



University of Dhaka

Department of Computer Science and Engineering

CURRICULUM OF
BACHELOR OF SCIENCE IN COMPUTER SCIENCE AND ENGINEERING
(B.Sc. ENGG. IN CSE)

ACADEMIC YEAR: 2023 - 2024 AND ONWARD

Preface

Welcome to the curriculum description of the Bachelor of Science in Computer Science and Engineering (shortly, B.Sc. Engg. in CSE) degree program of the Department of Computer Science and Engineering (CSE) under the Faculty of Engineering and Technology (FoET) of the University of Dhaka (DU). In this dynamic and rapidly evolving field, we are excited to offer a comprehensive curriculum that blends the realms of Computer Science and Computer Engineering. This 4-year undergraduate engineering degree program is designed following the principles and practices of Outcome Based Education (OBE) aiming to equip students with the knowledge, skills, and attitudes necessary for 21st-century workplaces and to excel them in the age of rapidly progressing industrial revolutions.

The convergence of computer science and computer engineering has revolutionized industries and reshaped the way we perceive and interact with technology. From enabling understanding of core theories of computer science to applying them in solving practical problems related to intelligent data collection, data processing, knowledge development and thereby optimizing business operations and creating self-learning machines. Nowadays, the applications of computers, software, networks, and data centers are limitless. As the students embark on this educational journey, they will explore the core theories, techniques, and applications that underpin solving complex engineering problems in these rapidly transformative domains.

The curriculum is meticulously crafted to strike a balance between theoretical foundations and practical hands-on experience. The students will explore a wide spectrum of subjects, ranging from basic science, mathematics, fundamentals of electronics and electrical engineering, programming, data structures, algorithms, microprocessors and microcontrollers, operating systems, computer networks, software engineering, artificial intelligence, computer graphics, cloud computing, information security, quantum computing, and many more. It also incorporates a basic understanding of engineering project management, professional ethics, history of the emergence of Bangladesh, and ICT business entrepreneurship. Our experienced faculty members, who are accomplished experts in the field, will guide the students through both the theoretical complexities and real-world implications of computing, communications, AI-driven automation, and knowledge engineering.

Throughout the program, the students will have the opportunity to sharpen their skills, collaborate on projects, and gain exposure to industry practices. The program's capstone projects will challenge the students to apply their accumulated knowledge and skills to solve real-world problems, preparing the students to make meaningful contributions to various domains upon graduation.

At the University of Dhaka, we value research-driven comprehensive education. Beyond technical expertise, we emphasize critical thinking, critical analysis, vertical and horizontal communications in teamwork, ethical considerations, and effective negotiation as essential pillars of success in emerging fields

of computing. Following the principles of Outcome Based Education (OBE) system, our goal is to nurture well-rounded professionals who not only excel in their technical capacities but also possess the ability to collaborate, innovate, and lead in a rapidly changing global landscape.

As per the current trend, computer science and engineering is not just a field of study, rather it avenues to shape demanding professionals in the practical workplace including chief technology officer (CTO), solutions architect, software architect, system analyst, software engineer, AI engineer, information security architect, data scientist, network engineer, etc. The skills the students acquire here will empower them to be at the forefront of innovation, tackling challenges, and creating solutions that have a positive impact on society, especially in improving the quality of human life.

We are excited to accompany our students on this transformative adventure as the students will explore the frontiers of computing machines, programming languages, complex computation systems, Internet technologies, artificial intelligence, machine learning, and data science. Through dedication, curiosity, and hard work, our students will undoubtedly contribute to a future driven by ubiquitous computing systems.

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I Part A

1 Title of the Academic Program

Bachelor of Science in Computer Science and Engineering
(Abbreviated as, B.Sc. Engineering in CSE)

2 Name of the University

University of Dhaka

3 Vision of the University

Cultivation of knowledge, skills, and attitudes and thereby enabling individuals as dynamic human capital poised to make a lasting national and global impact.

