DEPARTMENT OF CIVIL ENGINEERING

AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

BULLETIN FOR THE POSTGRADUATE DEGREE PROGRAMS

(INFORMATION BOOKLET ON SYLLABUS, RULES AND REGULATIONS)

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Disclaimer

Preface to Bulletin 2018

I am pleased to introduce the first edition of the Booklet for Postgraduate Studies. This booklet presents an overview of the postgraduate study and research program of the Department of Civil Engineering.

General information about the University, facilities available to the students, list of the faculty members, admission requirements, academic rules and regulations, detail outline of the postgraduate courses offered by the department have been presented in this booklet.

The information herein may be changed or modified from time to time by the proper authority of this university to meet the latest and prospective developments. Such changes and modifications will be informed to the students by the authority. Students are, therefore, strongly advised to be in touch with the PG coordinator, and/or their Advisor(s)/Supervisor(s).

I would like to thank all the members of the Editorial Committee and other Professors of this Department for their sincere efforts in preparing the booklet.

It is hoped that the information booklet will be very useful to the postgraduate students as well as the Students' Adviser(s)/Supervisor(s) and other teachers related to the postgraduate program of the Department of Civil Engineering for smoothly carrying out the postgraduate academic activities.

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Ahsanullah University of Science and Technology (AUST) is the first private University of Engineering and Technology in Bangladesh. On 2 May, 1995 the Govt. of Bangladesh formally approved the establishment of Ahsanullah University of Science and Technology in Dhaka under the Private University Act of 1992. The University is striving not only to maintain high quality in teaching and research but also to render community services through dissemination of information, organization of training programs and other activities. At present there are three faculties in the University, namely, Faculty of Architecture and Planning, Faculty of Engineering and Faculty of Business and Social Science. All the departments under Engineering Faculty offer degrees in different fields related to Engineering and Technology. The University is aimed to take the leadership in promoting technological developments and management of the nation by strengthening engineering and technological education and research.

In addition, the Department of Arts and Sciences provides support services to all departments in this university. Some of the departments offer either Undergraduate (UG) or Postgraduate (PG) degrees, while the other offer both the UG and PG degrees. The degrees offered by the departments under Faculty of Engineering are given below:

Faculty of Engineering:

Department of Computer Science and Electronics (CSE)	UG
Department of Electrical and Electronics (EEE)	UG & PG
Department of Civil Engineering (CE)	UG & PG
Department of Textile Engineering (TE)	UG
Department of Industrial and Production Engineering (IPE)	UG
Department of Mechanical and Production Engineering (MPE)	UG

The postgraduate courses are designed to meet the growing needs of engineering professions as well as further development of different specialized subjects as mentioned in course curriculum.

The University also provides, at a reasonable cost, Postgraduate education characterized by academic excellence in a range of subjects that are particularly relevant to the present and anticipated needs of the society. It aims to provide students with opportunities, resources and expertise to achieve academic excellence within stimulating and supportive environment. The university was sponsored by Dhaka Ahsania Mission (DAM), the largest Bangladeshi NGO involved in very extensive programs in education, health and socio-economic development sectors in the country acquired. DAM plays an active role in a number of national and international forums and organizations and has a Consultative Status with UNESCO.

The Campus:

The campus of the University has been constructed on a 72000 square feet (6693 sq. m) plot of land in Tejgaon Industrial Area which is located at the heart of Dhaka City and the area is due to change from an industrial to a commercial land use in the years ahead.

At present an 8-storied building comprising of four interconnected blocks with two basements has been constructed within own land. The total floor area is more than 400,000 square feet (37,180 sq. m). The basements can accommodate about 200 cars.

Facilities:
The building has sufficient space for accommodation for all kinds of facilities to be needed for the University. The following facilities are available here:

a. Office space for administration and management.
b. Requisite class rooms for all the academic disciplines.
c. Laboratory/Workshops.
d. Central library.
e. Common rooms for students (male and female).
f. Health care centre.
g. Prayer room.
h. Book shop, Indoor games and Cafeteria.
i. Other facilities according to the requirement of the University

Civil Engineering Department

Traditionally Civil Engineering deals with a large diversity of engineering problems. Because of its general nature, Civil Engineering allows a number of multidisciplinary activities to be conventionally organized within it. In this University the Department of Civil Engineering was established in 1995. The total enrolment in the 4-year B.Sc. Engineering program is about 1000. A class size of about 50 students is maintained for effective teaching. The B.Sc. Engg. degree offered by the Civil Engineering Department is officially recognized by the Institution of Engineers, Bangladesh. There are now 51 full-time faculty members including eight professors. The department started postgraduate program from Spring 2011 semester. In this department, the existing total number of PG students are around 73. The Department offers basic and advanced regular and optional courses in the area of Structural Engineering, Geotechnical Engineering, Environmental Engineering, Concrete Technology, Transportation Engineering and Water Resources Engineering. The Department established all laboratories, namely, Strength of Materials Lab, Concrete Lab, Transportation Lab, Geotechnical Lab, Environmental Engineering Lab, Fluid Mechanics and Hydraulics Lab, Auto CAD Lab and Surveying Lab with modern and sophisticated equipments to support all teaching and research works of the Department.

In Civil Engineering Department, the postgraduate program is dynamic. The department offers courses from major five specialized fields for postgraduate programs, namely, Structural Engineering, Geotechnical Engineering, Environmental Engineering, Transportation Engineering and Water Resources Engineering. The postgraduate program leads to the degree of Master of Science in Civil Engineering abbreviated as M. Sc. Engg. (Civil) and Master of Engineering in Civil Engineering abbreviated as M. Engg. (Civil).

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A. Committee for the Advanced Studies and Research (CASR)

- The CASR consists of the following members:
  (i) The Vice-chancellor
  (ii) The Deans of the faculties
  (iii) One professor from each PG. degree-offering department
  (iv) Two experts to be nominated by the Academic Council from the suggestions of the Vice-chancellor

- The functions of the CASR are as follows:

  (i) To advice the teaching departments on all matters connected with promotion of advanced studies and research.

  (ii) To consider the proposals for research submitted by the different departments of the university for approval.

  (iii) To consider the proposals submitted by different departments for introduction of advanced study courses, research requirements and PG degrees in particular subject or subjects for approval.

  (iv) To consider the recommendations of the BPGS concerning the proposal of a post graduate student for Research, project work or special study/report etc. for approval.

  (v) To consider the recommendations of the BPGS for supervisor and co-supervisor (if any) for a postgraduate student for approval.

  (vi) To consider for approval of the constitution of the Examination committee by the BPGS for a postgraduate student.

  (vii) To arrange for the publication of research reports and bulletins.

  (viii) To do such other things as may be assigned or referred to it by the Vice chancellor, the syndicate or the Academic Council.

B. Board of Postgraduate Studies (BPGS)

- The Board of Postgraduate Studies consists of:
  (i) All professors and Associate Professors of the Department concerned having a postgraduate degree
  (ii) All Assistant professors having Postgraduate degree and offering postgraduate courses
  (iii) Any other departmental or extra departmental teachers who offer a course will be invited as and when necessary to attend the BPGS meeting
  (iv) Two experts to be suggested by the BPGS to the Academic council for

nomination

- The Head of the Department concerned is the chairman and convener of the BPGS.
- The responsibilities and duties of the BPGS in relation to the departments concerned are as follows:

  (i) To recommend to the Academic Council the rules for admission to the university for Postgraduate study under the department.

  (ii) To modify these rules, or add new one, if need be, and place before the Academic council for approval.

  (iii) To constitute the Admission Committee for selecting candidates for admission to the Postgraduate program of the department and place before the Academic Council for approval.

  (iv) To assign an advisor to a student from the teachers of the department not below the rank of an Assistant Professor having a postgraduate degree and place it before the Academic Council for information.

  (v) To review the curriculum from time to time and propose any modification, if necessary and place it before the Academic council for information.

  (vi) To determine the courses to be offered by the department in any semester.

  (vii) To recommend a Supervisor for a postgraduate student from within the department and a Co-Supervisor, if necessary, from within the department or from outside and report to the Academic Council for approval.

  (viii) To evaluate proposal from a postgraduate student for research, for project or for special study/report etc. and recommend to the committee for Advanced Studies and Research (in case of PG degrees) or to the Vice-Chancellor (in case of PG. Diploma) for consideration and approval; Subsequently if any change becomes necessary to be made, the BPGS will consider it and report it to the CASR for approval.

  (ix) To constitute an Examination Committee for each Thesis/Project in the post-graduate degree program and an Examination Committee for each of the project/special study or report in the PG. Diploma program and report to the CASR for approval.

