar solution by a polarimeter; to verify Malus' law of polarization; determination of the threshold frequency for the material of a photocathode and hence find the value of the Planck's constant; determination of lattice constant by x-ray.

Suggested Readings:

1. Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.

Phy 105: Structure of matter, Electricity and magnetism and Modern physics
3.00 Credit, 3 hrs/week.

Structure of matter: crystalline and non-crystalline solids, single crystal and polycrystal solids, unit cell, crystal systems, co-ordinations number, crystal planes and directions, NaCl and CsCl structure, packing factor, Miller indices, relation between interplanar spacing and Miller indices, Bragg's law, methods of determination of interplanar 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: distinction between metal, semiconductor and insulator.

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

Electricity and Magnetism: Electrostatics: Electric charge, electric force, electric field, Coulomb's law, Gauss' law, electric potential and their applications due to continuous charge distribution, electric dipole and quadruple, capacitance and capacitors; Magnetism: The magnetic field and flux; magnetic force on a current carrying conductor, Hall effect, Biot-Savart law and Ampere's law and their applications, induction, Faraday's law, Lenz's law, self induction and mutual induction, magnetic properties of matter, different types of magnetism, three magnetic vectors, permeability and susceptibility, hysteresis.

Suggested Readings:
1) Introduction to Modern Optics, by Grant R. Fowles, second edition.
2) Introduction to Solid State Physics, Charles Kittle.
3) Fundamental of Solid State Physics, Gupta & P.N. Saxena.
4) Sound – N Subrahmanyam & Brij Lal; Vikas Publishing House Private Ltd.
5) Waves and Oscillations - N Subrahmanyam & Brij Lal; Vikas Publishing House Private Ltd
6) Fundamentals of Physics - Halliday, Resnick & Walker; John Wiley & Sons Inc.
7) Physics Part-I - David Halliday &Robert Resnick; Wiley Eastern Ltd & New Age Int. Ltd.
8) Physics Part-II - David Halliday & Robert Resnick; Wiley Eastern Ltd & New Age Int. Ltd.
9) Electricity and Magnetism, Vol. II by Edward M. Purcell
10) Modern Physics by Kenneth S. Krane.
11) Classical Mechanics by John R. Taylor.

Chem 101: Chemistry I
3.00 Credit, 3 hrs/week.

Atomic structure and quantum theory: Bohr's theory, Heisenberg's uncertainty principle, Schrödinger's wave equation, electronic configurations and properties of atoms; electronic configurations and properties of molecules: chemical bond, valence bond theory molecular orbital theory, shape of molecules, bond length, bond energy; chemistry of halogen, alkali metals, alkaline earth metals, non-metals and heavy metals; modern concepts of acids and bases; different types of solutions; properties of dilute solution; thermo-chemistry; electrochemistry: voltaic cells, electrolytic cells; colloids and colloidal solution; chemical and ionic equilibria; chemistry of water; chemistry of water pollution; chemistry of cements, silicates and limes.

Suggested Readings:
1) Chemistry – The Molecular Nature of Matter and Change by Silberberg
2) General Chemistry by Ebbing.
3) Chemistry for Engineering Students by Larry Brown and Tom Holme.
4) Engineering Chemistry by R. Gopalam, D. Venkappayya, and S. Nagonajan.
5) Textbook of Engineering Chemistry by S. Dara.
6) Industrial and Engineering Chemistry by Walter J.; (Ed.) Murphy.
7) Fundamentals of Engineering Chemistry Theory and Practice by S.K. Singh.

Chem 102: Chemistry II
3.00 Credit, 3 hrs/week.

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

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

Chemistry of environmental pollution: environment and its characteristics, chemistry of metal and non-metal pollutants, analytical techniques used in determination of pollutants, concepts of DO, BOD, COD and threshold odor number, chemistry involved in water treatment plants, quality of industrial waste water.

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

Paints and varnishes: introduction to paints and varnishes, pretreatment of the surface, metallic and non-metallic and organic protective coating and their uses.

> *Suggested Readings*:
> 1) Chemistry – The Molecular Nature of Matter and Change by Silberberg
> 2) General Chemistry by Ebbing.
> 3) Chemistry for Engineering Students by Larry Brown and Tom Holme.
> 4) Engineering Chemistry by R. Gopalam, D. Venkappayya, and S. Nagonajan.
> 5) Textbook of Engineering Chemistry by S. Dara.
> 6) Industrial and Engineering Chemistry by Walter J.; (Ed.) Murphy.
> 7) Fundamentals of Engineering Chemistry Theory and Practice by S.K. Singh.

Chem 104: Inorganic Quantitative Analysis Lab
1.5 Credit, 3 hrs/week.

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

> *Suggested Readings:*

> Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.

6.2 Mathematics Courses

Math 131: (Differential and Integral Calculus)
3.00 Credit, 3 hrs/week.

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

Integral calculus: integration by parts; standard integrals; integration by the method of successive reduction; definite integrals; beta function; gamma function; multiple integrals.

Suggested Readings:

1) Integral Calculus by Anton.
2) Integral Calculus by Abdul Matin.
3) Integral Calculus by Khose Mohammad.
4) Integral Calculus by B.C. Das and B. N. Mukharjhee.
5) A Text Book on   Differential Calculus - Mohammad & Bhattacharjee; Students' Publication.
6) Differential Calculus – M. L. Khanna; Joi Prokash Nath and Company.
7) Differential Calculus – Shanti Narayan; S. Chand and Company Ltd
8) Differential Calculus – Md Abu Yousaf; Mamun Brothers, Dhaka.

Math 133: Differential Equations and Statistics
3.00 Credit, 3 hrs/week.

Ordinary differential equation: formation of differential equations; solution of first order differential equations by various methods; solution of differential equation of first order but higher degrees; solution of general linear equations of second and higher orders with constant co-efficient; solution of Euler's homogeneous linear differential equations.

Partial differential equation: introduction, linear and non-linear first order differential equations; standard forms; linear equations of higher order; equations of the second order with variable co-efficients.

Statistics: measures of central tendency and standard deviation; moments, skewness and kurtosis; elementary probability theory and discontinuous probability distribution; continuous probability distributions, e.g. normal and exponential distribution.

Suggested Readings:

1) Differential Calculus by B.C. Das and B. N. Mukharjhee.
2) Ordinary Differential Equation by B.D. Sharma. Integral Calculus and Differential Equation – Mohammad and Bhattacharjee; Students' Publication.
3) Differential Equation - P N Chatterjee; Rajhans Prakashan Mandir, Meerut.
4) Differential Equation - Khanna; Joi Prokash Nath and Company.
5) Differential Equation – B. D. Sharma; Kader Nath.
6) Mathematical Physics – H.K. Dass; S. Chand and Company Ltd, New Delhi.
7) Differential Equation - Schaum's Series; McGraw-Hill.
8) Mathematical Methods – Sharma & Gupta; Ram Nath.
9) Statistics and Probability - Spiegel (Schaum Series); McGraw-Hill
10) Business Statistics - M.P. Gupta and S.P. Gupta; Sultan Chand and Sons.

11) Probability and its Applications - H.C. Saxena; S. Chand and Company Ltd.
12) Elementary Statistics – H.C. Saxena; S. Chand and Company Ltd.
13) Theory and Problem of Statistics by Schaum's Outlines Series.

Math 231: Matrices and Three Dimensional Coordinate Geometry
3.00 Credit, 3 hrs/week.

Matrices: definition of different kinds of matrices; algebra of matrices; inverse of matrix; rank and elementary transformation of matrices; solution of system of linear equations; Eigen values and Eigen vectors; Cayley-Hamilton theorem.

Coordinate Geometry: System of co-ordinate; distance between two positions; section formula; projection; Direction cosines; Equation of planes and lines; condition of perpendicularity and parallelism of planes and straight lines; perpendicular distance of a point from a straight line; coplanar lines; Shortest distance between two straight lines; volume of tetrahedron; sphere, cone and cylinder with their properties.

Spherical Trigonometry: Spherical triangle, properties of spherical triangle; relations between sides and angles of a spherical triangle; solution of spherical triangle.

Suggested Readings:

1) Matrices and Linear Transformations – Mohammad Iman Ali; Imans Mathematical Publication.
2) Matrices – M. L. Khanna; Joi Prokash Nath and Company.
3) An Introduction to Matrices – S. C. Gupta; Sultan Chand and Sons.
4) Martices – Frank Ayres, Jr (Schaum Series); McGraw-Hill.
5) Linear Algebra – Symour Lipschutz (Schaum Series); McGraw-Hill.
6) A Text Book of co-ordinate Geometry and Vector Analysis, by Rahman and Bhattacharjee.
7) Co-ordinate Geometry for Beginners by R C Fawdry.

Math 235: Laplace Transform, Fourier and Vector Analysis
3.00 Credit, 3 hrs/week.

Laplace transforms: definition of Laplace transforms, sufficient conditions for existence of Laplace transforms; inverse Laplace transforms; Laplace transforms of derivatives; the unit step function; periodic function; some special theorems on Laplace transforms; partial fraction; solutions of differential equations by Laplace transforms.

Fourier Analysis: Real and complex form of Fourier series; Finite transform; Fourier Integral; Fourier transforms and their uses in solving boundary value problems of wave 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; definition of line, surface and volume integral; gradient, divergence and curl of point functions; Gauss's theorem, Stoke's theorem, Green's theorem and their applications.

Suggested Readings:

1) Matrices and Linear Transformations – Mohammad Iman Ali; Imans Mathematical Publication.
2) Linear Algebra – Symour Lipschutz (Schaum Series); McGraw-Hill.
3) Vector analysis - Dr. Muhammad Abdus Sattar; Ali Publication.
4) Vector analysis - M.D. Raisinghania; S. Chand and Company Ltd, New Delhi.
5) Vector analysis - Murray R Spiegel (Schaum Series); McGraw-Hill.
6) Mathematical Methods by AbdurRahman
7) Fourier Transform by Schaums Outline
8) Laplace Transform by Schaums Outline

6.3 Basic Engineering Courses

CE 100: Engineering Drawing
1.50 credit, 3 hrs/week.

Introduction: Lines and lettering;
Plane geometry: drawing of linear and curved geometric figures, e.g. pentagon, hexagon, octagon, ellipse, parabola, hyperbola;
Solid geometry: concept of isometric view and oblique view, theory of projections;
3D Objects: drawing of isometric view of 3d objects such as cube, prism, pyramid, cone and cylinder; Projections: projections of cube, prism, cone, cylinder; developments of cube, pyramid, cone, and cylinder;
Cross section and Elevation: plan, elevations and sections of one storied and duplex building.

Suggested Readings:

1) Engineering Graphics and Drafting – Gill (Kataria& Sons)
2) Fundamentals of Engineering Drawing – J. Wareen, Luzzadder (Prentice Hall of India)

CE 101: Engineering Mechanics
3.00 credit, 3 hrs/week.

Equivalent force systems: basic concept of force-couple systems; coplanar and non-coplanar force systems: parallel force systems; equation of statics; two force member; moments; analyses of two-dimensional frames and trusses; friction; flexible chords.

