Guideline for preparing standard curriculum of B S in Computer Science and 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's 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 BS in Computer Science and Engineering/Computer Engineering/Computer Science 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 must include:

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

(j) 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 Computer Science and Engineering (and other related subject areas) 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 computer science and 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 electrical and electronic devices, software, and systems containing hardware and software 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.

1. Categories of Courses:

Type	Credit Hours (in percentage of total credit hours)	Remarks
Language & General Education	12-15%	Compulsory: English – one course Bengali – one course
Basic Science	8-10%	Compulsory: Physics – one course & Lab Chemistry – one course
Mathematics	8-10%	Topics: differential and integral calculus, probability and statistics, complex variables, vector analysis, differential equations, coordinate geometry, linear algebra, etc.
Other Engineering	8-10%	Introduction to electrical engineering, Electronic devices and circuits & pulse techniques, Electrical drives and instrumentation, Engineering drawing, etc.
Core Subjects	40-50%	Areas to Cover: Programming, Hardware Systems, Logics and Algorithms, Network Systems, Software Systems and Engineering, Computer and System Security. etc.
Elective Subjects	12-15%	Focus Areas: Computing Theory Communications and Networking Systems Data Science Software Engineering Hardware ICT

2. Minimum Credit Hours Requirement for Awarding Degree

Program	Minimum Credit hour requirement for degree	
	Bi-Semester	
	15 weeks + 60 minutes of classroom(excluding final exam week)	14 weeks + 50 minutes of classroom
B. Sc in CSE/CE/CS/ICT	120	154

3. A Rough Guideline

The details of the subjects and a rough guideline of credit hours from each category are listed below. Note that a University has the flexibility in choosing different subjects based on the credit hours limits depicted in the previous table.

3.1 Language

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	Remarks
Language	Composition, writing and Communication in English, Functional Bengali Language, etc.	3T	English 3+2 Bangla: 2	
Total semester credit hours = 7				

3.2 General Education

Type	Description	No of Courses (minimum)	Semester Credit hrs. (minimum)	Remarks
Social Science	Engineering Economics, Sociology, Financial and Managerial Accounting, Political Science, Environment and Society, Introduction to Human Development, Social Inequality and Planning, etc.	2T	3x2 =6	Compulsory: Bangladesh Studies (History of Independence), Professional Ethics and Environmental Protection.
Arts and Humanities	Bangladesh Studies (History of Independence), Professional Ethics and Environmental Protection, and International Relations, World Civilization Cultures of South Asia, History of South Asia, etc.	3T	3x2 = 6	
Business	Business Communications, Industrial and Operational Management, Technology Entrepreneurship, business management, etc.	1T	3x1 = 3	
Total semester credit hours = 15				

3.3 Basic Sciences

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	Remarks
Physics	Physics I Physics II Topics: mechanics, Waves and Oscillations, electricity and magnetism, light and thermodynamics, modern and quantum physics, etc.	1T 1T +1L	3x1 =3 3x1+1x1 = 4	T- Theory L- Laboratory
Chemistry	Chemistry Topics: Inorganic and Quantitate Analysis, etc.	1T +1L	3x1+1x1 = 4	
Total semester credit Hours = 11				

3.4 Mathematics

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	Remarks
Mathematics	Math – I Math-II Math- III Math – IV Topics: differential and integral calculus, probability and statistics, complex variables, vector analysis, differential equations, coordinate geometry, linear algebra, etc.	4T	3x4=12	T- Theory L- Laboratory
Total semester credit Hours = 12				

3.5 Other Engineering

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	Remarks
a. Electronics and Electrical Engineering b. Engineering Drawing	Introduction to electrical engineering, Electronic devices and circuits & pulse techniques, Electrical drives and instrumentation, Engineering drawing, etc.	2T+2L 1T+1L	3x2 = 6 1.5x2=3 2	T- Theory L- Laboratory
Total semester credit Hours = 11				

3.6 Computer Science and Engineering Core

Type	Description	No of Courses (minimum)	Semester Credit Hours (minimum)	Remarks
Programming	Introduction to Computing, Structured Programming, Object Oriented Programming, Web Programming, and Mobile Programming. etc.	4T + 4L	3x4+1.5x4 = 18	

Hardware Systems	Digital Logic Design, Computer Architecture, and Microprocessors & Microcontrollers, etc.	3T+2L	3x3+1x2=11	
Logics and Algorithms	Discrete Mathematics, Data Structures, Algorithms	3T +2L	3x3+1x2=11	
Systems	Computer and Cyber Security, Database, Operating System, Networking, etc.	4T+3L	3x4+1x3 = 15	
Software Systems and Engineering	Software Engineering, Information System and Design, etc.	2T + 2L	3x2+1x2=8	Software Engineering is compulsory
Others Project/Thesis	Project and Thesis		6	
Total semester credit Hours = 69				

3.7 Technical Electives

At least four courses should be taken. Requirement for major courses is mentioned in the table.

Type	Recommended Areas	Semester Credit Hours (minimum)		Remarks
		Major	Minor	
Technical Electives	Theory: Mathematical Analysis for Computer Science, Graph Theory, Algorithm Engineering, Compiler, Computational Geometry, Computer Graphics, etc. Communications: Data Communication, Wireless and Cellular Communication, etc. Systems: Distributed Systems, Simulation & Modeling, Artificial Intelligence, Computer Graphics, Cloud Computing, etc. Data Science: Artificial Intelligence, Machine Learning, Data Mining, Bioinformatics, Digital Image Processing, Big Data and Analytics, etc. Software Engineering: Human Computer Interaction, Software Architecture, Software Testing and Quality Assurance, Mobile Application Development, etc. Hardware: Digital System design, Embedded Systems, Robotics, Interfacing, VLSI, etc. ICT: Enterprise Systems: Concepts and Practice, Web Application Security, Electronic Business, Visualizing Complex Information, Mobile Web Development and Usability Testing, etc.	3T 3x3=9	2T 3x2=6	Different Branches (At least four courses should be taken.) a. **Computer Engineering:** at least 2 courses from Hardware and 1 course from systems. b. **Computer Science and Engineering:** any courses from any branch. c. **Computer Science:** at least 3 courses from Theory d. **Data Science:** at least 3 courses from data science e. **Software Engineering:** at least two courses from Software Engineering. And 1 course from ICT. f. **Information and Communication Technology:** at least three courses from ICT.
Total semester credit Hours = 15				

The total credit hour in the guideline above is 140. Some core courses may be shifted to elective courses to satisfy other credit hours requirement less than 140.

17.01.17

Prof. Dr. Dil Afroza Begum
Member, University Grants Commission of Bangladesh
and
Convenor, Standard Syllabus Guideline Making Committee

Prof. Dr. Md. Saidur Rahman
Department of Computer Science and Engineering
Bangladesh University of Engineering and Technology, Dhaka.

Prof. Dr. Mohammed Eunus Ali
Department of Computer Science and Engineering
Bangladesh University of Engineering and Technology, Dhaka.

17.01.17

Md. Mostafizar Rahaman
Sr. Assistant Director, Private University Division, University Grants Commission of Bangladesh
and
Member-Secretary, Standard Syllabus Guideline Making Committee