  (x) To do such other things as are assigned or referred to it by the Vice-Chancellor, the Academic Council or the Syndicate.

To conduct overall postgraduate program, Department of CE formed a committee named Masters' Coordination Committee and assigned a Tabulator and Students' Advisor.

A. Masters' Program Coordination Committee

- The committee consists of:
  - ❖ One Professor selected by the Head of the Department
  - ❖ Two Assistant Professors selected by the Head

- The functions of the committee are as follows:
  - ❖ To conduct admission of postgraduate students.
  - ❖ To carry out course pre-registration program.
  - ❖ To nominate a supervisor for a postgraduate student to BPGS as per preregistration applications.
  - ❖ To identify any failure of a student to proceed with the program according to rules and regulations and to take necessary measures accordingly.
  - ❖ To recommend to the BPGS the time extension of a student and conversion applications and to take necessary measures
  - ❖ To conduct course registration program
  - ❖ To conduct final examination
  - ❖ To publish result
  - ❖ To do such other things as to be assigned by the Chairman of BPGS

B. Tabulator

- The BPGS Committee assigns a Professor of Dept. of CE as a Tabulator for the postgraduate program.

- The roles of the Tabulator are as follows:
  - ❖ To prepare tabulation sheets of postgraduate students.
  - ❖ To prepare list of the students obtaining CGPA < 2.65 in every semester to observe the criteria mentioned in Article. 5.9 of rules and regulations.
  - ❖ To prepare list of students obtaining 'F' grade in three or more courses in the first two registered semesters to observe the criteria mentioned in Article. 5.8.1 of rules and regulations.
  - ❖ To prepare list of the students obtaining CGPA < 2.5 in every semester to observe the criteria mentioned in Article. 5.8.2 of rules and regulations.

- ❖ To make any changes in the grade sheet for the circumstance mentioned in Article. 6.2.

- ❖ To observe any improvement in the students' CGPA (whether CGPA improves to 2.65 or greater) from semester to semester if required.

C. Students' Advisor

- The BPGS assigns an Assistant Professor of CE Dept. as an adviser for each postgraduate student of different divisions (Structural, Environmental, Geotechnical, Transportation, and Water resources).
- The roles of Students' Advisor are as follows:

  - ❖ To check and approve his/her student's schedule for the pre-requisite courses (if required) as recommended by the selection committee and total hours.
  - ❖ To guide his/her student(s) on all academic problems.
  - ❖ To observe the progress of his/her postgraduate students.

1. Definitions

1.1 'University' means the Ahsanullah University of Science and Technology.

1.2 'Syndicate' means the Syndicate of the University.

1.3 'Vice-Chancellor' means the Vice-Chancellor of the University.

1.4 'Academic Council' means the Academic Council of the University.

1.5 'CASR' means the Committee for the Advanced Studies and Research, to be constituted by the Academic Council, of the University.

1.6 'BPGS' means the Board of Postgraduate Studies, to be constituted by the Academic Council, of the University.

2. Degrees/Diploma Offered

2.1 Master of Science in Engineering

- Master of Science in Civil Engineering abbreviated as M. Sc. Engg. (Civil)

2.2 Master of Engineering

- Master of Engineering in Civil Engineering abbreviated as M. Engg. (Civil)

2.3 Postgraduate Diploma

- Postgraduate Diploma in Civil Engineering abbreviated as PG. Dip. (CE)

3. Admission Requirements

For admission to the courses leading to Masters degree a candidate:
(i) Must have at least 50% marks or CGPA of a minimum of 2.50 out of 4.0 or its equivalent in B. Sc. Engg. or its equivalent examination in the relevant branch.
(ii) Must have a minimum Grade Point Average (GPA) of 3.50 out of 5.0 or a first division or equivalent in any one of the S. S. C. and H. S. C. or in equivalent examinations and must not have a GPA less than 2.00 out of 5.0 or a third division or equivalent in any of the aforementioned examinations.

4. Admission Procedure

4.1 Applications for admission to the above programs shall be invited before commencement of each semester through regular means of advertisement and received by the registrar.

4.2 On the recommendation of the appropriate BPGS the academic council shall frame the rules for admission to the university for M.Sc. Engg. / M. Engg. / PG. diploma programs from time to time.

4.3 There shall be a selection committee in each department as constituted by the respective BPGS on the recommendation of the Head of the Department.

4.4 Before being finally selected for admission, a candidate may be required to appear at an interview by the selection committee as constituted by the BPGS. He

will be required to take pre-requisite course(s) as may be prescribed by the committee.

4.5 Every selected candidate shall have to get himself/herself admitted to the University before the commencement of each semester on payment of prescribed fees.

4.6 After admission each student shall be assigned by the appropriate BPGS, an adviser from among the teachers of the relevant department not below the rank of an Assistant Professor. In advance of each enrolment and course registration for any semester, the adviser or supervisor shall check and approve his student's schedule for subjects, pre-requisites as recommended by the selection committee and total hours. A student can take a maximum of 30% of the course(s) from other departments consulting with his/her Advisor/Supervisor. The student is expected to consult his/her adviser/supervisor on all academic problems but, it is the responsibility of the individual student to see that his/her schedule conforms to the academic regulations.

5. Academic Regulations

5.1 There shall be two semesters in one academic year.

5.2 The courses of study in a department shall be proposed by the respective BPGS and approved by the academic council. The BPGS may review the curriculum from time to time and propose for any modification if necessary.

5.3 The courses to be offered by a department in any semester shall be determined by the respective department.

5.4 Academic progress should be assessed in terms of credit hours earned by the students. One credit hour theoretical course shall normally require one lecture per week during one semester while one credit hour of laboratory/ sessional/project/thesis work should normally require two hours of laboratory/sessional/project/thesis work per week in a semester. The number of credit hours for each course shall be specified in the syllabus of the respective department.

5.5 **Status of a student**

There shall be two categories of students, namely,

(i) Full-time: A full-time student shall not ordinarily be an employee of any organization. However, employees serving in different organizations may be registered as full-time students with prior permission from the concerned authority/employer. A full-time student may be employed as teaching/research assistant in this university.

(ii) Part-time: Students serving in different organizations may be admitted as part-time students with a written consent from the employer.

5.6 **Course Registration**

5.6.1 Every admitted student shall have to get himself/herself registered into the courses on payment of prescribed fees.

5.6.2 Course registration by a student must be completed within two weeks from the start of a semester, otherwise the student shall not be allowed to continue the

course in that semester.

5.6.3 A full-time student must register a minimum of 12 (twelve) credit hours and a maximum of 15 (fifteen) credit hours per semester.

5.6.4 A part-time student should register a maximum of 9 (nine) credit hours per semester.

5.6.5 A student may be permitted to withdraw and/or change his/her registered course within three working weeks from the commencement of that semester on the recommendation of his/her Supervisor (if any) and upon approval of the concerned Teacher(s) and Head of the department.

5.6.6 No student will be allowed to register a course for grade improvement. A student having an 'F' grade in any compulsory course (if any) shall be allowed to repeat the course.

5.7 **Course Duration**

5.7.1 M. Sc. Engg. / M. Engg. Degree

The minimum duration to complete the requirements of M. Sc. Engg. / M. Engg. shall be 3 (three) semesters and generally not more than 5 (five) academic years from the date of his/her admission.

5.7.2 PG. Diploma

The minimum duration to complete the requirements of PG. Diploma shall be 2 (two) semesters and generally not more than 3 (three) academic years from the date of his/her admission.

5.8 **Requirements for the Continuation of the Postgraduate Programs**

5.8.1 A student will not be allowed to continue the program if he/she obtains 'F' grade in three or more courses in the first two registered semesters.

5.8.2 A student will not be allowed to continue the program if his/her CGPA falls below 2.5 (including 'C' grades) at the end of second or any subsequent semester.

5.9 **Requirements for the Degrees/Diploma**

The following are the requirements for the Masters degrees :

5.9.1 **M. Sc. Engg.**

The following are the requirements for M.Sc. Engg. degree

(i) A student must complete at least 18 (eighteen) credit hours of course work with a minimum CGPA of 2.65, and

(ii) He/She must complete a project/thesis work of 18 (eighteen) credit hours with a "satisfactory" grade, and fulfilling the procedures and requirements as described in Article 5.8.

(iii) The minimum credit hour requirement as such is 36.

5.9.2 **M. Engg.**

(i) A student must complete at least 30 (thirty) credit hours of course work with a minimum CGPA of 2.65, and

(ii) He/She must complete a project/dissertation work of 6 (six) credit hours with a "satisfactory" grade, and fulfilling the procedures and requirements as described in Article 5.8.

(iii) The minimum credit hour requirement as such is 36.