Centroids of lines, areas and volumes; moments of inertia of areas and masses; plane motion; principles of work and energy; impulse and momentum; virtual work principle for rigid bodies; application of virtual and potential energy principles as replacement of equations of statics for real life problems.

Suggested Readings:
1) Analytic Mechanics (3rd Edition) - Virgil Morning Faires, Sherman Chambers (The Macmillan Company, New York)
2) Vector Mechanics for Engineers (Static & dynamics) – Ferdinand P. Beer, E. Russel Johnston (Tata McGraw – Hill Publishers)
3) Engineering Mechanics – Timoshenko & Young (McGraw – Hill Publishers)
4) Engineering Mechanics (Static & dynamics) – I.H. Shames (Prentice Hall of India)

CE 102: Computer Aided Drafting
1.50 credit, 3 hrs/week.

Introduction to computer usage; introduction to CAD packages and computer aided drafting: drawing editing and dimensioning of simple objects; plan, elevations and sections of multi-storied buildings; reinforcement details of beams, slabs, stairs etc; plan and section of septic tank; detailed drawings of roof trusses; plans, elevations and sections of culverts, bridges and other hydraulic structures; drawings of building services; using professional software like AutoCAD, 3D Studio Max, Graphics, Illustrator and Adobe collections.

Suggested Readings:

1) Mastering tm AutoCAD ® 2006 and AutoCAD Ltd ® 2006 – George Omura, September 2005, Sybex, Inc.

CE 103: Geoinformatics: Surveying
3.00 credit, 3 hrs/week.

Reconnaissance survey; linear measurements; traverse survey; triangulation, leveling and contouring; calculation of areas and volumes; problems on heights and distances; curves and curve ranging, transition curve, vertical curves; tacheometry: introduction, principles and problems on tacheometry; astronomical surveying: definition, instruments, astronomical observation of true N-S and latitude and corrections, systems of time; elements of mine surveying.

Photogrammetry: introduction of terrestrial photography, aerial photography, reading of photo mosaic, scale; project surveying; errors in surveying; remote sensing; introduction to geographic information system (GIS); Coordinate systems and datum transformation-Geoid, MSL, reference systems, transformation, map projection; Control surveys-traverse, triangulation, trilateration; Errors and adjustment-least squares adjustment; Total station survey-features and their use; GPS survey-basics and survey methods; Construction surveys-setting out civil engineering structures.

Suggested Readings:

1) A text Book of Surveying – M. Shahjahan, M.A. Aziz (Hafiz Book Center)

2) Surveying: Vol I (3rd Edition) – B.C Punmia (Laxmi Publication)

3) Surveying: Vol III (9th Edition)- B.C. Punmia (Laxmi Publication)

4) Surveying and Levelling – N.N. Basak (Tata McGraw – Hill)

5) *Engineering Surveying*, Schofield, W, Butterworth Heinemann, Oxford

6) *Surveying*, K. R. Arora, Standard Book House, Delhi

7) *Surveying*, B. C. Punamia, Standard Book House, Delhi

8) *Adjustment Computations*, P. R. Wolf and C. D. Ghilani,John Wiley, NY

9) *Textbook of Photogrammetry*, K. K. Rampal, Oxford & IBH Publishing, New Delhi

10) Elements of Photogrammetry, Paul Wolf, McGraw Hill, Singapore (ISE)

11) GPS Satellite Surveying, Alfred Leick, John Wiley

12) GPS for Land Surveyors, Sickle, J. V. Ann Arbor Press

13) Digital elevation model technologies and applications: The DEM users manual:; Manual of Remote Sensing: ASPRS; David F. Maune, 2002

14) Airborne and Terrestrial laser scanning, George Vosselman and Hans-Gerd Maas(2010), CRC Press, New York

15) Topographic laser ranging and scanning: principle and processing, Jie Shan and Charles K Toth (2009), CRC Press, New York

16) Edward M. Photogrammetry. Third Ed., Moffit, Francis H. and Mikhail, New York:Harper & Row, 1980.

CE 104: Practical Surveying
1.50 credit, 3 hrs/week.

Sketching a map and understanding symbols; Introduction to map reading and numbering system; Calibration of EDMI and distance measurement; Theodolite angle measurement and testing; Fly levelling, level net; Theodolite traverse and trigonometric leveling; Total station Surveys (control establishment and detail plotting); GPS surveys (control establishment and detail plotting); Setting out building; Setting out highway; modern surveying equipment and their applications.

Suggested Readings:

1) A text Book of Surveying – M. Shahjahan, M.A. Aziz (Hafiz Book Center)

2) Surveying: Vol I (3rd Edition) – B.C Punmia (Laxmi Publication)

3) Surveying: Vol III (9th Edition)- B.C. Punmia (Laxmi Publication)

4) Surveying and Levelling – N.N. Basak (Tata McGraw – Hill)

5) *Engineering Surveying*, Schofield, W, Butterworth Heinemann, Oxford

6) *Surveying*, K. R. Arora, Standard Book House, Delhi

7) *Surveying*, B. C. Punamia, Standard Book House, Delhi

8) *Adjustment Computations*, P. R. Wolf and C. D. Ghilani,John Wiley, NY

9) GPS Satellite Surveying, Alfred Leick, John Wiley

10) GPS for Land Surveyors, Sickle, J. V. Ann Arbor Press

11) Digital elevation model technologies and applications: The DEM users manual:; Manual of Remote Sensing: ASPRS; David F. Maune, 2002

12) Airborne and Terrestrial laser scanning, George Vosselman and Hans-Gerd Maas(2010), CRC Press, New York

CE 105: Computer Fundamental Applications Lab
(1.5 Credits, 3.0 hours/week)

The fundamental computing concepts including data presentation, the binary system, the system unit, memory, storage systems, input devices, output devices, systems software. Key Applications include MS Word, Excel,PowerPoint and Access; Internet, e-mail and the impact of computers on society.

Suggested Readings:

1) Parsons, J. J. &Oja, D. (2005).Practical Computer Literacy [With Accompanying CD]. Boston: Course Technology of Thomson Learning. ISBN: 0-619-21389-2

2) Introduction to Computers by Peter Norton.

3) Using Information Technology by Williams/ Sawer (A practical introduction to computers and communications).

4) Computer Today by Timothy J. O'Leary, Linda I. O'Leary.

5) Mastering HTML by Deborah, S. Ray, Eric J. Ray

6) Internet and Worldwide Web by Dietel H.M., PJ Dietel, TR Nieto

Shop 132: Workshop Sessional
1.50 Credit, 3 hrs/week.

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

Welding shop (3/2 hrs/week): Methods of metal joints: Riveting, grooving soldering, welding; Types of welding joints and welding practice; Position of arc welding and polarty: Flat, vertical, horizontal, overhead; Electric Arc welding and its machineries; Welding of different types of materials: Low carbon steel, cast iron, brass, copper, stainless steel, aluminium; Types of electrode, fluxes and their composition; Arc welding defects; Test of Arc welding: Visual, destructive and non-destructive tests. Types of gas welding system and gas welding equipment; Gases and types of flame; welding of different types of materials; Gas welding defects; test of gas welding.

Suggested Readings:

1) Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.

EEE 165: Basic Electrical Engineering
2.00 credit, 2 hrs/week.

Electrical units and standards; electrical network and circuit solution: series, parallel, node and mesh analysis; 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.

Suggested Readings:

1) Alexander Charles K., Sadiku Matthew N.O., Fundamental of Electric circuits, 2/e, Mc Grow Hill, New York, 2004
2) Boylestad Robert L., Introductory Circuit Analysis, 11/e, Pearson Prentice Hall, New Jersey,2007.
3) Theraja B. L., A.K. A text Book of Electrical Technology, Vol.I: Basic Electrical Engineering, 34/e, S. Chand & Company Ltd., new Delhi, 2004.

EEE 166: Basic Electrical Engineering Lab
1.50 credit, 3 hrs/week.

Experiment based on fundamental concepts of electrical series and parallel circuits; Measurement of AC quantities; Measurement of power; Electrical wiring; house wiring and industrial installation wiring.

Suggested Readings:

1) Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.

CE 200: Details of Constructions
1.50 credit, 3 hrs/week.

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

Foundation: foundations: shallow foundation and deep foundation, site exploration, bearing capacity of soil, standard penetration test;

Finishing and retrofitting works: brick masonry: types of brick, bonds in brickwork, supervision of brickwork, brick laying tools, defects and strength on brick masonry, typical structures in brickwork, load bearing and non-load bearing walls, cavity walls, partition walls; lintels and arches: different types of lintels and arches, loading on lintels, construction of arches; stairs: different types of stairs, floors: ground floors and upper floors; roofs and roof coverings; shoring; underpinning; scaffolding and formwork; plastering, pointing, painting; distempering and white washing; cement concrete construction; sound insulation: acoustics; thermal insulation; house plumbing: water supply and wastewater drainage; introduction to retrofitting in civil construction;

Suggested Readings:
1) Building Construction – Sushil Kumar (Standard Publishers, Delhi)
2) Building Construction – B.C Punmia (Laxmi Publication Pvt. Ltd. New Delhi)
3) Complete Construction Masonry & Concrete – Christine Beall (McGraw-Hill Book Company.)

CE 201: Construction Materials
3.00 credit, 3 hrs/week.

Properties and uses of bricks, efflorescence; cement, cement chemistry, aggregates, cement and lime mortars, concrete, standard tests of bricks, Cement and concrete, salinity problem in concrete, corrosion and its prevention, paints, varnishes, metallic coating; Design of concrete mixes; atomic structure and bonding; crystal structures, mechanical properties, yielding, fracture, elasticity, plasticity, properties and uses of rubber, timber and plastics; Concrete for special purposes; Ferrocement; wood structures and properties; shrinkage and seasoning; treatment and durability;

Suggested Readings:

1) Advanced Soil Mechanics., Das BM., 2008, Taylor and Francis, New York, USA.

2) ASTM standard method of mix design

3) Brick and Reinforced Brick Structures, P Dayaratnam, Oxford and IBH

4) Building Materials (1996) – Gurcharan Singh &Jagdish Singh (Standerd Publishers)

5) Concrete – Material, Microstructure and Properties, PK Mehta and PMJ Montiero, (Tata Mcgraw Hill)

6) Concrete Technology of Concrete – N Krishnaraju CBS Publishers & Distributors.

7) Concrete Technology, Neville and Brooks, ELBS/Longman

8) Concrete Technology, ML Gambhir (Tata Mcgraw Hill)

9) Construction Materials, D N Ghose, (Tata Mcgraw Hill)

10) Engineering Materials (1995) – M.A. Aziz (Hafiz Book Center, Dhaka)

11) Highway engineering, Khanna and Justo,(Khanna Publishers, Delhi)

12) Materials of Construction, GD Taylor, Prentice Hall

13) Principles of transportation engineering, Chakraborty and Das, Prentice Hall of India

14) Properties of Concrete, 4th Edition, Neville, ELBS/Longman

15) Relevant ASTM codes for testing and specifications

16) Soil Mechanics., Lambe TW., and Whitman RV., 2000, John Wiley and Sons (Asia), Singapore.

CE 202: Construction Materials Sessional
1.50 credit, 3 hrs/week.