4 Mission of the University

The mission of the University of Dhaka is split into 6 parts as follows:

- **UM1 (Transformative Education)** To provide transformative education by enabling students to embrace lifelong learning, and fostering a sustainable knowledge-based society through the continuous pursuit of scholarship and technology.
- **UM2 (Collaborative Research and Innovation)** To build Collaborative research and innovation hubs, leveraging partnerships to expand the boundaries of technological advancement.
- **UM3 (Education Ecology)** To develop an educational ecosystem that fosters excellence, transparency, and accountability.
- **UM4 (Community Engagement)** To engage with relevant stakeholders and communities in building a just, fair, and sustainable world.
- **UM5 (Ethical Responsibility)** To empower students to become ethically responsible global citizens for positive societal impact.
- **UM6 (National Heritage)** To instill a deep sense of national heritage and pride, cultivating a connection to our historical roots and global inheritance.

5 Name of the Program Offering Entity (Department/Faculty/Institute)

The name of the program offering department is the *Department of Computer Science and Engineering* under the *Faculty of Engineering and Technology* of the *University of Dhaka*.

6 Vision of the Program Offering Entity

The department envisions empowering students with cutting-edge knowledge and skills in Computer Science and Engineering and nurturing their potential to become problem solvers, architects, ethical leaders, and trailblazers in the globally evolving landscape of computer science and engineering.

7 Mission of the Program Offering Entity

Department of Computer Science and Engineering will venture:

- **PM1:** Educating students on the state-of-the-art knowledge and skills required for the design, development, and innovation of computers, software, networks, and intelligent application systems.
- **PM2:** Empowering students with research and innovation skills including investigation, critical thinking, analysis, synthesizing, and evaluation to bring positive changes in different fields such as transportation, healthcare, finance, education, climate science, and more, contributing to the betterment of the society.
- **PM3:** Preparing graduates to excel as leading professionals with social and environmental responsibilities, ethics, and human values.
- **PM4:** Enhancing the life-long learning capacity of students by engaging them in new technological problem-solving, design, and development activities.

8 Objectives of the Program Offering Entity

The objective of the Department of Computer Science and Engineering of University of Dhaka is to provide students with a comprehensive and cutting-edge education in these rapidly advancing fields. The program aims to equip students with the knowledge, skills, and practical experiences necessary to become proficient Computer Scientists and Computer Engineering professionals. By integrating theoretical foundations with hands-on training, the course seeks to foster critical thinking, problem-solving abilities, design of computer systems, software development, Internet technologies, and a strong understanding of data analysis techniques, machine learning algorithms, and AI applications.

The objectives of the program are noted as follows:

- **Foundational Knowledge:** To provide students with a strong foundational knowledge of the key concepts, theories, and principles underlying Computer Science and Engineering majors. This includes understanding computation systems and software, algorithms, networking and the Internet, AI methods, machine learning techniques, and data analysis.
- **Technical Skills:** To equip students with practical, hands-on technical skills required for addressing complex engineering problems using emerging computation tools and technologies. This includes

programming languages like Assembly, C/C++, Java, Python, HTML/CSS, PHP, and proficiency in relevant software libraries and frameworks.

- **Problem-Solving and Critical Thinking:** To develop students' problem-solving and critical thinking abilities, enabling them to analyze complex computation problems, handle large and complex datasets, identify patterns, make data-driven decisions, and address real-world challenges through designing efficient databases, using diverse algorithms, AI and data science techniques.
- **Ethics and Responsibility to the Society:** To instill ethical considerations and responsible engineering practices in students. This includes addressing issues related to bias in AI algorithms, data privacy, transparency, and the societal impact of AI technologies. Graduates should be able to develop AI solutions with ethical considerations in mind.

By fulfilling these objectives and goals, the Department of Computer Science and Engineering of University of Dhaka strives to produce skilled and ethical professionals who can put lasting national and global impact.

9 Description of the Program

The Bachelor of Science in Computer Science and Engineering is an undergraduate academic degree program designed to provide students with a comprehensive understanding of the theories, principles, techniques, and applications of computer systems. This program aims to equip students with the knowledge and skills necessary to design computers, software and network systems, analyze, interpret, and leverage large sets of data to make informed decisions and develop AI and ML-driven solutions across various domains.