5.9.3 **PG. Diploma**

(i) A student must complete at least 18 (eighteen) credit hours of course work with a minimum CGPA of 2.65, and

(ii) He/ She must complete a project/dissertation or special study/report work of 6 (six) credit hours with a "satisfactory" grade, and fulfilling the procedures and requirements as described in Article 5.8.

(iii) The minimum credit hour requirement as such is 24.

6. Grading System

6.1 Numerical marks may be made in answer scripts, tests, etc. for assessing the performance of the students but all the final grading shall be in letter grade/grade point as follows:

Numerical Marks	Letter Grade	Grade Point	Performance
90 % and above	A+	4.0	Excellent
≥ 80% but < 90%	A	3.5	Very Good
≥ 70% but < 80%	B+	3.0	Good
≥ 60% but < 70%	B	2.5	Average
≥ 50% but < 60%	C	2.0	Pass
Below 50%	F	0.0	Fail
Incomplete	I	-	-
Satisfactory	S	-	-
Unsatisfactory	U	-	-

6.2 On the written request from a student, a maximum of two courses, having B or C grade in each may be ignored for the calculation of CGPA. In such case the CGPA must not be less than 2.65 in the remaining courses.

6.3 Courses in which a student gets 'F' grade shall not be counted towards credit hour requirements and for the calculation of GPA.

6.4 A student shall get 'I' grade in a course with prior permission from the Head of the department if he/she is unable to complete the course due to any unavoidable circumstances. He/She has to complete the course within the next two consecutive semesters; otherwise he/she will get 'F' in that course. He/She may, however, be allowed to register that course without further payment of course registration fees.

6.5 Satisfactory ('S') and Unsatisfactory ('U') shall be used for grading of thesis/project and non-credit prerequisite courses. If, however, thesis is discontinued an 'I' grade shall be recorded.

7. Conduct of Examination for Theoretical Courses

7.1 In addition to Class Tests, Assignments, Term Papers etc. there shall be a written examination on all theoretical courses at the end of each semester. The Head of the department shall announce the date of the examination generally two weeks before its commencement. The final grade in a theoretical course shall be based on the performance of all class tests, assignments, term papers and written examination.

7.2 The respective course teacher will be solely responsible for the performance evaluation of a student as detailed in Article. No. 7.1. He/She will announce the final grade of the course within three weeks from the date of examination of that course and will also submit a copy to the Head of the Department.

7.3 The controller of examinations shall keep up-to-date records of all the grades obtained by a student in individual academic record card. The student can get an official grade sheet from the office of the Controller of Examinations.

8. Project/Thesis, Project/Dissertation & Special Study/Report

8.1 Appointment of Supervisor

8.1.1 Research work for a project/thesis or project/report or special study/report, as the case may be, shall be carried out under the supervision of a teacher, not below the rank of an Assistant Professor from the respective or from any other department of this university proposed by the Head of the department and accepted by the BPGS. A Joint Supervisor or Co-Supervisor (if necessary) may be appointed from within/outside the university recommended by the BPGS. No co-supervisor shall normally be allowed for PG. Diploma project/report or special study/report supervision.

8.1.2 In case of selecting a Supervisor/Joint Supervisor/Co-Supervisor from other than the respective department, an approval from the Supervisor's Head of the department has to be taken.

8.1.3 The Supervisor/Joint Supervisor/Co-Supervisor (if any) shall be approved by the CASR on the recommendation of the BPGS.

8.1.4 A project/thesis, project/dissertation or project/report supervisor has to be normally appointed after the completion of the first semester of a student.

8.2 **Research Proposal**

A student shall submit a research, project or special study proposal as the case may be, to BPGS through his/her supervisor(s). For both M.Sc. Engg. & M. Engg. degrees, the BPGS shall examine the proposal and recommend it to CASR, through the Head of the Department, for approval. For PG. Diploma, BPGS will follow the similar procedure except that the approval shall be taken from the Vice-Chancellor. The Vice-Chancellor will report this approval to CASR. If any change is required in the approved proposal (title, content, cost, supervisor etc), it shall be approved, by the relevant approving authority on the recommendation of the BPGS.

8.3 The research, project or special study work should normally be carried out in the university. However, if necessary, the supervisor can allow his/her student to carry out research work outside the university with the approval of the BPGS. The work schedule and financial involvement should be mentioned in the research proposal for carrying out research work.

8.4 At the end of a student's research work on the advice of the supervisor the student shall submit a thesis which must be an original contribution to Engineering and worthy of publication. Every student shall have to submit required number of printed copies of his/her thesis, dissertation or report in the approved format to the head of the department through his/her supervisor on or before a date to be fixed by the Head

of the department in consultation with the Supervisor(s).

8.5 A student shall have to make a declaration, duly countersigned by the supervisor, that the research or project work has been carried out by him and not submitted elsewhere for any purpose except for publication.

8.6 **Thesis, Dissertation and Special Study Report Examination**

8.6.1 **M. Sc. Engg. and M. Engg.**

The CASR shall constitute an Examination Committee for each project / thesis examination and oral examination from the panel of examiners proposed by concerned Head of the Department in consultation with the Supervisor(s) and recommended by the concerned BPGS. The Examination Committee shall be as follows :

- Supervisor — Chairman
- Joint Supervisor / Co-Supervisor (if any) — Member
- Head of the Department — Member
- One or Two Teachers from within the Department Not below the rank of Assistant Professor — Member
- One External Examiner outside the University (preferably holding a postgraduate degree) — Member (External)

8.6.2 **PG. Diploma**

The BPGS shall constitute an examination committee (consisting of at least three members) for each of the project/dissertation or special study/report examination from the panel of examiners proposed by the concerned Head of the Department in consultation with the Supervisor. The examination committee shall be approved by the Vice-Chancellor and to be reported to CASR.

The examination committee shall be as follows:

- Supervisor — Chairman
- One member from within the Department — Member
- One member from within or outside the University (preferably with a postgraduate degree) — Member

8.6.3 The Supervisors and the External Examiners shall examine the thesis/dissertation, whereas the examination committee shall assess the performance in the oral examination only.

8.6.4 If any examiner is unable to accept the appointment or wants to relinquish his/her appointment before the examination, the Vice-Chancellor shall appoint another examiner from the panel.

9. Striking off and removal of names from the rolls

The name of the student shall be struck off and/or removed from the rolls of the university on the following grounds :

(i) Unsatisfactory progress of the student reported by the Supervisor through the BPGS and approved by the Vice-Chancellor (for PG. Diploma) or CASR (for

Masters degree) as the case may be.

(ii) Failing to proceed with the program according to the Article. 5.7 and 5.8.

(iii) Forced to discontinue his/her studies under disciplinary rules.

(iv) Withdrawal of his/her name from the roll sheet of the university.

(v) Non payment of dues of the University and the Halls of residence (if any) within a prescribed period.

10. Academic fees

The amount of academic fees shall be decided by the University Authority from time to time.

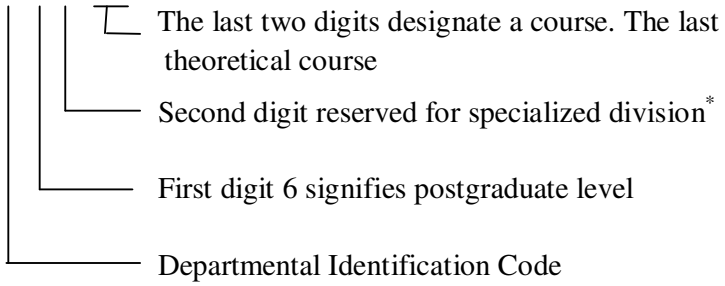
Course Designation and Numbering System

These courses are designed for postgraduate programs leading to the award of postgraduate degrees. Each course is designated by a two letter word identifying the department which offers it following by a four digit number with the following criteria:

a) The first will correspond to the postgraduate level.
b) The second digit will be reserved for departmental use to identify different areas/fields within a department such as Structure, Transportation etc.
c) The last two digits will designate a course. The last digit will be odd for theoretical and even for laboratory or sessional courses.

The course designation system is illustrated by the following example.