General discussion on preparation and properties of concrete, test for specific gravity, unit weight, voids and bulking of aggregates; moisture content and absorption of coarse and fine aggregates; normal consistency, initial setting time, soundness and fineness test of cement; direct tensile and compressive strengths of cement mortar; gradation of coarse and fine aggregates; design and testing of a concrete mix, sampling and testing of bricks for absorption, unit weight, efflorescence and compressive strength; testing on the effect of chemical admixture addition on consistency of cement paste & setting time of cement, effect of mineral admixture addition and water cement ratio on strength of cement mortar.

Suggested Readings:

1) Engineering Materials (1995) – M.A. Aziz (Hafiz Book Center, Dhaka)
2) Building Materials (1996) – Gurcharan Singh &Jagdish Singh (Standerd Publishers.
3) Concrete Technology – A.M. Neville & J.J Suggested Readings (Peeson Education Ltd).
4) ASTM standard method of mix design
5) Relevant ASTM codes for testing and specifications

CE 203: Engineering Geosciences
3.00 credit, 3 hrs/week.

Introduction to geosciences in civil engineering; Plate tectonics (Continental drift, sea-floor spreading, types of plates and plate motion); Introduction to rock forming minerals (silicate structure, physical and chemical properties of minerals); Igneous, sedimentary and metamorphic rocks (texture; engineering properties); cycle of rock change;

Structural Geology: Geological Structures; Seismology and Earthquakes, magnitude and intensity, seismic hazard, earthquake prediction; earthquake and seismic map of Bangladesh Types of mass wasting events; Geological time scale and principles of stratigraphy; Weathering and soil formation; Surface processes and landforms (rivers, coastal, and groundwater), Environmental geology; Geology of Bangladesh, Criteria for site selection of dams, tunnels, waste disposal; Introduction to geophysical methods.

Geomorphology: 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.

Geophysics: geophysical methods for determining the subsurface distribution of physical rock and soil properties; acquisition, processing, and interpretation of seismic data; application to environmental site characterization, earthquake engineering, and groundwater;

Suggested Readings:

1) Changing The Face of earth Engineering Geomorphology – Giardino (Amazon Books, New Delhi).
2) Dynamic of Earth by Skinner and Porter
3) Engineering & General Geology – Prabin Singh (Katson Publishing House).
4) Environmental Geology – K.S Valdiya (Tata McGraw-Hill, New Delhi)

5) Environmental Geology- An Earth System Science Approach by Dorothy J. Merrities; et. Al, W.H. Freeman and Company, Newyork, 1998
6) Essentials of Geology by Frederick Lutgens
7) Geology Applied to Engineering by Terry West, Prentice Hall.
8) Physical & Engineering Geology – S. K. Garg (Khanna Publishers).
9) Structural Geology by M. P. Billings
10) Understanding Earth (5th edition) by Grotzinger, Jordan, Press and Siever, Freeman and Company.
11) Introduction to Environmental geology, Keller, Edward (2005). Prentice Hall.
12) Understanding Earth (5th edition) by Grotzinger, Jordan, Press and Siever, Freeman and Company.
13) Geology Applied to Engineering by Terry West, Prentice Hall.
14) Dynamic of Earth by Skinner and Porter
15) Structural Geology by M. P. Billings
16) Essentials of Geology by Frederick Lutgens

CE 205: Numerical Methods and Analysis
2.00 credit, 2 hrs/week.

Solutions of algebraic and transcendental equations: Bisection method, regular falsi method, Newton-Raphson method, Iteration method; Rate of convergence; Orders of errors; Interpolation: Simple differences, difference tables, differences of polynomials, Newton's formula for interpolation, central difference interpolation formula, divided differences, tables of divided differences, Newton's general interpolation formula, Lagrange's interpolation formula, inverse interpolation by Lagrange's formula by successive approximation; Solutions of system of linear equations: matrices, Gaussian elimination method, Gauss-Seidal iteration method; Numerical differentiation and integration; finite differences; curve fitting by least squares; solutions of differential equations: Picard's method, Euler's method and Runge-Kutta method; numerical differentiation; numerical integration; initial value problems; two-point boundary value problems.

Suggested Readings:

1) Numerical Analysis by BD Gupta.
2) Finite Difference and Numerical Analysis: Dr. Gupta and Malik.
3) Numerical Analysis: B.S. Goyal, Mittal S. K.

CE 206: Computer Programming Sessional
1.50 credit, 3 hrs/week.

Programming concepts and algorithms; internal representation of data; elements of structured programming language: data types, operators, expressions, control structures, functions, pointers and arrays, input and output; concept of Object Oriented Programming (OOP): encapsulation, inheritance, polymorphism and abstraction.

Suggested Readings:

1) Programming in C (3rd Edition) (Developer's Library), Stephen Kochan (Paperback - Jul 8, 2004).
2) The C Programming Language (2nd Edition), Brian W. Kernighan, Dennis Ritchie, and Dennis M. Ritchie (Paperback - Mar 22, 1988).
3) Object-Oriented Programming by Peter Coad and Jill Nicola (Textbook Binding - Feb 3, 1993)
4) Introduction to Object-Oriented Programming Using C++, Peter Muller.

CE 207: Engineering Computation Sessional
1.50 credit, 3 hrs/week.
Prereq. CE 206

Introduction to hi-level computational programming tools; application to numerical analysis: basic matrix computation, solving systems of linear equations, non-linear equations, differential equations, interpolation and curve fitting, numerical differentiation, numerical integration; application to engineering problems: solving problems related to mechanics, numerical solution of equation of motion etc.; introduction to the application of MATLAB to an array of engineering systems.- emphasis on computational and visualization methods in the design, modeling and analysis of engineering problems; Introduction to MATHEMATICA, SAP, and Abaqus.

Suggested Readings:
1. Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.

CE 208: Estimating and Costing
1.50 credit, 3 hrs/week.

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 septic tank; estimation and costing of underground water reservoir; estimation and costing of retaining wall; estimation and costing of slab culvert; estimation and costing of bridges; highways construction; estimation of steel truss; computer aided quantity estimation; construction site survey and estimation.

Suggested Readings:

1) Estimating – Abul Faraz Khan (Sabdik Publishers).
2) Estimating, Costing & Valuation (Civil) – Pasrija, Arora, Inderjit Singh (New Asian Publishers, Delhi).
3) A Text Book on Estimating & Costing (Civil) With Drawings – D. Kohli, R.C.Kohli (Ambala Ramesh Publication).
4) BNBC & PWD rate-charts are helpful.

CE 211: Mechanics of Solids I
3.00 credit, 3 hrs/week.
Prereq. CE 101

Concepts of stress and strain – normal and shear stresses; State of stress; Concept of strain – normal and shear strains; State of strain; Hooke's law, constitutive relationships; deformations due to tension, compression and temperature change; beam statics: reactions, axial force, shear force and bending moments; axial force, shear force and bending moment diagrams using method of section and summation approach; indeterminate systems and compatibility conditions; Simple indeterminate systems and lack of fit problems; Generalized Hooke's law; stress in cylindrical and spherical shells; elastic analysis of circular shafts, solid non-circular and thin walled tubular members subjected to torsion; flexural and shear stresses in beams; shear flow and shear centre; principle of superposition and its limitations; transformation of plane stress and strain; Principal stresses and strains; Mohr's circle.

Suggested Readings:

1) Engineering Mechanics of Solids –Egor. P. Popov (Prentice-Hall of India).
2) Strength of Materials (4th Edition) – Andrew Pytel, Ferdinand L. Singer (Harper & Row Publishers).
3) Mechanics of Materials – Ferdinand P. Beer & E. Russel Johnston (Tata McGraw-Hill Publishers).
4) Strength of Materials (part 1 & 2) – S. Timoshenko (CBS Publishers & Distributors).
5) Mechanics of Materials – James M. Gere (McGraw-Hill Publishers).
6) Theory and Problems of Strength of Materials – William A. Nash (McGraw-Hill Book Company)

CE 212: Structural Mechanics Sessional
1.50 credit, 3 hrs/week.

Tension test on mild steel and cast iron rods, impact test on metal, compression and shear test on Neoprene pad specimens, buckling of slender steel columns, torsion test on round mild steel and cast iron rods, indentation hardness test on metals; helical spring test; measurement of strain by electrical resistance strain gauge (cantilever beam), evaluation of Poisson's ratio on mild steel flat, deflection of simply supported, location of shear centre in a channel section, unsymmetrical bending. Compression test on plane concrete cube and cylinder, ultrasonic test on concrete cube; study of structural models: truss, beam frame.

Suggested Readings:

1) Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.

CE 213: Mechanics of Solids II
3.00 credit, 3 hrs/week.
Prereq. CE 211

Beam deflection by direct integration and moment area method; buckling of columns; Elasticity fundamentals: Stress and Strain; Constitutive, compatibility, and equilibrium equations, boundary conditions; Types of boundary value problems; Plane stress and plane strain, 2-D problems in rectangular, polar, and curvilinear coordinates; Elementary 3-D problems; Torsion of non-circular members; Unsymmetrical bending of straight beams, shear center; Curved beams. Beams on elastic foundation; Thermal stresses; Energy methods: Castigliano's theorems, statically indeterminate structures; Introduction to Viscoelasticity; Introduction to plasticity, failure theories, formulation for elasto-plastic problems; Numerical techniques; cable and cable supported structures; bolted, riveted and welded joints.

Suggested Readings:

1) Advanced Strength and Applied Elasticity, A.C. Ugural and S. K. Fenster, Prentice-Hall, New York, 1995.
2) Advanced Mechanics of Materials, 5th Ed., A.P. Boresi and O. M. Sidebottom, Wiley, Singapore, 1992.
3) Plasticity for Engineers - Theory and Applications, C.R. Calladine, Horwood Publishing, Chichester, 2000.

4) Mathematical Theory of Elasticity, I.S. Sokolnikoff, McGraw Hill, New York, 1956.
5) Advanced Mechanics of Solids, 2nd Ed., L.S. Srinath, Tata McGraw Hill, New Delhi, 2003.
6) Theory of Elasticity, 3rd Ed., S.P. Timoshenko and J. N. Goodier, McGraw Hill, Tokyo, 1970
7) Engineering Mechanics of Solids –Egor. P. Popov (Prentice-Hall of India).
8) Strength of Materials (4th Edition) – Andrew Pytel, Ferdinand L. Singer (Harper & Row Publishers).
9) Mechanics of Materials – Ferdinand P. Beer & E. Russel Johnston (Tata McGraw-Hill Publishers).
10) Strength of Materials (part 1 & 2) – S. Timoshenko (CBS Publishers & Distributors).
11) Mechanics of Materials – James M. Gere (McGraw-Hill Publishers)

CE 261: Fluid Mechanics
3.00 credit, 3 hrs/week.

Introduction: Development and scope of fluid mechanics; Physical properties of fluids; Ideal and real fluids; Newtonian and non Newtonian fluids.

Fluid Statics: Fluid pressure; Manometers; Pressure on plane and curved surfaces; Centre of pressure; Buoyancy; Stability of immersed and floating bodies; Fluid masses subjected to uniform acceleration; Free and forced vortex.