The program's curriculum containing 150 credits combines foundational courses in computer science, computer engineering, mathematics, basics of electrical and electronic engineering, statistics, and humanities with specialized courses in the areas of AI and Data Engineering, hardware and software systems, network and distributed systems, and theoretical computer science. Here is a general overview of the program's components:

a. Foundation Courses:

- **Programming:** Students learn programming languages such as Assembly, C/C++, Java, PHP, HTML/CSS, database, and network programming that are widely used in developing intelligent software systems.
- **Mathematics and Statistics:** Courses cover topics like differential equations, linear algebra, calculus, vector, geometry, probability, and statistics, which form the basis of solving computing problems, data analysis, and machine learning algorithms.
- **Electrical and Electronic Engineering Fundamentals:** One physics with laboratory and two courses - Introduction to basic electrical circuits and Electronic devices and circuits with corresponding laboratories help to grow foundation knowledge and skills working with electrical and electronic stuff.

b. **Core Computer Science and Engineering Courses:** The program is designed to provide knowledge and skills on cutting-edge Computer Science, Computer Engineering, and Computer Technologies. The following courses can be considered as highlights of the program.

- **Data Structure and Algorithms:** Courses on Data Structure, Design and Analysis of Algorithms, Algorithm Engineering, and Database Systems build a strong foundation of technologies required for data storage and data processing.
 - **Microprocessor and Microcontrollers:** A good set of courses on Discrete Mathematics, Digital Logic Design, Computer Architecture, Microprocessor, Microcontrollers, and Embedded Systems equips students with operational details of computing devices and embedded programs.
 - **Software Systems Engineering:** The Object Oriented Design and Programming, Software Engineering, Web Engineering and Technology courses along with corresponding laboratories significantly support students in designing and developing application software systems.
 - **Artificial Intelligence and Machine Learning:** The inclusion of Artificial Intelligence and Machine Learning courses opens doors to address complex real-world challenging problems in real-time environments.
 - **Network and Distributed Systems:** The studies on Operating Systems, Data and Telecommunications, Computer Networking, Information Security, Internet of Things, and Parallel and Distributed Systems courses would help students to build secured and efficient information network systems.
- c. **Elective or Specialization Courses:** A large set of specialization courses has been designed to be offered as elective courses to meet the diverse interests of the students. Each student will take 2 such courses with laboratories and 1 without lab. These courses would help students in growing their knowledge and skills in depth in their area of interest.
- d. **Capstone Projects and Industrial Experience:**
- Students will be working on capstone projects where they apply computing, networking, AI and ML techniques to address real-world problems.
 - Internships with industry partners are expected to provide hands-on exposure to the field.
- e. **Soft Skills and Communication:** The inclusion of presentations, demonstrations, and teamwork activities in the laboratories gives strong emphasis on communication skills so that the students can effectively present findings and insights to both technical and non-technical audiences.
- f. **Humanities:** Four courses including History of Emergence of Bangladesh, IT Project Management, Professional Ethics and Environment, and ICT Business Entrepreneurship help to grow students with professionalism and responsibility to society.

Graduates of the Bachelor of Science in Computer Science and Engineering degree program will be well-prepared for careers in technology innovation, transportation, healthcare, finance, e-commerce, and more, where distributed software and network systems, Artificial Intelligence and data-driven decision-making are becoming increasingly essential.

10 Program Educational Objectives (PEOs)

Graduates of the Bachelor of Science in Computer Science and Engineering degree program are expected to attain the following Program Educational Objectives (PEO) within 3 to 5 years of graduation.

- **PEO1:** Graduates will demonstrate leadership roles as Computer professionals and continue to acquire knowledge, skills, and experiences to address new challenges in the field of computer science and engineering.
- **PEO2:** Graduates will retain the pursuit of knowledge, skills, intelligence, and interdisciplinary learning in a multicultural environment for achieving top-notch academic scholarships and professional careers.
- **PEO3:** Graduates will design and develop computing, software, and network technologies with a focus on sustainability to offer a better place for humanity while they will practice ethical and responsible usage of technologies.

11 Program Learning Outcomes (PLOs)/Program Outcomes (POs)

Graduates of the Bachelor of Science in Computer Science and Engineering degree program are expected to attain the following Program Outcomes (POs) by the time of graduation.