C E 6 1 0 3 Theory of Elasticity



*2nd digit '1' means Structural Engineering, '2' means Environmental Engineering, '3' means Geotechnical Engineering, '4' means Transportation Engineering, '5' means Construction Management and '6' means Water Resources Engineering

Course No.	Course Title	Credit
CE 6000	Thesis for M.Sc. Engg.	18.0
CE 6002	Project for M. Engg.	6.0

Structural Engineering

CE 6101	Boundary Element Method	3.0
CE 6103	Theory of Elasticity	3.0
CE 6105	Theory of Plates	3.0
CE 6107	Plastic Design of Structures	3.0
CE 6109	Elastic Stability of Structures	3.0
CE 6111	Analysis and Design of Shells	3.0
CE 6113	Finite Element Methods I	3.0
CE 6115	Computer Methods in Civil Engineering	3.0
CE 6117	Advanced Design of Concrete Structures	3.0
CE 6119	Analysis and Design of Tall Buildings	3.0
CE 6121	Bridge Engineering	3.0
CE 6123	Finite Element Methods II	3.0
CE 6125	Structural Dynamics and Seismic Design of Structures	3.0
CE 6127	Structural Brickwork	3.0
CE 6129	Advanced Theory and Design of Steel Structure	3.0
CE 6131	Advanced Concrete Technology	3.0
CE 6133	Theory and Design of Structural Concrete	3.0
CE 6134	Experimental Methods in Structural Engineering	3.0

Environmental Engineering

CE 6201	Theory of Water Treatment	3.0
CE 6203	Theory of Sewage Treatment	3.0
CE 6205	Biology of Sewage and Polluted Waters	3.0
CE 6207	Environmental Sanitation	3.0
CE 6209	Industrial Water and Waste Treatment	3.0
CE 6211	Municipal and Rural Sanitation	3.0
CE 6213	Water Pollution and its Control	3.0
CE 6215	Water Supply Engineering and Design	3.0
CE 6217	Sewerage and Drainage Engineering Design	3.0
CE 6219	Environmental Management	3.0
CE 6221	Environmental Impact Assessment (EIA)	3.0
CE 6223	Surface Water Quality Modeling	3.0
CE 6225	Environmental Fluid Dynamics	3.0
CE 6227	Aquatic Chemistry for Environmental Engineers	3.0

Geotechnical Engineering

Course No.	Course Title	Credit
CE 6301	Soil Mechanics I	3.0
CE 6303	Soil Mechanics II	3.0
CE 6305	Foundation Analysis Methods	3.0
CE 6307	Earth Pressure and Retaining Structures	3.0
CE 6309	Earth Dams and Stability of Slopes	3.0
CE 6311	Rock Mechanics	3.0
CE 6313	Soil Dynamics	3.0
CE 6315	Advanced Engineering Geology	3.0
CE 6317	Reinforced Earth	3.0
CE 6319	Constitutive Modeling in Soil Mechanics	3.0
CE 6321	Earthquake Engineering	3.0

Transportation Engineering

CE 6401	Transportation Engineering	3.0
CE 6403	Geometric Design of Highways	3.0
CE 6405	Highway Materials	3.0
CE 6407	Advanced Surveying	3.0
CE 6409	Structural Design of Pavements	3.0
CE 6411	Traffic Engineering	3.0
CE 6413	Railway Engineering	3.0
CE 6415	Waterways	3.0
CE 6417	Planning and Design of Airports	3.0
CE 6419	Transportation Planning	3.0
CE 6421	Transportation Engineering Economics	3.0
CE 6423	Traffic Simulation	3.0
CE 6425	GIS and Remote Sensing in Transportation	3.0
CE 6427	Fundamentals of ITS and Traffic Management	3.0
CE 6429	Transportation Demand Analysis	3.0

Construction Management

CE 6501	Operations Analysis for Productivity Construction	3.0
CE 6503	Construction Project Administration	3.0
CE 6505	Economic Decision Analysis in Construction	3.0
CE 6507	Construction Planning and Scheduling	3.0
CE 6509	Construction Cost Estimating and Control	3.0
CE 6511	System Analysis in Construction	3.0
CE 6513	Design of Construction Job Facilities	3.0
CE 6515	Construction Equipment Management	3.0

Water Resources Engineering

Course No.	Course Title	Credit
CE 6601	Advanced Fluid Mechanics-I	3.0
CE 6603	Advanced Fluid Mechanics-2	3.0
CE 6605	Open Channel Flow	3.0
CE 6607	Hydrology	3.0
CE 6609	Statistical Method in Hydrology	3.0
CE 6611	Ground Water Hydraulics	3.0
CE 6613	Flow Through Porous Media	3.0
CE 6615	Irrigation and Drainage Engineering	3.0
CE 6617	River Engineering	3.0
CE 6619	Sediment Transport	3.0
CE 6621	Water Power Engineering	3.0
CE 6623	Hydraulic Structures	3.0
CE 6625	Photogrammetry in Water Resource	3.0
CE 6627	Computational River Morphology	3.0
CE 6629	River Basin Management	3.0
CE 6631	Integrated Water Resources Management	3.0
CE 6633	Physical Modeling and Hydraulic Similitude	3.0
CE 6635	Mathematical Modeling	3.0
CE 6637	Water Resources Economics	3.0
CE 6639	Operation and Maintenance Water Resource System	3.0
CE 6641	Coastal Engineering	3.0
CE 6643	Estuarine Hydraulics	3.0
CE 6645	Hydraulics of Port and Harbour Engineering	3.0
CE 6647	Coastal Zone Management	3.0

Structural Engineering

CE 6101 Boundary Element method

3.00 Credit, 3 hrs./week

Introduction; One-dimensional problems: potential flow, beam bending; Two-dimensional problems of potential flow; Two dimensional problems of elastostatics; Axisymmetric analysis; Three-dimensional formulations; Parametric representations of functions and geometry; Time-dependent analysis: elastodynamics, transient groundwater flow; Non-linear analysis: problems of elastoplasticity; Combination of Boundary Element Method with other numerical methods.

CE 6103 Theory of Elasticity

3.00 Credit, 3 hrs./week

Stress-strain relationship; Plane-stress and plane-strain; Stress functions; Two dimensional problems in rectangular and polar coordinates; Torsion; Energy principles; Stress and strain in three dimensions; General theorems; Three dimensional problems; Theories of failure; Computer solutions of elasticity problem.

CE 6105 Theory of Plates

3.00 Credit, 3 hrs./week

Rectangular plates with various edge conditions; Circular plates; Energy methods; Approximate methods; Orthotropic plates; Numerical methods in the solution of plate problems; Non-liner analyses of plates.

CE 6107 Plastic Design of Structures
3.00 Credit, 3hrs./week

Review of fundamental concepts; Plastic hinges, collapse of beams and frames; Effects of axial load and shear forces; investigation of plastic collapse mechanisms and calculation of collapse loads; Upper and lower bounds; Plastic analyses and design of beams, frames and grillages; Plastic collapse of reinforced concrete and masonry structures; Elastic-plastic' analysis; Repeated loading; Shakedown theorems; Minimum weight design; numerical analysis; Design of multi-storey frames.

CE 6109 Elastic Stability of Structures
3.00 Credit, 3hrs./week
Stability of struts and beam-columns; Initial imperfections; Inelastic buckling; Stability functions; Stiffness matrix; Fixed end moments; Energy method; Elastic instability of plane frames; Critical load; Buckling modes; Failure load analysis; Torsional buckling under various conditions of end loads; Buckling by combined torsion and flexure. Lateral buckling

of beams; Local buckling phenomenon; Buckling of thin plates and membrane shells; Buckling of built-up sections.

CE 6111 Analysis and Design of Shells
3.00 Credit, 3hrs./week

Economics of shells; Acoustics of shell roofs: Review of membrane theory of shells; Bending theory of cylindrical shells and shells of revolution; Synclastic and anticlastic shells; Design of shell roof of various shapes. Finite difference and finite element methods; Model analysis.

CE 6113 Finite Element Methods I
3.00 Credit, 3hrs./week

Introduction to finite element concepts, basic techniques, shape functions. Finite element formulation of various elastic problems-plane stress, plane strain, axisymmetric and three dimensional cases; Isoparametric elements, the elastic membrane, thick shell and plate elements, body of revolution with pressure and sinusoidal loading. Local loads from shape function routines; Bending of plates axisymmetric shells; the semiloof beam and shell; Developing and implementing elements; Convergence the patch test; Solution techniques-front and band solutions, element assembly and equation solving, round off errors; Variational principles in finite element analysis.

CE 6115 Computer Methods in Civil Engineering
3.00 Credit, 3hrs./week

Advanced programming techniques related to civil engineering problems; Program optimization; Computational pitfalls; Management of files and data bases; File structures; Direct access backing storage; Computational aspects of matrix algebra relaxation methods, various reduction and elimination schemes; Eigenvalue problems, storage of and computation with large and space matrices; Numerical differentiation and integration; Interpolation and curve fitting; Linear and non-linear programming algorithms; Software packages; Computer graphics; Interactive analysis and design; Programming for civil engineering problems on microcomputers.