Kinematics of Fluid Flow: Steady and unsteady, uniform and nonuniform, laminar and turbulent flows; One, two and three dimensional flows; Streamlines, streaklines and pathlines; Continuity equation; Rotation and circulation;

Dynamics of Fluid Flow: Euler's equation of motion along a streamline and its integration; Bernoulli's equation; Measurement of pressure and velocity head; Bernoulli's equation applied to flow through Venturimeter, orifices, mouthpieces, nozzles, sluice gates under free and submerged conditions; Various types of notches and weirs under free and submerged flow conditions; Aeration of nappe; Cavitation; Momentum equation and its application to stationary and moving vanes and pipe bends; Problems related to combined application of energy and momentum equations.

Dimensional Analysis and Hydraulic Similitude; Laminar and Turbulent Flow: Equation of motion for laminar flow through pipes; Stockes' law; Flow between parallel plates; Flow through porous media; Fluidization; Transition; Turbulent flow; Equation for turbulent flow; Eddy viscosity; Mixing length concept and velocity distribution in turbulent flow.

Pipe Flow Problems: Nature of turbulent flow in pipes; Equation for velocity distribution over smooth and rough surfaces; Resistance coefficient and its variation; Flow in sudden expansion, contraction, diffusers, bends, valves and siphons; Concept of equivalent length; Branched pipes; Pipes in series and parallel; Simple networks.

Suggested Readings:

1) Engineering Mechanics with Engineering Applications –L. Daugherty, Finnemore, Franjini (McGraw-Hill Book Company).
2) A Text Book of Hydraulics, Fluid Mechanics & Hydraulics Machines-R.S. Khurmi (S. Chand & Company Ltd).

3) Fluid Mechanics (1st SI Edition)-Victor Streeter, Benjamin Wylie (McGraw-Hill Book Company).
4) Elementary Fluid Mechanics (7th Edition)-Robert Street, G. Z. Watters, J.K. Vennard (John Wiley & Sons).
5) Introduction to Fluid Mechanics and Machines-Som and Biswas (Tata McGraw-Hill Publisher).
6) V.L. Streeter and E.B. Wylie, Fluid Mechanics, McGraw Hill, 1998.
7) Granger, R.A., Fluid Mechanics, CBS College Publishing, New York, 1985.
8) J.F. Douglas, J.M. Gasiorek, and J.A. Swaffield, Fluid Mechanics, Addison-Wesley, Harlow 1999.
9) I.H. Shames, Mecahnics of Fluids, McGraw Hill, New York, 1992.
10) R.L. Daugherthy, J.B. Franzini and E.J. Finnemore, Fluid Mechanics with Engineering Applications, McGraw Hill, New York, 1985.
11) A.K. Jain, Fluid Mechanics, Khanna Publishers, New Delhi, 1998.
12) L.P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 2002

CE 262: Fluid Mechanics Sessional
1.50 credit, 3 hrs/week.

Centre of pressure; proof of Bernoulli's theorem; flow through venturimeter; flow through orifice; coefficient of velocity by coordinate method; flow through mouthpiece; flow over v-notch; flow over sharp-crested weir;; Bernoulli apparatus, Reynolds apparatus. Flow net studies around circular cylinder, Verification of Darcy's law- fluid friction in pipe.

Suggested Readings:

1) Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.
2)

6.4 Basic Civil Engineering Courses

CE 309: Advance Construction Technology and HES Sessional
1.50 credit, 3 hrs/week.

Advance Construction Technology: introduction with different construction equipments and their suppliers; strategic analysis of the performance of different construction equipments of CATERPILLER, HITACHI and other prominent companies; application of different machineries in building, road, rail, airfield, bridge, and other sector of construction; advance HES tools for construction; Market Analysis: market survey on local construction and finish goods; short case study on different items availability; source segregation; fire hydrants and other safety equipments.

HES practices & policies and Legal Aspects of Construction in Bangladesh: HES practices in BD and all around the world; discussion on Labor law, public procurement rules and ISO 9001; Comparison with U.S. legal systems applicable to civil engineering and construction; Introduction to ISO 14001.

CE 311: Structural Analysis and Design I
3.00 credit, 3 hrs/week.
Prereq. CE 213

Stability and determinacy of structures; analysis of statically determinate trusses and arches; influence lines; moving loads on beams, frames and trusses; analysis of suspension bridge; approximate analysis of statically indeterminate structures: braced trusses, portal method, cantilever method and vertical load analysis of multi storied building frames; application of MATLAB or MATHEMATICA in structural analysis and modeling procedures.

Suggested Readings:

1) H.H. West, Fundamentals of Structural Analysis, Wiley, New York, 1993.
2) C.H. Norris, J.B. Wilbur and S. Utku, Elementary Structural Analysis, 3rd Ed., McGraw Hill International, Tokyo, 1976.
3) C.S. Reddy, Basic Structural Analysis, 2nd Ed. Tata McGraw Hill, New Delhi, 1996.
4) L.S. Negi and R.S. Jangid, Structural Analysis, Tata McGraw Hill, New Delhi, 1997.
5) Theory of Simple Structures (2nd Edition) – T.C. Shedd & J. Vawter (John Wiley & Sons, Inc)
6) Theory of Structure-S. Timoshenko (CBS Publishers & Distributors)

CE 312: Computer Aided Structural Analysis and Design Lab I
1.50 credit, 3 hrs/week.

Analysis and Design problems; using of computer software like: STAAD Pro; ETABS; ANSYS; design of members and connection of steel structures; e.g. roof truss and plate girder.

Numerical and symbolic operations using software: Introduction to Mathematica - basic operations; Solution of simultaneous equations (application to slope-deflection method); Solution of ODEs (application to direct integration method); Simple matrix operations (application to flexibility matrix method).

Idealizations and approximations in structural modeling: Idealizations in material modeling, Idealizations in structural geometry, support conditions and connections; Idealizations in member structural behavior.

Matrix structural analysis using software: Analysis of determinate and indeterminate trusses in 2D, Analysis of continuous beams and frames in 2D, Analysis of space (building) frames
Finite element analysis using software: Analysis of a simple beam using line, shell and solid elements, Elastic buckling analysis of a column, Analysis of a plate with a hole: stress concentration.

Suggested Readings:

1) Structural Analysis (5th Ed.), Hibbeler, R.C. Pearson Education India, 2005. {624.04 Hib}
2) Engineering Mechanics of Solids (2nd Ed.), Popov, E.P., Prentice-Hall India, 2006. {620.1 Pop}
3) Users' Manuals for Mathematica, SAP2000 and Abaqus.

CE 313: Structural Analysis and Design II
3.00 credit, 3 hrs/week.
Prereq. CE 311

Wind and earthquake loads; analysis of statically indeterminate beams and frames by moment distribution, consistent deformation/flexibility and stiffness methods; algorithms for implementing direct stiffness method in computer; influence lines of statically indeterminate beams and frames;; orsional effects; Concept of local effects, generation of load vector, Effects of finite joints; Application to plane frames, space frames, grid structures, Introduction to Finite Elements Method for 2-D plane problems; application of MATLAB or MATHEMATICA in structural analysis and modeling procedures.

Suggested Readings:

1) Matrix Analysis of Framed Structures, 3rd Ed., W. Weaver and J.M. Gere, Von. Nastrand, New York, 1990.
2) Fundamentals of Structural Analysis, H.H. West, Wiley, New York, 1993.
3) Basic Structural Analysis, 2nd Ed., C.S. Reddy, Tata McGraw Hill, New Delhi, 1996.
4) Theory of Matrix Structural Analysis, J.S. Przemieniecki, Dover, New York, 1968.
5) Structural Analysis - A Matrix Approach, G.S. Pandit and S.P. Gupta, Tata McGraw Hill, New Delhi 1994.
6) Matrix Methods of Structural Analysis, M.B. Kanchi, Wiley Eastern, New Delhi, 1993.
7) Structural Analysis, L.S. Negi and R.S. Jangid, Tata McGraw Hill, New Delhi, 1997.
8) Elementary Structural Analysis, 4th Ed., S. Utku, C.H. Norris and J.B. Wilbur, McGraw Hill College, New York, 1990.
9) Theory of Simple Structures (2nd Edition) – T.C. Shedd & J. Vawter (John Wiley & Sons, Inc)
10) Theory of Structure-S. Timoshenko (CBS Publishers & Distributors)

CE 315: Design of Concrete Structures I
3.00 credit, 3 hrs/week

Fundamental behavior of reinforced concrete; introduction to strength design and alternate design methods; flexural design of beams (singly reinforced, doubly reinforced, T-beam) using strength design method; shear, diagonal tension and torsion of beams; bond and anchorage; design of one way slabs; design of two-way edge supported slabs: using strip and alternate methods.

Suggested Readings:

1) Design of Concrete Structures (7th Edition)-George Winter, o' Rourke, Nilson (Tata McGraw-Hill Publisher, New Delhi)
2) Design of Concrete Structure (13th Edition)- Nilson, Drawing, Charles Dolan (McGraw-Hill Higher Education)
3) Reinforced Concrete Design (6th Edition)-Chukia Wang & Charles G. Salmon (John Wiley & Sons)
4) Civil & Structural Engineering Design of Reinforced Concrete Structure – Alan Williams (Kaplan AEC Education)
5) Reinforced Concrete Fundamentals-Ferguson, Breen, Jirsa (John Wiley & Sons, Inc.)
6) Reinforced Concrete Design – George F. Limbrunner& Leonard Spigel (Prentice – Hall of India Pvt. Ltd.)

CE 316: Concrete Structures Design Sessional I
1.50 credit, 3 hrs/week.

Analysis and design problems based on CE 315; design of slab bridge, simple girder bridge, balanced cantilever bridge and low-rise building; Use of computer software like: STAAD Pro; ETABS; ANSYS.

> *Suggested Readings:*
> 1) AASHTO Bridge Design Manual 2002
> 2) Design of Concrete Structures (10th Edition)-George Winter, Nilson (McGraw-Hill Higher Education)
> 3) Design of Bridges, N. KrishanaRaju (Oxford & IBH Publishing Co, New Delhi)
> 4) Different Manuals From AISC/AREA can be used as guideline as well

CE 317: Design of Concrete Structures II
3.00 credit, 3 hrs/week.
Prereq. CE 315

Design of column supported slabs; introduction to floor systems; design of columns under uniaxial and biaxial loading, introduction to slender column; structural design of footings, pile caps; seismic detailing; shear wall; structural forms; introduction to prestressed concrete; Analysis and design for torsion; design of one way and two way joist slabs with or without beam on the column line; design of reinforcement at joints.

> *Suggested Readings:*
> 1) Design of Concrete Structures (7th Edition)-George Winter, o' Rourke, Nilson (Tata McGraw-Hill Publisher, New Delhi)
> 2) Design of Concrete Structure (13th Edition)- Nilson, Drawing, Charles Dolan (McGraw-Hill Higher Education)
> 3) Reinforced Concrete Design (6th Edition)-Chukia Wang & Charles G. Salmon (John Wiley & Sons)
> 4) Civil & Structural Engineering Design of Reinforced Concrete Structure – Alan Williams (Kaplan AEC Education)
> 5) Reinforced Concrete Fundamentals-Ferguson, Breen, Jirsa (John Wiley & Sons, Inc.)
> 6) Reinforced Concrete Design – George F. Limbrunner& Leonard Spigel (Prentice – Hall of India Pvt. Ltd.)