- **PO1 - Foundational Knowledge:** Apply a profound understanding of basic science, mathematics, and core principles of computer, computing, and communications to tackle complex engineering problems within the field effectively. Utilize theoretical insights and practical skills to devise innovative solutions.
- **PO2 - Problem Analysis and Modeling:** Identify, formulate, and rigorously analyze complex engineering problems in computer science and engineering domains. This involves extensive computing and scientific issues, literature review, and the application of mathematical, statistical, and computational algorithmic techniques to derive substantiated conclusions.
- **PO3 - Algorithm Design and Implementation:** Design solutions for complex computer science and engineering problems and design systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (K5)
- **PO4 - Investigation:** Conduct investigations of complex problems using research-based knowledge (K8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
- **PO5 - Modern Tool Usage:** Apply a cutting-edge array of computing, communication and artificial intelligence techniques to develop innovative software application models, network systems and other AI applications. Understand the use of prediction and modeling techniques for complex engineering activities and their limitations.
- **PO6 - Computer Engineers and Society:** Apply reasoning informed by computer science and engineering knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (K7)
- **PO7 - Environment and Sustainability:** Understand and evaluate the sustainability and impact of professional engineering work in solving complex computer science and engineering problems in societal and environmental contexts. (K7).

- **PO8 - Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and the norms of professional practice.
- **PO9 - Individual Work and Teamwork:** Function effectively as an individual and as a member or leader of diverse teams and in multidisciplinary settings.
- **PO10 - Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11 - Project Management and Finance:** Demonstrate knowledge and understanding of the computation, software and network systems, and AI principles and apply these to one's work as a member or a leader of a team to manage projects in multidisciplinary environments.
- **PO12 - Life-Long Learning:** Recognize the need for and have the preparation and ability to engage in independent, life-long learning for adaptability in the broadest context of technological change

12 Mapping Mission of the University with PEOs

The mapping between the mission of the university (please refer to Section 4) and PEOs (please refer to Section 10) is shown as follows. The cells marked with '√' denote a mapping.

		Program Educational Objectives		
		PEO1	PEO2	PEO3
Mission of the University	UM1	√		√
	UM2	√		
	UM3		√	
	UM4			√
	UM5			√
	UM6	√	√	

13 Mapping PLOs with the PEOs

The aforementioned PLOs/POs and their mapping with the PEOs are presented in the following Table. The cells marked with '√' denote a mapping.

		Program Educational Objectives (PEOs)		
		PEO1	PEO2	PEO3
Program Outcomes (POs)	PO1	√		
	PO2	√		
	PO3	√		
	PO4		√	
	PO5		√	
	PO6			√
	PO7			√
	PO8			√
	PO9		√	
	PO10	√		
	PO11			√
	PO12		√	

14 Mapping Courses with the PLOs

The mapping of courses with the PLOs/POs is presented in the following Table. Here, the courses are only identified by course codes. For details of the course information, please refer to Section 15. The cells in the following table marked with '√' denote a mapping.

Sl	Course Code	Program Outcomes (POs)											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	CSE 1101	√	√	√									
2	CSE 1103	√	√	√									
3	CSE 1104	√	√								√		
4	EEE 1105	√	√				√						
5	MATH 1107	√	√				√						
6	HUM 1109	√	√				√						
7	CSE 1201	√	√				√						
8	CSE 1202	√	√				√						
9	CSE 1203	√	√				√						
10	CSE 1204			√		√				√			
11	EEE 1209	√	√										
12	EEE 1210		√			√							√
13	CSE 2101	√		√	√								√
14	CSE 2102	√	√									√	
15	CSE 2103	√	√				√						

16	CSE 2104			✓		✓				✓		
17	CSE 2105	✓	✓			✓						
18	CSE 2106	✓	✓					✓				
19	CSE 2201	✓	✓	✓								
20	CSE 2202		✓							✓		
21	CSE 2203	✓		✓	✓							✓
22	CSE 2204	✓	✓								✓	
23	CSE 2205	✓	✓					✓				
24	CSE 2206	✓	✓								✓	
25	STAT 2207	✓	✓	✓								
26	CSE 3101	✓	✓			✓					✓	
27	CSE 3102	✓	✓							✓	✓	
28	CSE 3103	✓	✓					✓				
29	CSE 3104	✓						✓			✓	
30	CSE 3105	✓	✓	✓	✓							
31	CSE 3109	✓	✓					✓			✓	
32	CSE 3110		✓	✓						✓		
33	CSE 3201	✓		✓					✓			
34	CSE 3202		✓	✓							✓	
35	CSE 3203	✓		✓	✓							✓
36	CSE 3204	✓		✓	✓			✓				
37	CSE 3205	✓	✓					✓				
38	CSE 3206	✓						✓			✓	
39	CSE 3207		✓	✓	✓							
40	CSE 4100		✓				✓	✓	✓	✓	✓	✓
41	CSE 4101			✓	✓	✓						
42	CSE 4102	✓	✓								✓	
43	CSE 4103	✓	✓					✓				
44	HUM 4105							✓		✓		✓
45	CSE 4110	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
46	CSE 4201	✓	✓					✓				
47	CSE 4202	✓	✓					✓				
48	HUM 4203	✓	✓					✓				
49	CSE 4210	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Summary		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