CE 6117 Advanced Design of Concrete Structures
3.00 Credit, 3hrs./week

Review of principles; beams, slabs and columns, Design of columns; long columns, two way slab systems, grids, waffle slabs, ribbed slab, deep beams, curved beams, shear walls, building frames, Design for torsion. Bulk storage structures, creep and temperature effects; Details of reinforced concrete members; Advanced problems in foundations of structures; Codes and specifications and their influence in design; An individual or group project to design a complete structural system; Prestressed concrete structures.

CE 6119 Analysis and Design of Tall Buildings
3.00 Credit, 3hrs./week

System and concepts of tall buildings; Structural forms of tall buildings-floor system, vertical load resisting systems, lateral load resisting systems. Choice of systems optimum design; Coupled shear walls-continuous medium, wide-column analogy, and finite element solutions;

Interaction of walls and frames-approximate methods, analysis; Tubular structures-approximate methods, computer analysis; Masonry high-rise buildings; The future of high-rise building.

CE 6121 Bridge Engineering
3.00 Credit, 3hrs./week

Planning concepts, various types of bridges and their suitability for different span ranges. Bridge loadings, Orthotropic plate decks; Grillage, space frame, finite element and finite strip methods of bridge deck analysis; Long span bridges, cable stayed bridge, suspension bridge; Substructures: Design and construction; Prestressed concrete bridges. .

CE 6123 Finite Element Methods II
3.00 Credit, 3hrs./week

General sources of nonlinearity in structures; Solution of nonlinear equations: incremental, Iterative. Newton- Raphson and Modified Newton Raphson solution procedures; Geometric Nonlinearity; Large displacement and structural instability; Lagrangian approach-both total and updated; Eulerian approach, Material Nonlinearity, Material modeling; Yield criteria, plasticity, creep, elasto-plasticity, viscoplasticity, elasto viscoplasticity, modeling of reinforced concrete; Combined geometric and material nonlinearity; Modeling of dynamic problems and solution procedure. Finite element analysis of non-structural problems fluid flow, heat conduction, electromagnetic field analysis etc.

CE 6125 Structural Dynamics and Seismic Design of Structures
3.00 Credit, 3hrs./week

Fundamentals of structural dynamics; SDOF, Free vibration response, response to harmonic, periodic, impulsive and general dynamic loading; MDOF, undamped free vibrations. Analysis of dynamic response; Beam: vibrations, random vibrations, Probability theory; Deterministic and nondeterministic analysis of earthquake response; Earthquake resistant design of buildings, bridges and dams.

CE 6127 Structural Brickwork
3.00 Credit, 3hrs./week

Properties of bricks and mortar: Strength and deformation properties of brickwork; Strength of brick masonry compression element; Analysis and design of unreinforced brickwork structures; Reinforced and prestressed brickwork structures; Composite action of brick masonry walls.

CE 6129 Advanced Theory and Design of Steel Structure
3.00 Credit, 3hrs./week

Tension members - Design criteria; Compression members - Buckling of Column; Residual Stress; Column Strength curves; AISC design formulas for working stress design; Buckling of plates; Design of column as affected by local buckling; Design of laterally supported beam; Shear on beams; Biaxial bending; Stresses due to torsions; Analogy between torsion and plane bending; Design for combined procedures for laterally unsupported beams; Beam

column; AISC working stress design criteria for combined bending and axial load; Connections.

CE 6131 Advanced Concrete Technology
3.00 Credit, 3hrs./week

Properties of plain concrete, physico-chemical aspects of behavior; Constituent materials; Cements, aggregates and admixtures; Influence of material properties on stress distribution in structural members; Durability, permeability and porosity; physical and chemical deterioration; Mix design, manufacture, transportation and placing. Form works, Field control and acceptance; Testing destructive and non-destructive; Concrete for special purposes.

CE 6133 Theory and Design of Structural Concrete
3.00 Credit, 3hrs./week

Introduction to the limit state design concept; Ultimate limit state design of sections in bending, shear, torsion and, combination of axial load and bending; Comparison of design recommendations of different codes (viz. American, British, Canadian etc.); Evaluation of the impact of traditional concepts describing structural concrete behavior on its analysis and design; Introduction to compressive field theory, strut-and-tie model and compressive-force path concept; Design in compliance with these concepts; Prospects and problems of applying finite element method in the analysis and design of structural concrete.

CE 6134 Experimental Methods in Structural Engineering
3.00 Credit, 3hrs./week

Theories of engineering experimentation; theories and applications of structural models; strain gauge techniques; photo elasticity method; cracking phenomenon in concrete structures; field instrumentation; inelastic behavior of steel, reinforced and prestressed concrete structures; special projects.

Environmental Engineering

CE 6201 Theory of Water Treatment
3.00 Credit, 3hrs./week

Water and its impurities; Criteria of water quality; Physical, chemical and biological treatment processes; Desalinization and demineralization processes; Controls of aquatic growth; Control of taste and odor.

CE 6203 Theory of Sewage Treatment
3.00 Credit, 3hrs./week

Composition, properties and analysis of sewage; Biology and biochemistry of sewage treatment; Principles of physical, chemical and biological treatment processes; Tertiary treatment of effluents; Sludge digestion, Sludge dewatering and disposal.

CE 6205 Biology of Sewage and Polluted Waters
3.00 Credit, 3hrs./week

Important micro-organisms related to water and waste water engineering; Cell physiology; Introductory Biochemistry; Bacterial growth and disinfection kinetics; Enumerisation of bacterial population; Indicator organisms and water borne pathogens: Sampling and bacteriological examination of water and waste water.

CE 6207 Environmental Sanitation
3.00 Credit, 3hrs./week.

Application of engineering principles to the control of communicable diseases; Vector control; Insecticides and bacteriocides; Collection and disposal of municipal refuse; Housing; Milk and food sanitation; Industrial and personal hygiene; Air pollution; Plumbing; Ventilation, air-conditioning; Hospital sanitation; Camp sanitation.

CE 6209 Industrial Water and Waste Treatment
3.00 Credit, 3hrs./week

Requirements of water in various industries; Quality and treatment of industrial water; Characteristics and volume of industrial waste; Problems associated with industrial wastes; Physical, chemical and biological methods of treatment; Industrial waste problems of major industries and their methods of treatment and disposal.

CE 6211 Municipal and Rural Sanitation
3.00 Credit, 3hrs./week

Transmission and control of communicable diseases; Importance of safe water supply and safe disposal of waste on sanitation; Principles of excreta disposal with and without water carriage; Individual water supply facilities and their sanitary protection: Solid waste management; Municipal and rural sanitation facilities ill Bangladesh; Public health organizations.

6213 Water Pollution and its Control
3.00 Credit, 3hrs./week

Sources of pollution; Effects on water; Basic theory of control devices; Pollution surveys; Assessment of water quality in rivers and lakes; Monitoring and management planning; Control programs; Water pollution problems in Bangladesh. .

CE 6215 Water Supply Engineering and Design
3.00 Credit, 3hrs./week

Development of design criteria for municipal and rural water sources; Intakes, pipe lines, distribution systems, storage facilities and water treatment systems; Ground water resources and well design.

CE 6217 Sewerage and Drainage Engineering Design
3.00 Credit, 3hrs./week

Design of collection system, pump house; Functional hydraulic and structural design of complete sewage treatment plant and drainage systems.

CE 6219 Environmental Management
3.00 Credit, 3hrs./week

Environment and sustainable development; Global and regional approach to environmental management; Environmental implications of sectoral development: Infrastructure, water resources, industry, agriculture, transport and communication, energy, health and population, mineral resources, tourism, land use and urbanization; Environmental management at project level; Environmental resource management and conservation strategies; Environmental policy and legislation; Environmental Quality Standards (EQS); Economics of Environmental Management.

CE 6221 Environmental Impact Assessment (EIA)
3.00 Credit, 3hrs./week

Historical development: Definition, aims and objectives of Environmental Impact Assessment (EIA); Environmental issues related to development projects; Project screening, Initial Environmental Examination (IEE); Impact identification, prediction analysis and evaluation; EIA methodologies: Adhoc, Checklists, Matrices, Network, Simulation Modeling Workshops (SMW), Environmental Evaluation System (EES), Overlays, Geographical Information System Guidelines; Environmental Impact Statement (EIS); Impact mitigation plan; Environmental monitoring and post development audits; Organization of EIA: Scope, Work plan, resource requirements and costs of EIA, TOR for EIA; EIA in developing countries; Case studies.