CE 319: Design of Steel Structures
3.00 credit, 2 hrs/week.

Behavioral principles and design of structural steel; design of tension members, bolted and welded connections; compression members; residual stress, local buckling, effective length; flexural members; lateral torsional buckling; design of beam-columns; connection design, moment connections, joint design.

> *Suggested Readings:*
> Design of Steel Structures-Gaylord & Gaylord (McGraw-Hill Inc)
> A.S. Arya and J.L. Ajmani, Design of steel structures; Nemchand Bros, Roorkee, 1990.
> S.M.A. Kazimi and R.S. Jindal, : Design of Steel Structures Prentice Hall (India), New Delhi, 1981.
> S.K. Duggal, : `Design of Steel Structures, Tata McGraw Hill, New Delhi, 1993

CE 320: Steel Structures Design Lab
1.50 credit, 3 hrs/week.

Computer based analysis of steel structures and detail design of. roof truss and bridge truss; design of members and joints of roof and bridge truss.

Suggested Readings:

1) Design of Steel Structures-Gaylord & Gaylord (McGraw-Hill Inc)

CE 331: Environmental Engineering I
3.00 credit, 3 hrs/week.

Introduction to Environmental Engineering; Important environmental issues; ecology and environment; climate change; biodiversity

Introduction to Water Supply Engineering; Water requirements; Estimation of water use; Fire demand; Surface water collection and transportation; Headworks; Groundwater exploration, aquifer properties and groundwater flow; Pumping system; Water quality; Drinking water quality standards; Alternative technologies for problem areas in Bangladesh.

Introduction to Wastewater Engineering; Sanitation and health; Estimation of wastewater; Wastewater collection system; Hydraulics of sewer design, construction and maintenance of sanitary sewer and storm drainage system; Sewer appurtenances; Plumbing system.

Health and hygiene; Disease description, transmission and control; Hygiene education: scope and methodology.

Suggested Readings:

1) Water Supply Engineering (1st Edition)- M. A. Aziz (Hafiz Book Center, Dhaka)
2) Sewage Treatment in Hot Climates (1976)-Duncan Mara (John Wiley & Sons, London)
3) Water Supply & Sewerage (November 1990)-Terence McGhee. E. W. Steel (McGraw-Hill Int'1 Edition)
4) Water & Waste Water Treatment (4th Edition)-Mark J. Hammer (Prentice-Hall of India Pvt. Ltd).
5) Sewage Treatment in Hot Climates (1976)-Duncan Mara (John Wiley & Sons, London)
6) Water Supply & Sewerage (November 1990)-Terence McGhee. E. W. Steel (McGraw-Hill Int'1 Edition)
7) Water & Waste Water Treatment (4th Edition)-Mark J. Hammer (Prentice-Hall of India Pvt. Ltd)
8) Waste Water Engineering: Treatment, Disposal, Reuse (3rd Edition)-Metcalf & Eddy, Inc. (McGraw-Hill Inc.)
9) Plumbing & Heating-William J. Hornung (Prentice-Hall, Inc. Newjersy)
10) Plumbing-Harold E. Babbitt (McGraw-Hill Book Company)
11) Environmental Engineering Science. Authors: William W. Nazaroff and Liza Alvarez-Cohen. Publisher: John Wiley and Sons (Indian Edition Available).
12) Chemistry for Environmental Engineering and Science. Authors: Clair N. Sawyer, Perry L. McCarty and Gene F. Parkin. %th Edition (2003). 1st Edition (2001). Publisher: Tata McGraw-Hill (Indian Edition Available).
13) Standard Methods for Examination of Water and Wastewater. Editors: APHA, WEF, AWWA. 19th Edition (1995). Publisher: APHA, Washington D.C.

CE 332: Environmental Engineering I Sessional
1.50 credit, 3 hrs/week.

Water and wastewater sampling techniques, sample preservation, physical, chemical and biological tests of water and wastewater; breakpoint chlorination, alum coagulation, sampling and laboratory analysis of air, sampling and laboratory analysis of soil and solid waste.

Suggested Readings:

1) USEPA (U. S. Environment Protection Agency) Standard Test Method.
2) WHO (World Health Organization) Standard Test Method.
3) Water & Waste Water Treatment (4th Edition)-Mark J. Hammer (Prentice-Hall of India Pvt. Ltd)

CE 333: Environmental Engineering II
3.00 credit, 3 hrs/week.

Introduction to Environmental pollution; Environmental protection and management.

Planning and design consideration of water treatment plant; Water treatment: Sedimentation, coagulation, filtration, disinfection, chemical precipitation, adsorption, ion exchange, reverse osmosis, etc; Iron and arsenic removal units; Salinity removal; Water safety plans.

Low cost treatment for rural communities; Water distribution system: design and construction; Water meter; Leak detection; Unaccounted for water; Socio-economic aspects of WSS: concept of community participation and participatory planning.

Microbiology of sewage and wastewater; Wastewater characteristics; Introduction to aerobic and anaerobic treatment of wastewater; Self purification of stream: DO kinetics; BOD removal kinetics; Preliminary, primary and secondary treatment methods and disposal; Treatment and disposal of industrial effluent; Sludge treatment and disposal.

Sanitation for low income communities: On-site sanitation for rural communities; Low cost small bore sewage for townships; Design and construction of septic tanks, soak wells and subsurface drain fields; Rural sanitation in Bangladesh.

Sustainability of WSS services; Participatory development approach in WSS sector.

Suggested Readings:

1) Water Supply & Sanitation (2nd Edition, 1974)-M. Feroze Ahmed, Md. MujiburRahman (ITN Bangladesh)
2) Environmental Engineering (1985)-Howard Peavy, Rowe, Tchobanoglous (McGraw-Hill Book Company)
3) Sewage Treatment in Hot Climates (1976)-Duncan Mara (John Wiley & Sons, London)
4) Water Supply & Sewerage (November 1990)-Terence McGhee. E. W. Steel (McGraw-Hill Int'1 Edition)
5) Water & Waste Water Treatment (4th Edition)-Mark J. Hammer (Prentice-Hall of India Pvt. Ltd)
6) Waste Water Engineering: Treatment, Disposal, Reuse (3rd Edition)-Metcalf & Eddy, Inc. (McGraw-Hill Inc.)
7) Plumbing & Heating-William J. Hornung (Prentice-Hall, Inc. Newjersy)
8) Plumbing-Harold E. Babbitt (McGraw-Hill Book Company)

9) Environmental Engineering Science. Authors: William W. Nazaroff and Liza Alvarez-Cohen. Publisher: John Wiley and Sons (Indian Edition Available).

10) Chemistry for Environmental Engineering and Science. Authors: Clair N. Sawyer, Perry L. McCarty and Gene F. Parkin. %th Edition (2003). 1st Edition (2001). Publisher: Tata McGraw-Hill (Indian Edition Available).

11) Standard Methods for Examination of Water and Wastewater. Editors: APHA, WEF, AWWA. 19th Edition (1995). Publisher: APHA, Washington D.C.

CE 341: Geotechnical Engineering I: Principles of Soil Mechanics
3 credit, 3 hrs/week.
Prereq. CE 203

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. Stresses in soil from surface loads; Boussinesq theory; Westergaards theory; Newmarks chart, Contact pressures.

Suggested Readings:

1) Geotechnical Engineering, S.L. Gulhati and M. Datta, Tata McGraw-Hill, New Delhi, 2005.
2) Applied Analyses in Geotechnics, F. Azizi, E&FN SPON, London and New York, 2000.
3) Essentials of Soil Mechanics and Foundations: Basic Geotechnics, 6th Ed., D. F. McCarthy, Prentice Hall, New York, 2002.
4) Foundation Engineering (2nd Edition, 1974)-Ralph B. Peck, Hanson, Thornburn (Wiley Eastern Limited, India
5) Principles of Geotechnical Engg (6th Edition)-B. M. Das (Thomson Brooks/Cole)
6) Geotechnical Engineering-Principles & Practice-Donald P. Codute (Prentice-Hall of India)
7) Soil Mechanics & Foundation (13th Edition)-B. C. Punmia (Laxmi Publication, New Delhi)

CE 342: Geotechnical Engineering Sessional I
1.5 credit, 3 hrs/week.

Field identification tests of soils; grain size analysis by sieve and hydrometer; specific gravity test; Atterberg limits test; permeability tests; unconfined compression test; compaction test; relative density test; direct shear tests; vane shear test; consolidation tests; tri-axial test; test of geotextiles.

Suggested Readings:

1) Soil Testing for Engineers (1951)-T. William Lambe (MIT).
2) Soil Testing Manual: Procedure, Classification Data & Sampling Practices (2001)-Robert W. Day (McGraw-Hill Book Company)
3) Field Instrument In Geotechnical Engineering (1985)-T. H. Hanna (Trans Tech Publication, USA.)
4) ASTM or AASHTO Standard Test Method Must be Adopted.
5) Soil Mechanics Laboratory Manual, 6th Ed., B.M. Das, Oxford University Press, London, 2001.
6) Physical Properties of Soils, 2nd Ed., J.E. Bowles, McGraw Hill International, Singapore, 1990.

CE 343 : Geotechnical Engineering – II
3 credit, 3 hrs/week.
Prereq. CE 203

Surface and subsurface investigations; boring and sampling, types of foundation; bearing capacity of shallow and deep foundations; field tests, Consolidation of soils; Settlement of compressible soil layers; Sand drains. Shear strength; Mohr circle of stress; Mohr-Coulomb failure criterion; Estimation of shear strength parameters; Stress paths; theories of earth pressure and retaining walls, excavation, bracing, stability of slopes; earth and rock-fill dams; design and construction of footings, raft and piles.

Suggested Readings:
1) Geotechnical Engineering, S.L. Gulhati and M. Datta, Tata McGraw-Hill, New Delhi, 2005.
2) Applied Analyses in Geotechnics, F. Azizi, E&FN SPON, London and New York, 2000.
3) Essentials of Soil Mechanics and Foundations: Basic Geotechnics, 6th Ed., D. F. McCarthy, Prentice Hall, New York, 2002
4) Soil Mechanics, R.F. Craig, Spon Press, 7th Edition, 2004.
5) Foundation Engineering (2nd Edition, 1974)-Ralph B. Peck, Hanson, Thornburn (Wiley Eastern Limited, India
6) Foundation Analysis & Design-Joseph E. Bowles (McGraw-Hill Book Company)
7) Geotechnical Engineering-Principles & Practice-Donald P. Codute (Prentice-Hall of India)
8) Soil Mechanics & Foundation (13th Edition)-B. C. Punmia (Laxmi Publication, New Delhi)
9) An Introduction to Soil Mechanics & Foundation (3rd Edition)-C. R. Scott (Applied Science Publishers, London)
10) Foundation Design & Construction-M. J Tomlinson (Addison Wesley Longman Ltd)
11) Foundation Design & Construction-W. C Teng (McGraw-Hill Book Company)

CE 351: Transportation Engineering I: Transportation Planning and Traffic Engineering
3.00 credit, 3 hrs/week.

