Guideline for preparing standard curriculum of B Sc in Civil Engineering

Submitted by

Standard syllabus guideline making committee

Introduction: An engineering program must be carefully crafted to prepare engineering students for immediate entry into the workplace or to pursue advanced graduate study. Much of our youth future success depends on the quality of the education they receive. Therefore, the demands for quality standards in higher education are increasing. To ensure that an academic program is meeting certain standards necessary to produce graduates who are ready to enter their professions, UGC has decided to prepare curriculum guidelines. Curriculum needs to be aligned with national and international professional association guidelines and also to be accredited by reputable standards. For example engineering curricula of universities in USA are prepared meeting criteria set by Accreditation Board for Engineering and Technology (ABET). UGC has prepared curriculum design guidelines meeting international standards.

Department offering a program on BSc in civil engineering should have Educational Objectives based on the mission of the department and the perceived needs of the stakeholders. The mission statement should have a preamble followed by declarations of four interconnected commitments: to students, to faculty, to alumni, and to the industries. The program must have documented student outcomes. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. The curriculum must support attainment of the student outcomes and may include ABET/similar agency required features:

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) an ability to function on multidisciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Program outcomes are outcomes (a) through (k) plus any additional outcomes that may be articulated by the program. Program outcomes must foster attainment of program educational objectives. There must be an assessment and evaluation process that periodically documents and demonstrates the degree to which the program outcomes are attained.

To prepare students to meet their career objectives, the civil engineering curriculum is suggested to be composed of three stages of education. During the first two years, emphasis should be placed upon establishing competence in mathematics, basic sciences, engineering sciences, and fundamental civil and computer engineering topics.

The faculty must ensure that the program curriculum devotes adequate attention and time to each component, consistent with the outcomes and objectives of the program and institution. The professional component must include:

(a) one year of a combination of mathematics and basic sciences (some with experimental experience) appropriate to the discipline. The program must demonstrate that graduates have: knowledge of probability and statistics, including applications appropriate to the program name and objectives; and knowledge of mathematics through differential and integral calculus, basic sciences, computer science, and engineering sciences necessary to analyze and design complex civil infrastructure, knowledge related to relevant software and systems components, as appropriate to program objectives.

(b) one and one-half years of engineering topics, consisting of engineering sciences and engineering design appropriate to the student's field of study. The structure of the curriculum must provide both breadth and depth across the range of engineering topics implied by the title of the program.

(c) a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives. Students take minimum fives courses from Language, social science and humanities. In general (i) one must be a first year course in English Literature and Composition (i) two or three courses from the list of social science courses, and (ii) one or two course from the list of approved humanities courses.

1. Categories of Courses:

1.1 Language

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	*Semester Credit Hours without lab credit* [Remarks]
English	Comprehension and Composition (Including Reading and Listening lab), Writing and Communication (Including Proposal writing seminar)	2	3 TH+1 LAB	[Credit hour for bi-semester are defined in section 3.]
Bangla	Comprehension and Composition, Writing and Communication		3TH	
Total semester credit hours = 7 (4.8%)				*6*

1.2 General Education

Type	Description	No of Courses (minimum)	Semester Credit hrs. (minimum)	*Semester Credit Hours without lab credit* [Remarks]
Social Science	Engineering Economics, Sociology, Financial and Managerial Accounting, Introduction to Sustainable Development, Social Inequality and Planning, etc.	2	3x2 =6	
Arts and Humanities	History of Bangladesh independence and Indian sub-continent, International Relations,	2	3x2 =6	[Compulsory

	Religion-Culture-Humanity, etc.			: History of independence,]
Business	Business Communications, Industrial and Operational Management , Technology Entrepreneurship, Business management	1	3x1 = 3	
Total semester credit hours = 15 (10.4%)				15

1.3 Basic Sciences

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	*Semester Credit Hours without lab credit* [Remarks]
Physics	Physics I Physics II Topics: mechanics, Waves and Oscillations, electricity and magnetism, light and thermodynamics, modern and Quantum Physics	1 1T +1L	3 4	[T- Theory L- Laboratory Credit hour for bi-semester are defined in section]
Chemistry	Chemistry Topics: Inorganic and Quantitate Analysis	1T +1L	4	
Total semester Credits = 11 (7.6%)				9

1.4 Mathematics

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	*Semester Credit Hours without lab credit* [Remarks]
Mathematics	Math – I Math-II Math- III Math – IV Topics: Differential and integral calculus, Probability and Statistics, Matrices and Laplace Transform, Vector analysis, Differential equations, linear algebra, Applied Mathematics	4	3x4=12	Credit hour for bi-semester are defined in section 3
Total semester credit Hours = 12 (8.3%)				*12*

1.5 Other Engineering

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	*Semester Credit Hours without lab credit* [Remarks]
a. Computer Science and Engineering b. Electrical Engineering	Introduction to computer fundamentals and programming, Basic Electrical Technology , Engineering Computation and Data Science, etc.	3	3x3= 9	Credit hour for bi-semester are defined in section 3
Total semester credit Hours = 9 (6.2%)				*9*