CE 6223 Surface Water Quality Modeling
3.00 Credit, 3hrs./week

Principal components of dissolved oxygen (DO) analysis, sources and sinks of DO kinetics, DO analysis for water bodies, engineering control of DO; Basic mechanisms of eutrophication, significance of N/P ratio, sources and sinks of N and P, phytoplankton and nutrient interactions, phytoplankton-DO relationships, simplified river- stream eutrophication analysis for phytoplankton and rooted aquatic plants; Objectives of modeling applications; Mass loading rage estimations: point source, tributary and intermittent sources; Low flow estimates, travel time and velocity estimates; Steady state stream equations; Estuarine hydrology; Distribution of water quality in rivers and estuaries, dispersion coefficients, hydraulic transport processes, mathematical formulations, water quality parameters, solution techniques, multi-dimensional models; Physical and hydrologic characteristics of lakes, lake wide response to inputs, finite segment steady state lake models, model calibration and verification, sensitivity analysis parameter estimation; Case studies.

CE 6225 Environmental Fluid Dynamics
3.00 Credit, 3hrs./week

Governing laws of motion for a viscous fluid: Review of laminar and turbulent flows; Fickian diffusion; Turbulent diffusion, Mass transport equation; Shear flow dispersion; Mixing in rivers and estuaries; Jets and buoyant jets; Reservoir dynamics; Pollutant movement in porous media; Computation of environmental flows.

CE 6227 Aquatic Chemistry for Environmental Engineers
3.00 Credit, 3hrs./week

Review of some fundamentals of Chemistry; Approaches to equilibrium problem solving: numerical solution, graphical solution, the' tableau method'; Natural weak acids and bases, alkalinity and pH in natural waters, buffer capacity; Dissolved carbonate equilibria (closed system), dissolution of CO2 (open system); Solubility of solids, coexistence of phases in equilibrium; Metal ions and ligands in natural waters, aqueous complexes, ion association among major aquatic constituents, inorganic and organic complexation of trace elements; Redox equilibria and electron activity, pe-pH diagrams, redox conditions in natural waters; Aquatic particles and coordinative properties of surfaces, adsorption of metals and ligands on aquatic particles, surface complexation models; Fate of organic compounds in natural environment: volatilization, sorption/partitioning, transformation reactions, structure-activity and property-activity relationships.

Geotechnical Engineering

CE 6301 Soil Mechanics I
2 hours per week theory and 3 hours per week practical

Identifying characteristics of soils, clay. minerals, clay-water relation, fabric, Compression; One and three dimensional consolidation; swelling, collapse and rheological properties; Soil shear strength; concept of cohesion and internal friction; Failure theories; Bearing capacity equations and factors; Subsoil exploration program; interpretation of topographic, geological and agricultural soil maps; Laboratory testing of soils and their interpretation for engineering purposes.

CE 6303 Soil Mechanics II
3.00 Credit/ 3hrs.lweek

Soil porosity and moisture effects relative to effective stress principles; capiliarity, permeability and frost action. Hydraulic fracturing; Principles governing flow of water through soils; Soil seepage analysis for isotropic and anisotropic conditions; Numerical techniques for vertical and radial drainage; Description, design procedure and usage of current site improvement techniques: preloading, earth reinforcement, dynamic consolidation, vibrocompaction, blasting densification, lime treatment, drains and geotechnical fabrics.

CE 6305 Foundation Analysis Methods
3.00 Credit, 3hrs./week

Elastic foundations, loads on infinite slabs, subgrade coefficient, settlement on non-homogeneous half space, linearly-elastic pile and soil, laterally loaded pile, soil foundation interaction for footing and mat designs; Analysis of simple pile and pile group foundations; Exact and numerical solutions to above problems; Shoring and underpinning.

CE 6307 Earth Pressure and Retaining Structures
3.00 Credit, 3hrs./week

Fundamentals of lateral earth pressure and classical methods of analysis; Analysis of braced excavations; retaining walls and design of sheet piling system; Principles of cofferdam design; Bearing capacity theories related to shallow and deep foundations.

CE 6309 Earth Dams and Stability of Slopes
3.00 Credit, 3hrs./week

Seepage in composite sections; Methods of stability analysis, stability of slopes; Compaction; Measurement of performance, construction and control of embankment.

CE 6311 Rock Mechanics
3.00 Credit, 3hrs./week

Classification and engineering properties of intact rocks, brittle fracture, theory. Characterization and properties of rock discontinuities criteria of rock failure. Engineering problems associated with construction in rocks; Stabilization, anchoring and rock bottling; Rock slope stability and reinforcement; Design of underground opening and structures; Geotechnical aspects of open pit and underground mining; soft and hard rock; Material handling, waste disposal.

CE 6313 Soil Dynamics
3.00 Credit, 3hrs./week

Sources and types of dynamic loading. Vibration of elementary systems. Wave propagation in soils; Dynamic solid properties and methods of their determination; liquefaction; shear modulus and damping effects; Vibrations of foundations on elastic media; machine foundations, earthquake response, blast effects including nuclear weapon effects.

CE 6315 Advanced Engineering Geology
3.00 Credit, 3hrs./week

Advanced physical geology concerning transported and residual soils; Erosion and deposition. Geomorphology; Study of the formation of delta; Engineering geology of soft clays; Engineering properties of rocks; Geologic structures; Historical geology; Geology of Bengal Basin; Earthquake zones of Bangladesh; Geological considerations for engineering designs.

CE 6317 Reinforced Earth
3.00 Credit, 3hrs./week

Materials used in reinforced earth; constitutive laws; Design parameters and testing techniques; Conceptual performance of reinforced soil; Analysis, design and construction of reinforced earth retaining structures; Reinforced slopes; Design and construction of reinforced paved and unpaved road; Analysis, design and construction of granular in situ stabilized columns; Soil nailing, root or micropiles, Random (non-oriented) fibre reinforced soil.

CE 6319 Constitutive Modeling in Soil Mechanics
3.00 Credit, 3hrs./week

Elasto-plastic modeling of soils; Model development process; Models for different types of soils; Monotonic, cyclic and repetitive loading models; Modern approach of constitutive modeling in soil mechanics; Thermodynamic approach of modeling; Application of soil models with small and large strain theories; Application of soil models in Finite Element Method, Distinct Element Method and Finite Difference Method.

CE 6321 Earthquake Engineering
3.00 Credit, 3hrs./week
Historical background; Plate tectonics; Various types of earthquakes and faulting; Wave types and their characteristics; Characteristics of seismometers and microtremor instruments; Characteristics of magnitude and intensity scales; Earthquake time histories; Fourier and response spectra; Historical seismicity and earthquake catalogues: data acquisition, sources, magnitude resealing, application to hazard analysis; Site characterization: amplification and responses; Experimental simulation and shaking tables; Introduction to lifeline engineering: electricity, water, natural gas, telecommunication and transportation systems; Post earthquake damage survey; Mitigation strategies; Case studies of major earthquakes.

Transportation Engineering

CE 6401 Transportation Engineering
3.00 Credit, 3hrs./week

Historical development, systems of transportation, technical and operation characteristics of highways, railways, waterways, airways and pipelines; transportation planning and development.

CE 6403 Geometric Design of Highways
3.00 Credit, 3hrs./week

Highway classification; Design controls and criteria; Traffic, vehicle characteristics, speed capacity; Elements of design; Sight distance, horizontal and vertical alignment; Cross-section elements; Road intersections, grade separation and interchanges; Highway drainage.

CE 6405 Highway Materials
3.00 Credit, 3hrs./week

Origin, production, specifications properties and uses of bituminous materials; binder mixtures; design and analysis of bituminous paving mixes; field operations, surface treatments, stabilization methods; aggregates, base, subbase and subgrade; cement concrete in pavement constructions.

CE 6407 Advanced Surveying
3.00 Credit, 3hrs./week

Triangulation; Classification and schemes, instruments, linear and angular measurements, field works errors and corrections, computations; Geometric leveling; Field astronomy; Motions of earth, and other stars, time, co-ordinate systems, errors and corrections; Hydrographic surveying; determination of depth under water, measurement of discharge and stream current; Terrestrial and aerial photogrammetry; Instruments, field works, plotting of maps, analysis and interpretation of photographs, stereophotogrammetry, remote sensing and its application in civil engineering.

CE 6409 Structural Design of Pavements
3.00 Credit, 3hrs./week

Pavement types, wheel loads, stresses in flexible pavements, stresses in rigid pavements, pavement performance, evaluation of subgrade and base support, design theories and practices, construction methods and maintenance, pavement rehabilitation.

CE 6411 Traffic Engineering
3.00 Credit, 3hrs./week

Characteristics of vehic1es and driver, traffic stream characteristics, traffic control and operation, traffic surveys, accidents and road safety, parking, roadway lighting, traffic management and administration.