Transportation engineering, transportation functions; transportation systems, functional components, factors in transportation development, transportation modes, public transportation, emerging modes; 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.

Geometric design of highways: design controls and criteria, cross sectional elements, alignment, sight distance, intersection and interchange layouts, planning and design of bicycle and pedestrian facilities; traffic engineering: fundamentals of traffic engineering, vehicle and traffic characteristics, traffic control devices and systems, traffic studies, planning and design of parking facilities, roadway lighting; transportation in Bangladesh: transportation modes and networks, constraints and challenges, transport demand and modal share, road classification and design standards.

Suggested Readings:

1) A Text Book of Railway Engineering, S.C. Sexena and S.P. Arora, Dhanpat Rai & Sons, New Delhi, 1998.
2) Highway Engineering, 7th Ed., P.H. Wright and K. Dixon, Wiley, New York, 2003.
3) Highway Engineering, S.K. Khanna and C.E.G. Justo, Khanna Publishers, Roorkee, 2001.
4) Introduction to Transportation Engineering, J.H. Banks, McGraw-Hill, New York, 2002.
5) Manuals on Design of Flexible / Rigid Pavement- BRRI (Bangladesh Road Research Institute).
6) Pavement Analysis and Design, Y.H. Huang, Prentice Hall, New Jersey, 2003.
7) Planning and Design of Airports, R. Horonjeff and F.X. Mckelvey, McGraw Hill, New York, 1994.
8) Principles and Practice of Highway Engineering, L.R. Kadiyali, Khanna Technical Publications, Delhi, 2000.
9) Principles of Railway Engineering (14th Edition)-Rangwala (Charotar Publishing House, India).
10) Principles of transportation engineering, Chakraborty and Das, Prentice Hall of India
11) Railroad Engineering, W.W. Hay, Wiley, New York, 1988.
12) The Asphalt Hand Book-The Asphalt Institute.
13) Transportation Engineering and Planning, 3rd Ed., C.S. Papacostas and P.D. Prevedouros, Prentice Hall, New Jersey, 2001.

CE 353: Transportation Engineering II: Pavement Design and Railway Engineering
3.00 credit, 3 hrs/week.

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.

Suggested Readings:

1) Geometric Design Standards of RHD.
2) Highway Engineering (7th Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.).
3) Information Book of Bangladesh Railway, 2004.
4) Introduction to Transportation Engineering-William W. Hay (John Wiley, New York).
5) RHD Road Network Database: Annual Report-Roads & Highways Department: Ministry of Communications, Government of Bangladesh.
6) Road Design Standards – Bangladesh Gadget: September 5, 2004
7) Traffic Engineering & Transportation Planning (2nd Edition)-L. R. Kadiyali (Khanna Publishers).
8) Transport Sector Status Report-Transport Sector Coordination Wing: Planning Commission, Government of Bangladesh.
9) Transportation Engineering & Planning (3rd Edition)-C. S. Papacostas, P. D. Prevedouros (Prentice-Hall of India).
10) Transportation Engineering: An Introduction (3rd Edition)-JotinKhistry, Kent Lall (Prentice Hall Publication).

CE 354: Transportation Engineering Sessional I: Highway Materials and Traffic Engineering Design
1.50 credit, 3 hrs/week.

Highway design case studies using well known highway design computer softwares; testing and quality control of highway materials; bituminous mix design; roadway traffic and capacity analysis; computer models and application packages

Suggested Readings:

1) Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.

CE 361: Hydraulic Engineering
3.00 credit, 3 hrs/week.

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

Boundary Layer Analysis: Boundary layer thicknesses; Boundary layer over a flat plate; Laminar boundary layer; Application of momentum equation; Turbulent boundary layer; Laminar sub-layer; Smooth and rough boundaries; Local and average friction coefficient; Separation.

Suggested Readings:

1) Flow Through Open Channels-K. G. RangaRaju (Tata McGraw-Hill Publisher, India)
2) Open Channel Hydraulics (1959)- VenTe Chow (McGraw-Hill Book Company)
3) Introduction to Fluid Mechanics, Fox, R.W., and McDonald, A.T., John Wiley.

4) Flow through Open Channels, Srivastava, R., Oxford University Press.

5) Irrigation and Water Resources Engineering, Asawa, G.L.,New Age International Ltd.

CE 362: Hydraulic Engineering Sessional
3 hours in a week, 1.50 Cr.

Broad-crested weir; sluice gate; venturi flume; parshall flume; cutthroat flume; hydraulic jump; velocity distribution profile; Manning's roughness coefficient; specific force and specific energy; Channel expansion and contraction studies, Small surges and wave experiments, Flow measurements in open channels.

Suggested Readings:

1) Laboratory Work in Hydraulics, Lamox W.R. : Granada Publishers, London 1979.

2) Engineering Fluid Mechanics Vol. II, S. Narasimhan (Ed.) : Orient Longmans Ltd., New Delhi, 1973.

3) Fluid Mechanics, V.L. Streeter, E.B. Wylie, McGraw Hill, 1985.

CE 363: Engineering Hydrology
3.00 credit, 3 hrs/week.

Hydrologic cycle; hydrologic measurement: precipitation, evaporation and stream flow; rainfall-runoff relations; hydrographs; application of telemetry and remote sensing in hydrologic data acquisition; flood routing, statistical methods in hydrology; ground water hydrology.

Suggested Readings:

1) Applied Hydrology-V. T. Chow, David R Maidment, Larry (McGraw-Hill Book Company)
2) Engineering Hydrology (2nd Edition)-K. Subramanya (Tata McGraw-Hill Publisher, India)

6.5 Advance Civil Engineering Elective Courses

CE 400: Project and Thesis
4.50 credit, 9 hrs/week.

Experimental and theoretical investigation of various topics in structural engineering, environmental engineering, transportation engineering and geotechnical engineering; Individual or group study of one or more topics from any of the above fields; the students will be required to submit thesis/project report at the end of the work.

CE 402: Application of GIS in Civil Engineering
1.5 credits, Lab 3.0 hours/week

Introduction: Scope, Fundamentals of GIS, Maps and Map Projections; Scale and Coordinate system

GIS data: Distinguish the different types of data used in a GIS, Vector Data Structures; Raster Structures; Sources of GIS data, Understand the concept of spatial data; Identify the different types of attributes (such as nominal, ordinal, interval, ratio); Know the main geographical data formats (such as coverage, geodatabase, shapefile, grid, dxf, dwg, geotiff, GML)

Data Acquisition: Digitizing, Editing; Vectorize, Rasterize, Attribute data, Managing Attribute Tables; Attribute Queries; Relational database

Spatial Analysis: Raster spatial analysis, Single layer vector spatial analysis, Multi-layer; Vector spatial analysis, Attributes based analysis; Application of GIS in Engineering and Environmental Modeling.

Suggested Readings:

1) Digital elevation model technologies and applications: The DEM users manual:; Manual of Remote Sensing: ASPRS; David F. Maune, 2002

2) Individual lab manual will be prepared and supplied by the course instructor.

CE 410: Concrete Structures Design Sessional II
1.50 credit, 3 hrs/week.

Computer applications in the analysis of buildings and PC girder bridges; design of multistoried RCC frame residential building and simple span PC girder bridge.

Suggested Readings:

1) AASHTO Bridge Design Manual 2002

2) Design of Concrete Structures (10th Edition)-George Winter, Nilson (McGraw-Hill Higher Education)

3) Design of Bridges-N. KrishanaRaju (Oxford & IBH Publishing Co, New Delhi)

4) Different Manuals From AISC/AREA can be used as guideline as well

5) Individual lab manual will be prepared and supplied by the course instructor.

CE 412: Computer Aided Structural Analysis and Design Lab II
1.50 credit, 3 hrs/week.

Computer aided analysis and design of various reinforced concrete and steel structures, e.g. high-rise building, modular bridge, water tower etc. Us

CE 413: Introduction to Steel-Concrete Composite Structures
2.00 credit, 2 hrs/week.

Introduction to composite structures; advantages of composite construction; interaction between steel and concrete, shear connectors, elastic analysis of composite beams, beam-column connections, behavior of different types of composite columns, axial load capacity and interaction diagrams for composite columns.

CE 415: Prestressed Concrete
2.00 credit, 2 hrs/week.

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.

Suggested Readings:

1) Prestressed Concrete, T. Y. Lin, NED H Burns, 3rd Edition.

CE 416: Computer Aided Structural Analysis and Design Lab III
1.50 credit, 3 hrs/week.

Introduction to tall building in different countries of the world; Application of computer aided analysis and design softwares in tall building design; design of a six storied residential building or high rise office building.

CE 419: Introduction to Finite Element Method
2.00 Credit, 2 hrs/week

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

Suggested Readings:

1) Introduction to Finite Element In Engineering-Chandrupatla, D. Belegundu (Prentice-Hall, Inc.)
2) Theory & Problems of Finite Element Analysis-Georg R. Buchanon (McGraw-Hill Book)

CE 421: Dynamics of Structures
2.00 Credit, 2 hrs/week

Single degree of freedom system, formulation of equation of motion; free vibration response; response to harmonic, impulse and general dynamic loading; vibration analysis by Rayleigh's method; response spectra; two degrees of freedom system.

Suggested Readings:

1) Dynamics of Structures, by Clough and Tenzial.

CE 431: Design of Water Supply, Sanitation and Sewerage Systems
1.50 credit, 3 hrs/week.

Design of water supply and sewerage system: estimation of industrial, domestic and fire demands, designing deep tubewell and water distribution network; estimation of industrial, domestic and commercial wastewater generation, wastewater network design; household plumbing system design; design of water and wastewater treatment plant; computer application in environmental engineering; field visits and reporting.

CE 432: Environmental Engineering Sessional II
1.50 credit, 2 hrs/week.

Design of water supply and sewage system; design of water and wastewater treatment plant; computer application in environmental engineering; field visits and reporting

Suggested Readings:

1) Class notes and reference material will be provided during lectures, either in softcopy or hardcopy forms. A hardcopy laboratory manual will also be made available.

CE 433: Solid and Hazardous Waste Management
2.00 credit, 2 hrs/week.

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

Hazardous Waste Management: identification, sources and characteristics of hazardous wastes; hospital waste management practices; legal aspects; auditing and prevention; methods of treatment and disposal; physical, chemical, biological and thermal treatment; stabilization and solidification, engineering storage, incineration, landfill and deep burial.

Suggested Readings:

1) Environmental Engineering-Peavy, Rowe, Tchobanoglous (McGraw-Hill Inc.)
2) Hazardous Waste Management (2nd Edition)-Lagrega, Buckingham, J. Evans (McGraw-Hill Book Company)

CE 435: Environmental Pollution Management
2.00 credit, 2 hrs/week.