II ♦ Part B

15 Structure of the Curriculum

- a. **Duration of the program:** 4 Years/8 Semesters.
- b. **Admission Requirements:** General Undergraduate Admission guidelines of the Science Unit will be applicable. Some important eligibility criteria are described as follows:
 - Candidates having a minimum GPA of 3.50 (including 4th subject) separately in SSC and HSC examinations held in recent designated years from the Science/ Agricultural Science branch of any education board of Bangladesh or Alim in Science branch from Madrasa Board or IGCSE/O-level and IAL/GCE/A-level or equivalent foreign degree and a minimum total GPA of 8.0 in these two will be eligible to apply. For IGCSE/O-level and IAL/GCE/A-level and any foreign degree holders, the equivalent grades will be calculated and thus the eligibility will be determined.
 - Candidates having a minimum GPA of 3.0 (including 4th subject) separately in SSC and HSC examinations held in recent designated years from the Arts/General or Business Education branches of any education board of Bangladesh and a minimum total GPA of 7.5 in these two will also be eligible to apply. For IGCSE/O-level and IAL/GCE/A-level and any foreign degree holders, the equivalent grades will be calculated and thus the eligibility will be determined.
 - In the admission test, the candidate must secure at least 60% marks of the total marks allocated for the Physics and Mathematics parts.
- c. **Total class weeks in a Year/semester:** 15 weeks/semester including midterm exam; 2 semesters in a year
- d. **Teaching hours of theory courses:** One theory course credit is defined as conducting one 60 minutes class delivery in a week, spanning 14 weeks in a semester excluding midterm examination. For a 3-credit course, two classes each of 90 minutes are held in a week, i.e., 42 hours of total contact hours per 3-credit course. Similarly, a 2-credit course has 28 hours of teaching, two classes of 60 minutes each week.
- e. **Teaching hours of laboratory courses:** One laboratory course credit is defined as conducting hands-on work in the lab for 2 hours in a week, spanning 14 weeks in a semester. For a 1.5 credit laboratory course, one class of 3 hours is held in a week, i.e., 42 hours of total contact hours in 14 weeks. Similarly, a 0.75-credit lab course has one class of 3 hours in alternate weeks, and a 1.0-credit lab course has 28 hours of teaching, each class of 2 hours in 14 weeks.
- f. **Mid and Final Examinations:** 1 week for midterm and 2 to 3 weeks for final examinations.

- g. **Preparatory leave:** 9-10 days of preparatory leave will be allocated between the last class date of a semester and the starting date of the final examinations.
- h. **Total minimum credit requirement to complete the degree program:** 150 Credits.
- i. **Minimum CGPA requirements for graduation:** 2.00, and without 'F' grade in any subject.
- j. **Maximum academic years of completion:** 6 (Six) Years from the date of admission at 1st year 1st semester.

k. **Course Code**

i. Every course has a unique course code. The letter prefix in any course code indicates the field or the discipline of the course, e.g., **CSE** stands for Computer Science and Engineering, **EEE** for Electrical and Electronic Engineering, **PHY** for Physics, **MATH** for Mathematics, **STAT** for Statistic, **HUM** for arts and humanities, **BUS** for business, and **MIS** for management of information system.

ii. The four digits in the course code have the following meaning:

- The first digit corresponds to the year in which the course is offered by the department.
- The second digit represents the semester in which the course is offered.
- The third and fourth digits are used to specify different theory and lab courses taught in a semester. The last digit is assigned an odd number for theoretical courses and even for laboratory courses.

l. **Category of Courses:**

i. General Education Courses: (Interdisciplinary courses, beyond the discipline/program, that provide a well-rounded learning experience to the students) For example Arts and Humanities, Social Sciences, Business, ICT, Basic Science/STEM, other engineering, etc. (as applicable for the disciplined academic program).