CE 6413 Railway Engineering
3.00 Credit, 3hrs./week

General requirements, permanent way, alignments, gradient and curves, points and crossings, signaling and interlocking, tunneling, construction and maintenance.

CE 6415 Waterways
3.00 Credit, 3hrs./week

Historical development of navigation, navigational channels, survey of waterways, classification of waterways, traffic, vessels, ports and harbors, navigational aids, maintenance of waterways.

CE 6417 Planning and Design of Airports
3.00 Credit, 3hrs./week

Growth and demand of air transport, airport: site selection and configuration, geometric design of runways and taxiways, terminal areas, capacity analysis, lighting and marking, air traffic control systems, structural design, construction and maintenance of airport pavements, airport drainage.

CE 6419 Transportation Planning
3.00 Credit, 3hrs./week

Techniques and processes used in solving transportation problems, relationship between trip generation and land use, collection and characteristics of base year data, formulation of mathematical models to simulate existing travel patterns, forecasting procedures and evaluation of transportation systems.

CE 6421 Transportation Engineering Economics
3.00 Credit, 3hrs./week

Introduction to basic economic theories; principles and methodologies appropriate to transportation engineering; identification and measurement of transportation costs and benefits; Road user charges and principles of road pricing; Evaluation of transportation proposals in terms of their economic, social and environmental consequences; Techniques of cost benefit analysis; Selected case studies - application of economic principles to one or more current issues in transportation policy and planning.

CE 6423 Traffic Simulation
3.00 Credit, 3hrs./week

Introduction to simulation techniques; Review of Monte Carlo simulation, macroscopic and microscopic simulation, deterministic and stochastic simulation; Simulation in traffic engineering, review of traffic simulation models, lane-based and non-lane-based mixed traffic simulation; Simulation system components, introduction to statistical distributions; sampling from distributions, random number generation techniques, vehicle representation and processing techniques; simulation warm up and update procedures; Development of traffic simulation model, logical aspects of modeling traffic flow components, elements of systems analysis and synthesis; Model verification, refinements and parameter estimation, calibration and validation; Application of simulation models.

CE 6425 GIS and Remote Sensing in Transportation
3.00 Credit, 3hrs./week

Concepts of Geographic Information Systems (GIS): definition, data structure, data processing and management, spatial analysis; GIS software; Basic principles of remote sensing (RS) and global positioning systems (GPS): definition, data acquisition, spectral characteristics of land cover, multi-spectral analysis, image interpretation, geometric corrections, classification techniques; Integration of RS and GPS with GIS; GIS applications in the field of transportation planning and traffic engineering: digitized mapping of land use and transport network, transport infrastructure development and management, analysis and prediction of impacts, strategy planning, monitoring and evaluation of transport systems and environment, route selection, traffic management and accident analysis, public transport information systems; Integration of GIS packages with transport modeling software.

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CE 6427 Fundamentals of ITS and Traffic Management
3.00 Credit, 3hrs./week

An introduction to the emerging concepts and elements of intelligent Transportation Systems (ITS) with a focus on Advanced Traffic Management and Information Systems (ATMIS). Topics include ITS user services, ITS system architecture, ITS enabling technologies, traffic

flow theory for ITS, freeway management and control, adaptive signal control, incident management, traveler information systems and route guidance, corridor management and ITS simulation. The course will also include an introduction to ITS related communication and information technologies.

CE 6429 Transportation Demand Analysis
3.00 Credits, 3hrs./week

The course deals with the quantitative analysis and modeling of transportation demand for planning purposes. The course principally deals with urban passenger demand. A theoretical framework for the study of transportation demand is developed from basic micro-economic principles of consumer behavior. Both traditional, aggregate travel demand models and disaggregate choice models of travel behavior are presented. An understanding of the theory of the demand for transportation is coupled with practical experience in the specification, estimation and the use of transportation demand models.

Construction Management

CE 6501 Operations Analysis for Productivity Construction
3.00 Credits, 3hrs./week

Basic concepts of productivity, factors affecting construction productivity; productivity measurement and improvement techniques, analysis and simulation of construction operations using CYCLONE modeling system. Case studies of construction productivity enhancement.

CE 6503 Construction Project Administration
3.00 Credits, 3hrs./week

Introduction to the construction industry; project delivery systems; project organization; value engineering; budgeting and project planning, site investigation and bid preparation; project control, evaluation, auditing, and termination; personnel and materials management; health and safety; productivity issues; principles of contract law; construction contracts and specifications; claims; insurance; international contracting.

CE 6505 Economic Decision Analysis in Construction
3.00 Credit, 3hrs./week

Basic economic concepts; principles of engineering economics; comparison of construction projects, structural system alternatives, materials substitutions; heavy construction equipment replacement policies; evaluation of public utility construction projects; effects of inflation; decision making under risk and under uncertainty, especially for the design of hydraulic structures; economic decision models; working examples from the construction industry in all topics.

CE 6507 Construction Planning and Scheduling
3.00 Credit, 3hrs./week

Planning, scheduling and progress control of construction operations; bar-charts, progress curves; principles of resource aggregation; deterministic arrow networks, time analysis,

resource leveling, cost planning, network compression; introduction to PERT; precedence networks; implications of schedule related matters in contract administration; implementation problems; computer application; introduction to claims management; introduction to line-of-balance and simulation techniques.

CE 6509 Construction Cost Estimating and Control
3.00 Credit, 3hrs./week

Types of estimates; organization of cost estimates; quantity take-offs, manual and computer methods; cost of construction resources; design and cost estimating methods; contract cost estimates based on Construction Specifications Institute (CSI) subdivisions; cost adjustments with and without indices; project cost control; construction cost accounting; financing business units and projects.

CE 6511 System Analysis in Construction
3.00 Credits, 3hrs./week

Management and systems concepts in the construction activity; application of linear programming (graphical and analytical solutions, the Simplex method, two-phase Simplex, Integer programming) to problems such as optimizing the structural design of trusses, and locating borrow pits; the transportation algorithm (allocating contracts from competitive bids); the assignment algorithm (heavy equipment allocations); system modeling by activity networks; maximal flow (pipelines, traffic) and shortest path (equipment replacement policy) analyses; longest path (CPM scheduling) analysis; working examples from the construction Industry in all topics.

CE 6513 Design of construction Job Facilities
3.00 Credits, 3hrs./week

General construction site layout, design of utility services, site security, site discipline, damage prevention; material handling operations, plant and equipment, storage, stock control, security; methods and equipment for handling rock, earth, and concrete, design of conveyor systems, aggregate processing and handling systems, and concrete mixing plants; design of temporary works such as plant-associated temporary works, scaffolding, formwork, falswort and shoring; safety and health on construction sites.

CE 6515 Construction Equipment Management
3.00 Credits, 3hrs./week

Selection of construction equipment; description, operating methods, production rates, and unit costs related to excavating equipment; power shovels, draglines, clamshells, trenchers; engineering fundamentals of moving earth; rolling and grade resistance, drawbarpull and rimpull, coefficient of traction, effects of temperature and altitude on internal combustion engines; description, operating methods, production rates, and unit costs related to earth moving equipment; trucks, wagons, scrapers, graders, tractor shovels, dozers, rippers; soil stabilization and compaction equipment; belt conveyors, drilling equipment, tunneling machines, pile driving equipment pumps, crushers, concrete mixers, compressors, hoisting equipment.

Water Resources Engineering

CE 6601: Advanced Fluid Mechanics-I
3.00 Credit, 3hrs./week

Eulerian and Lagrangian coordinates; Reynolds's transport theorem; Basic conservation laws; Continuity equation, Navier-Stokes equation, energy equation; Two-dimensional potential flows; Complex potential and complex velocity, circle theorem, Blasius integral formula and Cauchy integral formula; Three dimensional potential flows; Velocity potential and Stokes stream function and apparent mass.

CE 6603: Advanced Fluid Mechanics-2
3.00 Credit, 3hrs./week

Dimensionless parameters in various flow, non-dimentionalizing the basic equations and boundary conditions; Solution of the Newtonian viscous flow equations; Coquette shear flows, steady fully developed duct flows; unsteady flow with moving boundaries; Laminar boundary layer equations, Similarity solutions for steady two dimensional flow; Blasius solution for flat-plate flow, Falker-Skan Wedge flows; One-parameter momentum integral solution of laminar boundary layer; Turbulent boundary layer equations; Eddy viscosity theories, law of the wall, law of the wake.

CE 6605: Open Channel Flow
3.00 Credit, 3hrs./week

Energy and momentum principles; Flow resistance; Boundary layer theory; Non-uniform flow computation; Channel controls; Channel transitions; Hydraulic jump and surges; Unsteady flow; Hydraulic method of flow routing; Overland flow; Mathematical models of open channel flow; Practical problems.