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

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

Suggested Readings:

1) Introduction To Environmental Engineering & Sciences (2nd Edition)-Gilbert M. Masters (Prentice-Hall of India)
2) An Introduction To Water Quality & Pollution Control (2003)-Kenneth Vigil (Oregon State University Press)

CE 437: Sustainable Development and Environmental Impact Assessment
2.00 credit, 2 hrs/week.

Environment and development projects: environment and sustainable development; environmental policies and legislation; environmental implication of sectoral development; environmental quality standards; environmental issues and priorities; environmental impact assessment of development schemes-baseline studies, assessment methodologies; economics of environmental management; contemporary issues; case studies.

Suggested Readings:

1) Applied Contaminant Transport Modelling, C. Zheng, Kluwer Publications, Dordrecht, 1995.
2) Environmental Impact Analysis Handbook, Rau G. J. and Wooter C. D., McGraw-Hill, 1980.
3) Environmental Impact Assessment for Developing Countries, A. K. Biswas and Q. Geping, Tycooly International Publications, London, 1985.
4) Environmental Impact Assessment, Canter L.W., McGraw-Hill, New York, 1977.
5) Environmental Impact Assessment, Larry W. Canter (McGraw-Hill Book Company)
6) Impact Assessment and Environmental Planning, Westman W.E., Ecology, John Wiley, 1985.
7) Integrated Risk Assessment, Applications and Regulations, M. G. Stewart (Ed.), Balkema Publications, Rotterdam, 1998.
8) Mathematical Modelling of Groundwater Pollution, S. Ne-Zheng, Springer Verlag, New York, 1995.
9) Measurements and Modelling in Environmental Pollution, R. S. Jose and C. A. Brebbia (Ed.), Comp. Mech. Publ., Barcelona, 1997.
10) W. E. Westman, Ecology, Impact Assessment and Environmental Planning, John Wiley, New York, 1985.
11) Water Quality: Prevention, Identification and Management of Diffuse Pollution, V. Novotny, Van Nostrand Reinhold, New York, 1994.

CE 441: Foundation Engineering
2.00 credit, 2 hrs/week.

Soil investigation techniques; types of foundations; bearing capacity of shallow and deep foundations; settlement and distortion of foundations; design and construction of footings, rafts and piles; slope stability analyses.

Suggested Readings:

1) Foundation Analysis & Design-Joseph E Bowles (McGraw-Hill Book Company)
2) Foundation Design & Construction-W.C Teng (McGraw-Hill Book Company)
3) Geotechnical Engineering: Principles & Practice-Donald P. Coduto (Prentice-Hall of India)
4) Soil Mechanics & Foundations (13th Edition)-B.C. Punmia (Laxmi Publication, New Delhi)
5) Principles of Geotechnical Engg (6th Edition)-B.M.Das (Thomson Books/Cole.)
6) Craig's Soil Mechanics., Craig RF., Taylor and Francis, New York, USA.

CE 442 : Geotechnical Engineering Sessional II
1.50 credit, 3 hrs/week.

Computer aided design of foundations: footing, pile and pile cap, pier, raft/mat foundations and caisson; retaining structures: shore pile, abutment, retaining walls; reinforced soils. Introduction to PLAXIS.

Suggested Readings:

1) Foundation Analysis & Design-Joseph E Bowles (McGraw-Hill Book Company) Individual lab manual will be prepared and supplied by the course instructor.

CE 443: Earth Retaining Structures
2.00 credit, 2 hrs/week.

Foundation of structures subjected to lateral loads; rigid and flexible earth retaining structures; methods of construction: dewatering and slurry-wall construction, braced excavation, sheet piles, cofferdams, caissons.

Suggested Readings:

1) Foundation Analysis & Design-Joseph E Bowles (McGraw-Hill Book Company)
2) Foundation Design & Construction-W.C Teng (McGraw-Hill Book Company)
3) Vibration Theory (1998)-Louis V. Schmidt (Aiaa Education Series)
4) Principles of Geotechnical Engg (6th Edition)-B.M.Das (Thomson Books/Cole.)

CE 445: Elementary Soil Dynamics
2.00 credit, 2 hrs/week.

Elementary vibrations; dynamic properties of soil; seismic response of soils: site effects, site amplification, liquefaction problems, remedial measures and earthquake hazards.

Suggested Readings:

1) Foundation Analysis & Design-Joseph E Bowles (McGraw-Hill Book Company)
2) Foundation Design & Construction-W.C Teng (McGraw-Hill Book Company)
3) Geotechnical Engineering: Principles & Practice-Donald P. Coduto (Prentice-Hall of India)
4) Soil Mechanics & Foundations (13th Edition)-B.C. Punmia (Laxmi Publication, New Delhi)
5) Principles of Geotechnical Engg (6th Edition)-B.M.Das (Thomson Books/Cole.)

CE 451: Traffic Engineering Design and Management
2.00 credit, 2 hrs/week.

Advanced concepts of traffic management, management strategies; analysis of traffic flow characteristics; traffic control devises; intersection control and design; grade separation and interchanges; computer application in traffic system analysis; introduction to micro simulation and ITS; NMT issues and road safety.

Suggested Readings:

1) Highway Engineering (7th Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.)
2) Traffic Engineering & Transportation Planning (2nd Edition)-L.R. Kadiyali (Khanna Publishers)
3) Highway-Traffic Planning & Engineering-C.A. O'Flaherty (Edward Arnold, UK)
4) The Institute of Transportation Engineers, Transportation & Traffic Engineering Hand Book, Prentice-Hall (1982)
5) Principles of Transportation Engineering, Chakroborty, P. and Das, A Prentice Hall of India, 2003
6) Traffic & Highway Engineering, 3rd Ed., Garder, N.J. and Hoel, L.A Brooks/Cole, Pacific Grove, 2001
7) A Policy on Geometric Design of Highways and Streets, 5th Ed., American Association of State Highway and Transportation Officials (AASHTO), AASHTO, 2004

CE 452: Transportation Engineering Sessional II: Pavement Design and Traffic Studies
1.50 credit, 3 hrs/week.

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

Suggested Readings:

1) The Institute of Transportation Engineers, Transportation & Traffic Engineering Hand Book, Prentice-Hall (1982)
2) A Policy on Geometric Design of Highways and Streets, 5th Ed., American Association of State Highway and Transportation Officials (AASHTO), AASHTO, 2004

CE 453: Pavement Management, Drainage and Airport
2.00 credit, 2 hrs/week.

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.

Suggested Readings:

1) Highway Engineering (7th Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.)
2) Planning & Design Of Airports (4th Edition, 1994)-Robert Horonjeff, McKelvey (McGraw-Hill Book Company)
3) Feredal Aviation Administration (FAA) Guidelines.

CE 455: Urban Transportation Planning and Management
2.00 credit, 2 hrs/week.

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

Suggested Readings:

1) Transportation Engineering & Planning (3rd Edition)-C.S. Papacostas, Prevedouros (Prentice-Hall of India)
2) Highway Engineering (7th Edition)-Paul H. Wright, Karen Dixon (John Wiley & Sons, Inc.)
3) Documents on Traffic Engineering Administration and Legislation in Courtesy of RHD, LGRD, City Corporation, Planning Commission
4) Principles of Transportation Engineering, Chakroborty, P. and Das, A Prentice Hall of India, 2003
5) Traffic & Highway Engineering", 3rd Ed., Garder, N.J. and Hoel, L.A Brooks/Cole, Pacific Grove, 2001
6) McShane W.R, Roess R.P., Prassas, E.S., "Traffic Engineering", 2nd Ed., Prentice Hall 1998
7) A Policy on Geometric Design of Highways and Streets, 5th Ed., American Association of State Highway and Transportation Officials (AASHTO), AASHTO, 2004

CE 461: Irrigation and Flood Control
3.00 credit, 3 hrs/week

Importance of irrigation; source and quality of irrigation water; plant-soil-water relationship; consumptive use and estimation of irrigation water requirements; methods of irrigation; problems of irrigated land; Irrigation canal system planning and design; Irrigation structures; Irrigation pumps; problems of irrigated land; flood and its management.

Suggested Readings:

1) Irrigation Engineering & Hydraulic Structures (17th Edition, 2003)-Santosh K. Garg (Khanna Publishers)
2) Flood Control & Drainage, S. N. Ghosh
3) Flood in Bangladesh, Mohiuddin Ahmed
4) Irrigation Principles & Practices-V. Hansen, W. Israelsen, Stringham (John Wiley & Sons, Inc.)
5) Irrigation Water Management Principles & Practice-D. K. Majumder, (Prentice-Hall of India Pvt. Ltd)

CE 465: Flood Mitigation and Management
2.00 credit, 2 hrs/week.

Flood and its causes; methods of flood management: structural and non structural measures such as reservoirs, levees and flood walls, channel improvement, interior drainage, floodways, land management, flood proofing, flood zoning, flood hazard mapping, flood forecasting and warning.

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

Suggested Readings:

1) Flood Control & Drainage, S. N. Ghosh
2) Flood in Bangladesh, Mohiuddin Ahmed
3) Irrigation Engineering & Hydraulic Structures (17th Edition, 2003)-Santosh K. Garg (Khanna Publishers)
4) Irrigation Principles & Practices-V. Hansen, W. Israelsen, Stringham (John Wiley & Sons, Inc.)
5) Irrigation Water Management Principles & Practice-D. K. Majumder, (Prentice-Hall of India Pvt. Ltd)

CE 467: Groundwater Engineering
2.00 credit, 2 hrs/week.

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.

Suggested Readings:

1) Ground Water Hydrology, David Keith Todd.
2) Ground Water Hydrology, Bouwer Herman.
3) Ground Water Hydrology, H M Raghunath.
4) Ground Water Hydrology, J G M Uffink.

CE 469: River Engineering
2.00 credit, 2 hrs/week.

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

Suggested Readings:

1) Irrigation Engineering & Hydraulic Structures (17th Edition, 2003)-Santosh K. Garg (Khanna Publishers)
2) Petersen, M.S. (1986). River Engineering. Prentice-Hall
3) Graf, W.H: Hydraulics Of Sediment Transport, McGraw-Hill
4) R.J.Grade, K.G.RangaRaju:Mechanics of Sediment Transportation & Alluvial Stream Problems. (2nd Edition), Wiley Eastern Ltd.

CE 471: Hydraulic Structures
2.00 credit, 2 hrs/week.

Principles of design hydraulic structures, types of hydraulic structures; design of dams, barrages, weirs, spillways, energy dissipators and spillway gates; cross drainage works.

Suggested Readings:

1) Irrigation Engineering & Hydraulic Structures (17th Edition,2003)-Santosh K. Garg (Khanna Publishers)
2) Text Book of Irrigation Engineering & Hydraulics Structures-R.K. Sharma (Oxford and IBH Publishing, New Delhi)
3) Different Design Manual/Handbook/Annual Reports of Bangladesh Water Development Board.
4) Hydrologic Analysis and Design by Richard H. McCuen, Prentice Hall, New Jersey, USA.
5) Applied Hydrology by V. T. Chow, David Maidment, and Larry Mays, Tata McGraw Hill, New Delhi, India.
6) Hydraulic Design Handbook by Larry W. Mays, McGraw Hill

CE 472: Water Resources Engineering Sessional I: Hydraulic Structures Design
1.50 credit, 3 hrs/week.