1.6 Civil Engineering Core

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	*Semester Credit Hours without lab credit* [Remarks]
Basic	Civil engineering drawing and digital drafting, Surveying, Analytic Mechanics, Engineering Materials, Engineering Geology and geomorphology, Fluid Mechanics, Mechanics of Solids, Engineering and Uncertainty Analyses	7T + 1L	22	
STRUCTURAL ENGINEERING	Structural Analysis and Design, Design of Concrete Structures, Design of Steel Structures, , Concrete Structures Design Sessional, Steel Structures Design Sessional, Computer Aided Analysis and Design of Structures Sessional	3T + 3L	3x3+1x3 = 12	
ENVIRONMENTAL ENGINEERING	Environmental Engineering, Environmental Engineering Laboratory, Design of Water Supply, Sanitation and Sewerage Systems	2T+1L	3x2 + 1x1 = 7	
GEOTECHNICAL ENGINEERING	Principles of Soil Mechanics, Foundation Engineering, Geotechnical Engineering Laboratory, Geotechnical	2T +1L	7	

	Engineering Design Sessional			
TRANSPORTATIO N ENGINEERING	Transportation Planning & Traffic Engineering, Pavement Design and Railway Engineering, Highway Materials and Traffic Engineering Design, Pavement Design and Traffic Studies Sessional	2T+1L	3x2+1x1 = 7	
WATER RESOURCES ENGINEERING	Open Channel Flow, Hydrology, Irrigation and Flood Management, Open Channel Flow Sessional, Water Resources Engineering Sessional	2T + 1L	7	
Civil Engineering Practice	Professional Practices and Communication, Project planning and Construction Management, Business and Career Development, *Professional ethics and Environmental protection	2T	6	* C o m p u l s o r y
Others Project/Thesis	Practical Surveying, Concrete sessional, Strength of Material sessional,Construction detailing and estimation, Carpentry, Welding and Iron Shop, Fluid Mechanics Sessional	7L 4L	7 4	
Total semester credit Hours 79 (54.9%)				67

1.7 Technical Electives

Students will take at least three theory and one laboratory courses from her/his major area and three theory and one laboratory courses from other areas. Total semester credit hours = 11.

Type	Recommended Areas	Semester Credit Hours (minimum)		*Semester Credit Hours without lab credit* [Remarks]
		Major	Minor	
Technical Electives	Introduction to Steel- Concrete Composite Structures, Prestressed Concrete, Dynamics of Structures, Introduction to Finite Element Method, Solid and Hazardous Waste Management, Environmental Pollution Management, Environmental and Sustainable Management, Infrastructure and the Environment, Earth Retaining Structures, Soil Dynamics and Soil-water Interaction, Traffic Engineering Design and Management, Pavement Management, Drainage and Airport, Urban Transportation Planning and Management, Flood Mitigation and Management, Ground Water Engineering, River Engineering , Hydraulic Structures, Coastal Engineering	2T+1L= 7	1T+1L = 4	
Total semester credit Hours 11 (7.6%)				*9*

2. Minimum Credit hour Requirement for awarding degree

Program	Minimum Credit hour requirement for degree Bi-semester: (15-16 weeks excluding final exam week)	*Proposed bi-Semester Credit Hours without lab credit* [Remarks]
BSc in CE	125*	*127** [Counting lab credit as 1.5hr total credit would be 151 hrs For 14 weeks classes of semester system, minimum credit hours = 134 BUET total credit 160 hrs with 7 courses involving 4.0 credit hrs]

Note: For attaining a minimum level socialization/public presentation/networking skill/mental stability/obedience to nation and country, as judged by the academic advisor, a student may be asked to go through a non-credit formally arranged extracurricular sessions in the form of debate/public lecture/cultural ceremony/national event ceremony/sports competition, etc.

The credit hour for semester system considered in the calculation is used for 15 weeks classes excluding final examination week (details in section 3). But public universities in Bangladesh adopt bi-semester system of 14 weeks classes which is less than 15 weeks. Total credit hours (minimum) required for semester system in public universities is calculated considering a linear relation with no. of week classes. Minimum Credit hours required for 14 week classes is equal to 134 credit hours.

3. Credit Hour

A "CREDIT HOUR" is the unit of measuring educational CREDIT, usually based on the number of classroom hours per week throughout a semester of a bi-semester system. Students are awarded credit for classes on the basis of the Carnegie unit (http://www.lasc.edu/students/Credit%20Hour%20Definition%20for%20LASC.pdf).
The length of a semester shall consist of no fewer than 15 calendar weeks and no more than 17 calendar weeks of instructional time.

Lecture Classes:

One semester credit hour will be awarded for a minimum of 750 minutes of formalized instruction that typically requires students to work at out-of-class assignments an average of twice the amount of time as the amount of formalized instruction (1,500 minutes). It is acknowledged that formalized instruction may take place in a variety of modes.

Laboratory Classes

For a laboratory class, the hours per week are considered to be all in class with no outside assignments. Thus, one unit is two and a half hours (150 minutes) per week of laboratory time which amounts to 2250 minutes in 15 weeks.

4. University Grading Standards

Grade	Quality Points	Quality of Performance
A	4.0	Excellent
A-	3.75	Very good
B+	3.5	Good
B	3.0	Average
C	2.0	Satisfactory
F	0.0	Failure

Institution may adopt further division of letter grade viz B+, B-, C+, C-, D+, etc. and select percentage marks against letter grade. Institution will determine minimum average cumulative grade point (CGPA) ($\geq$ C) required for awarding degree.

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