CE 6607: Hydrology
3.00 Credit, 3hrs./week

Precipitation- its temporal and spatial variability, Evapotranspiration; Runoff and its time-space distribution; Conceptual models; Hydraulics of overland flow; Flood flow in stream channel and flood estimation; Flood forecasting; Hydrology of urban, agricultural and forest lands; Computer simulation of hydrologic techniques; Watershed models.

CE 6609: Statistical Method in Hydrology
3.00 Credit, 3hrs./week

Characteristics of hydrologic phenomena; Random phenomena and their distributions; Various probability topics applied to hydrology; Empirical distributions of hydrologic variables; Parameters and statistics; Probability distribution functions; Estimation methods; Sampling theory; Testing hypothesis and goodness of fit; Correlation and regression, auto correlation and cross-correlation; Analysis of variance; Time series, spectral and cross-spectral analysis; Stochastic models.

CE 6611: Ground Water Hydraulics
3.00 Credit, 3hrs./week

Basic principles and fundamental equations; well hydraulics; Aquifer test and flow-net analysis, Transient flow; Unsaturated flow; Well design criteria; Construction, production tests and maintenance; Surface and sub-surface water relations; Ground water recharge and runoff; Groundwater quality; Saline water intrusion; Subsidence and lateral movement of the land surface due to groundwater pumping; Flow system analysis and models; development and management of aquifers.

CE 6613: Flow Through Porous Media
3.00 Credit, 3hrs./week

Mechanics of fluid movement in porous media; Seepage force and critical gradient; Anisotropy; Application of the Dupuit's theory of unconfined flow; Conformal mapping by elementary functions; Confined flow; Relaxation method, method of fragments; Flow through foundation structures; Seepage from canal and ditches.

CE 6615: Irrigation and Drainage Engineering
3.00 Credit, 3hrs./week

Soil-water-plant relations; infiltration; consumptive use and irrigation water requirements; irrigation techniques; relation irrigation efficiencies; small irrigation structures; water management in irrigated lands.; salinity problems; relation between irrigation and drainage; tidal drainage; drainage systems and their design.

CE 6617: River Engineering
3.00 Credit, 3hrs./week

River hydraulics and morphology; Bed forms in alluvial channels; River channel patterns; Flood plain and their formations; Fluvial process in geomorphology; River training and bank protection works; River in Bangladesh.

CE 6619: Sediment Transport
3.00 Credit, 3hrs./week

Sediment properties; Sources of sediment in rivers and canals; Types of loads; bed load, Suspended load and total load; Critical review of the sediment transport theories and formulas; Sampling techniques; Modeling of sediment transport phenomena.

CE 6621: Water Power Engineering
3.00 Credit, 3hrs./week

Introduction to water power development; Estimating of water power potential; Types of hydropower plants; Water turbines; Dams; Waterways: Canals and penstocks; Intake structure and power house; Plant accessories; Wave and tidal power; Economic analysis: Cost and value of water power; Water power potential and projects of Bangladesh.

CE 6623: Hydraulic Structures
3.00 Credit, 3hrs./week

Principles of design of hydraulic structures; Theory of seepage; Diversion headworks: Weirs and barrages, head and cross regulators; Dams: gravity, earthen, rock fill and arch dams; Spillways, stilling basins and spillway gates; small Bridges and culverts; Cross-drainage works; channels and flumes; Transition and control structures; Locks and river intakes; Use of model in hydraulic design.

CE 6625: Photogrammetry in Water Resource
3.00 Credit, 3hrs./week

Principles of photogrammetry; Use of aerial photography; Land form analysis; Interpretation of drainage patterns, geomorphologic features, surface soils, vegetation and land use; Air photos in the planning and designing of water resources projects; Remote sensing.

CE 6627: Computational River Morphology
3.00 Credit, 3hrs./week

Basic concepts of River morphology and morphological computation; Principle of one-dimensional morphological model; Mathematical formulation. Schematized sediment transport equation, Celerities of water- sediment movements; Riverbed response-steady, time dependent; Analytical models, Numerical models for- fixed and mobile beds. Application of models in -river problems; Flood mitigation and design of floodway; Two-dimensional vertical model.

CE 6629: River Basin Management
3.00 Credit, 3hrs./week

River basin concepts; major issues in river basins; natural resource system, land-water interactions, soil erosion and sediment management; environmental and ecological aspects, climate change issues; socioeconomic system and assessment; economics and financial aspects; administrative and institutional system; Tran boundary issues, water right, water law, conflict resolution and management; analytical framework and planning for river basin management; analysis techniques and tools; monitoring, conservation and restoration in river basins; river basin management in Bangladesh; case studies and role play.

CE 6631: Integrated Water Resources Management
3.00 Credit, 3hrs./week

Water resources system; concepts and principles of integrated water resources management; planning processes and tasks; project formulation and appraisal; identification and evaluation of water management plans; comprehensive regional planning; administration of planning programs: CPM and PERT, water sources planning in Bangladesh; systems analysis; models and decision support system; economic and financial analyses; public involvement in water resources planning; environmental impact assessment; social and institutional aspects; water and environmental law.

CE 6633: Physical Modeling and Hydraulic Similitude
3.00 Credit, 3hrs./week

Principles and illustration of dimensional analysis; Principles of the theory of similarity; Reynolds models; River and open channel models; Filtration models; Design of experiments; Materials and methods of construction; Equipment in models; Model calibration.

CE 6635: Mathematical Modeling
3.00 Credit, 3hrs./week

Concepts of mathematical modeling; differential equations and solution techniques; method of characteristics, finite difference and finite element methods, consistency, stability and convergence of numerical schemes; schematization and boundary conditions, calibration and validation; application to river flow, groundwater flow and convection-diffusion processes.

CE 6637: Water Resources Economics
3.00 Credit, 3hrs./week

Concepts of water resources economics, Linkage between development and resources depletion; Theory of consumer behavior-utility, willingness to pay, marginal benefit; demand function for water elasticities of demand, consumer surplus; Production function of water, marginal cost, supply function of water, producer's surplus; Market economy-factor, mode and scale of production; Natural monopoly and economics of scale. Externalities and market failure; Basic concept of welfare economic-Pareto-superiority and Pareto optimality; Efficiency of perfect competition, monopoly; Economic and institutional tools for managing water such as tax, permit, regulation; Short run and long run value of water-Hedonic pricing and contingency valuation; Inter- temporal management of water; Opportunity cost and discount rate-private and public discounting; Concepts of benefit-cost analysis such as B/C ratio, IRR, NPV, NFV etc. ranking of computing/alternative water projects. Cost-effectiveness analysis and impact assessment; Axioms and measures of distributional equity-range, variance, Gene and Thiel indices.

CE 6639: Operation and Maintenance Water Resource System
3.00 Credit, 3hrs./week

Water resource management systems; concept of adaptive management, operation and maintenance of infrastructure; dynamic flow control in irrigation, drainage and flood control; O&M organizations, O&M cost and resource mobilization: people's participation; monitoring and evaluation; environmental and ecological issues; operation and maintenance of water resource systems in Bangladesh.

CE 6641: Coastal Engineering
3.00 Credit, 3hrs./week

Costal engineering works; waves; characteristics, types, theory, refraction, reflection, breaking, diffraction and damping; wind generated waves; wind wave prediction; coastal processes, features and formation; long shore sediment transport; sea level fluctuation: tides, storm surges, tsunami, coastal structures; models of coastal processes; coastal zone management.

CE 6643: Estuarine Hydraulics
3.00 Credit, 3hrs./week

Estuarine behavior: Hydrodynamics of estuaries; Maxing process; Tides and harmonic analysis; Modeling of tides; Saline water intrusion; Hydraulics of deltas; Pollution in estuaries; Control of estuaries; Estuarine problems in Bangladesh.

CE 6645: Hydraulics of Port and Harbour Engineering
3.00 Credit, 3hrs./week

Wave forces on structures; ports, docks and harbors; port and harbor planning; harbor siltation; marine structures: wharves, jetties, piers, bulkheads, dolphins, mooring; shore protection works; general cargo terminals, bulk cargo terminals and container terminals; navigation aids; dredging and dredgers; ports of Bangladesh.

CE 6647: Coastal Zone Management
3.00 Credit, 3hrs./week

Boundaries of the coastal system, natural and socio-economic subsystem, coastal concerns and problems; coastal hydrology and hydrodynamics; coastal morphology; multiple coastal processes and uses in Bangladesh; policy and management for coastal zone management, legal, institutional, economic and environmental aspects; policy analysis; physical infrastructure, institutional settings; global changes and trends; examples of coastal zone management activities from different countries; simulation games.