Design of hydraulic structures, river training works; groundwater resource assessment and water well design

Suggested Readings:

1) Applied Hydrology by V. T. Chow, David Maidment, and Larry Mays, Tata McGraw Hill, New Delhi, India.
2) Different Design Manual/Handbook/Annual Reports of Bangladesh Water Development Board.
3) Hydraulic Design Handbook by Larry W. Mays, McGraw Hill
4) Hydrologic Analysis and Design by Richard H. McCuen, Prentice Hall, New Jersey, USA.
5) Irrigation Engineering & Hydraulic Structures (17th Edition,2003)-Santosh K. Garg (Khanna Publishers)
6) Text Book of Irrigation Engineering & Hydraulics Structures-R.K. Sharma (Oxford and IBH Publishing, New Delhi)

CE 473: Coastal Engineering
2.00 credit, 2 hrs/week.

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.

Suggested Readings:

1) Basic Coastal Engineering-Robert M. Sorensen (John Wiley & Sons)
2) Coastal Engineering an Introduction To Ocean Engineering (1978)-K. Horikawa (University of Tokyo Press)

3) Introduction To Coastal Engineering & Management (1999)-J.W.Kamphuis (World Scientific Publishing)
4) Coastal Processes With Engineering Applications (2001)-R.G. Dean, and R. Dalrymple (Cambridge University Press)
5) Principles of water resource planning, Alvin S Goodman,
6) Water resource planning and management, Otto J Helweg.
7) Water resource management, Larry W Mays.

CE 474: Water Resources Engineering Sessional II: Computation Tools for Watershed Modeling
1.50 credit, 3 hrs/week.

Basic principles of hydrologic modeling are practiced in detail. Concepts of watershed, flood-plains delineation, hydrologic impact, design studies, and GIS; Watershed modeling using USACE (HEC) software tools (HEC-HMS, and HEC-RAS) along with their associated GIS interfaces.

Suggested Readings:

1) Mathematical Modelling of Groundwater Pollution, S. Ne-Zheng, Springer Verlag, New York, 1995.
2) Measurements and Modelling in Environmental Pollution, R. S. Jose and C. A. Brebbia (Ed.), Comp. Mech. Publ., Barcelona, 1997.

6.6 Civil Engineering Professional Practice Courses

CE 301: Professional Practices and Business Communication
3.00 credit, 3 hrs/week.

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; tender procedure; claims, disputes and arbitration procedure; measures for reducing fiduciary risks; World Bank and ADB's operational policy and procedures.

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, interviews and follow-ups; an introduction to the code of ethics for engineers.

Application of communication theory and professional practice approaches in a controlled class room environment; this may include case study analysis, role playing, preparing small reports and proposals, class room presentations and individual reports etc.

Suggested Readings:
1) Communication for Business, 3rd edition, Shirley Taylor, (1999), Pearson education Ltd.
2) Effective Business Communication: Principles and Practices for the Information Age, Richard Blundel, Prentice Hall.
3) Basic Business Communication, Raymond V. Lesikar,
4) Management Information Systems, David Kroevke
5) Essentials of Business Communication, 10th edition, Rajendra Pal & J. S. Korlahalli, (2005).
6) Modern Production and Operations Management, Buffa E.S
7) Project Management: A Systems Approach to Planning, Scheduling & Controlling (7th Edition)-Harold Kerzner (John Wiley & Sons)

CE 401: Project planning and Management
3.00 credit, 3 hrs/week.

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

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

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

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

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

Suggested Readings:

1) Operations Research: An Introduction. Hamdy A. Taha. McMillan
2) Applied Systems Analysis, Richard de Neufville. McGraw Hill
3) Project Management: A Systems Approach to Planning, Scheduling & Controlling (7th Edition)-Harold Kerzner (John Wiley & Sons)
4) Production Systems: Planning Analysis & Control (3rd Edition)-James L. Riggs (John Wiley & Sons, New York)
5) Construction Project Management 4th Edition (August 2000)-Richard H. Clough, G.A. Sears, (John Wiley & Sons)

CE 403: Socio-economic Aspects of Development Projects
2.00 credit, 2 hrs/week

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

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

Productivity; land loss, land use and land ownership patterns; fisheries and aquaculture; deforestation and afforestation; communication, commerce, industries and other economic benefits; water supply, sanitation, health and nutrition; inequalities in distribution of benefits and losses

Socio-economic impact assessment approach; socio-economic survey; case studies.

Suggested Readings:

1. Personnel Management and Industrial Relations and Labor Welfare, V. Ghosh
2. Individual lab manual will be prepared and supplied by the course instructor.

CE 405: Business and Career Development
2.00 credit, 2 hrs/week.

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.

Suggested Readings:

1. Introduction to Business, Straub and Attner,
2. A Practical Introduction to Business, Koontz and Fulmer,
3. An Introduction to Business, F. T. Haner et at.,
4. A hardcopy laboratory manual will also be made available.

CE 406: Law and Ethics for Engineers
2.00 credit, 2 hrs/week.

The Bangladeshi legal system from an engineer's perspective; Socratic-method analysis of statutory and case law; Contract, patent, corporation, antitrust, property, and environmental laws; Development of law, courts, and ethics; law on contracts, agency, sales, property, and patterns; specifications; preparation of contract documents; Coverage of following topics: Contracts: Definitions and essentials; Conditions: 3rd parties and law; Construction: Performance/Breach/Damages and Contracts; General Conditions: Proposals, advertisements and applications; Financial Considerations: Loans and leans; Specifications: Workmanship, material, drawings; Agencies: Partnerships and corporations; Torts: Limited coverage; Professional liability: Insurance, bonds, property; Litigation: Evidence, expert witness, mediation, ethics, resettlement and land acquisition principles; Trade Unions and CBA; Labor Court.

Overview of Bangladeshi legal system: Law of Contract (1872); The Sale of Goods Act (1930); Carriage of Goods Act; The Negotiable Instruments Act (1881); The Insurance Act (1938); The Partnership Act (1932); The Company Act (1994); The Insolvency Act (1997); Bank & Insurance Company act; The Factories Act (1965); The Payment of Wages Act (1936); The Industrial Relation Ordinance (1969).

Suggested Readings:

1) Commercial and Industrial Law, 26th edition, A.K. Sen & J. K. Mitra, (2006)
2) Labour and Industrial Law, A. Khan
3) Business Law, Mafizul Islam

4) Labour and Industrial Law, A. A. Khan
5) Integrated Risk Assessment, Applications and Regulations, M. G. Stewart (Ed.), Balkema Publications, Rotterdam, 1998.
6) Individual lab manual will be prepared and supplied by the course instructor.

6.7 Humanities and Social Science Courses

ENG 101: English Fundamentals
2.00 Credit, 2 hrs/week.

Introduction: current approaches to learning english, communication today.

Phonetics: phonetics and correct english pronunciation.

Syntax: vocabulary, diction and english sentence; sentence variety and style; grammatical problems.

Reading skill: readability, reading strategies, generating ideas through purposive reading, reading of selected stories, comprehension.

Writing skill: principles of effective writing; generating ideas, planning, organization and development of writing; composition, precise.

Written communication: business communication, tenders and quotations, journal articles, report.

Oral communication: dialogue, technical and scientific presentation.

Suggested Readings:

1) Prose of Our Time-Ahsanul Haque, Serajul Islam Chowdhury & M. Shamsuddoha; Nawroze Kitabistan Banglabazar, New Market.
2) A Guide to Correct speech- S.M. Amanullah; Okkar, New circular Road, Banglabazar.
3) Business Correspondence and Report Writing –R.C. Sharma & Krishna Mohan; Tata McGraw- Hill Publishing Company Ltd.
4) Simon Schusten & Handbook- Lynn Quitman Troyka; Prentice Hall of India Private Ltd.

ENG 102: Developing English Language Skills
1.50 Credit, 3 hrs/week.

Reading skill: skimming, scanning, predicting, inferring; analysis and interpretation of texts; comprehension from literary and non-literary texts.

Writing skill: product approach, process approach: brain storming, self-evaluation, peer evaluation, revision/rewriting, teacher's evaluation; techniques of writing: comparison and contrast, problem and solution, cause and effect, classification, illustration; writing paragraph, essay and report.

Listening skill: listening to recorded texts; learning to take useful notes and answering questions.

Speaking skills: dialogue in peer work; participation in discussion and debate; extempore speech; narrating events; story telling; presentation.

Hum 113: Economics
2.00 Credit, 2 hrs/week.

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

> *Suggested Readings:*
> 1) Principles of Microeconomics, 7th ed., by Stephen l. Slavin
> 2) Economics today: The macro view, 13th edition by Roger Leroy Miller
> 3) Macroeconomics, 7th ed., by Stephen l. Slavin

Hum 213: Principles of Accounting
2.00 Credit, 2 hrs/week.

Financial accounting: objectives and importance of accounting; accounting as an information system; basic accounting principles; accounting equation; recording system; accounting cycle; journal, ledger, trial balance; preparation of financial statements considering adjusting entries; financial statement analysis and interpretation.

Cost accounting: cost concepts and classification; cost-volume-profit analysis; contribution margin approach and its application, break-even analysis, target profit analysis, operating leverage; absorption costing vs variable costing; job order costing; capital budgeting; long run planning and control.

> *Suggested Readings:*
> 1) Financial Accounting: Weygandt & Keiso, latest edition.
> 2) Cost Accounting Planning and Control: Matz&Usry, South-Western Publishing, 8th edition.
> 3) Management Accounting: Garison&Noren, McGraw Hill Publishing, 10th edition.

SOC 113: Bangladesh Studies and Government
2.00 Credit, 2 hrs/week.

Basic concepts of government and politics: forms of government; organs of government-legislature, executive, judiciary; functions of government; democracy; socialism; welfare state; bureaucracy; good governance; e-government.

Government and politics of Bangladesh: major administrative reforms; major amendments to the constitution- non-party caretaker government; local government; public policies; non government organizations (NGOs); managing development project- planning, implementation, monitoring and evaluation; constitutional bodies- election commission, comptroller and auditor general, public service commission; foreign policy of Bangladesh. Regional and international organizations: SAARC, ASIAN, UNO.

> *Suggested Readings*:
> 1) Bangladesh: History and Culture (South Asian Studies) by S. R. Chakravarty and VirendraNarain**.**
> 2) Ancient Bangladesh: A Study of the Archaeological Sources by Dilip K. Chakrabarti, S. DaraShamsuddin, and M. ShamsulAlam.

SOC 255: Sociology
2.00 Credit, 2 hrs/week.
Nature, scope and perspectives of sociology; stages of social research and research methods; culture and civilization; socialization and personality development; globalization; media and individual; social organization and social problem; social stratification; industrial revolution, capitalism and socialism; work and economic life; environment and human activities; climate change and global risk; population and human society; urbanization and city development; social change and technology.

        Suggested Readings:
1) Sociology, 5th ed., by Anthony Giddens.
2) Foundation of Modern Sociology, by Meta spencer.
3) Sociology: A guide to Problems and Literature, by T.B. Bottomore.
4) Sociology, by Robertson.