Sl	Course Code	Course Title	Credit
1	HUM 1109	History of Emergence of Bangladesh	2.0
2	HUM 4105	Professional Ethics and Environment	2.0
3	MIS 4203	IT Project Management	2.0
4	BUS 4205	ICT Business Entrepreneurship	2.0
5	PHY 1205	Physics	3.0
6	PHY 1206	Physics Lab	0.75
7	MATH 1107	Differential and Integral Calculus	3.0
8	MATH 1207	Linear Algebra	3.0
9	MATH 2107	Differential Equations, Laplace Transform and Fourier Analysis	3.0
10	STAT 2207	Probability and Statistics	3.0
11	STAT 3107	Random Processes	3.0
12	EEE 1105	Electrical Circuits	3.0
13	EEE 1106	Electrical Circuits Lab	0.75
14	EEE 1209	Electronic Devices and Circuits	3.0
15	EEE 1210	Electronic Devices and Circuits Lab	0.75
Total		(12 Theory and 3 Lab courses)	34.25

ii. Core courses (Courses that characterize the discipline):

Sl	Course Code	Course Title	Credit
16	CSE 1101	Discrete Mathematics	3.0
17	CSE 1103	Computational Problem Solving	3.0
18	CSE 1104	Computational Problem Solving Lab	1.5
19	CSE 1201	Structured Programming	3.0
20	CSE 1202	Structured Programming Lab	1.5
21	CSE 1203	Digital Logic Design	3.0
22	CSE 1204	Digital Logic Design Lab	0.75
23	CSE 2101	Data Structures and Algorithms	3.0
24	CSE 2102	Data Structures and Algorithms Lab	1.5
25	CSE 2103	Object Oriented Design and Programming	3.0
26	CSE 2104	Object Oriented Design and Programming Lab	1.5
27	CSE 2105	Computer Architecture and Microprocessor	3.0
28	CSE 2106	Microprocessor and Assembly Language Lab	1.5
29	CSE 2109	Data and Telecommunication	3.0
30	CSE 2201	Database Management System	3.0
31	CSE 2202	Database Management System Lab	1.5
32	CSE 2203	Design and Analysis of Algorithms	3.0
33	CSE 2204	Design and Analysis of Algorithms Lab	1.5
34	CSE 2205	Microcontroller and Embedded System	3.0
35	CSE 2206	Microcontroller and Embedded System Lab	1.5
36	CSE 2209	Numerical Methods	3.0
37	CSE 3101	Software Engineering	3.0
38	CSE 3102	Software Design and Development Project	1.5
39	CSE 3103	Web Engineering and Technology	3.0
40	CSE 3104	Web Engineering and Technology Lab	1.5
41	CSE 3105	Algorithm Engineering	3.0
42	CSE 3109	Operating System	3.0
43	CSE 3110	Operating System Lab	1.5
44	CSE 3201	Computer Network	3.0
45	CSE 3202	Computer Network Lab	1.5
46	CSE 3203	Artificial Intelligence	3.0
47	CSE 3204	Artificial Intelligence Lab	1.5
48	CSE 3205	Information Security	3.0
49	CSE 3206	Information Security Lab	1.5
50	CSE 3207	Theory of Computation	3.0
51	CSE 4101	Machine Learning	3.0
52	CSE 4102	Machine Learning Lab	1.5
53	CSE 4103	Internet of Things	3.0
54	CSE 4104	Internet of Things Lab	1.5
55	CSE 4201	Parallel and Distributed Systems	3.0
56	CSE 4202	Parallel and Distributed Systems Lab	1.5

Total

(23 Theory and 18 Lab courses)

95.25

iii. Elective Courses (Courses for specialization within the discipline):

ELECTIVE I courses with laboratories

Sl	Course Code	Course Title	Credit
1	CSE 3209	Digital Image Processing	3.0
2	CSE 3210	Digital Image Processing Lab	1.5
3	CSE 3211	Introduction to Data Science	3.0
4	CSE 3212	Introduction to Data Science Lab	1.5
5	CSE 3213	Bioinformatics	3.0
6	CSE 3214	Bioinformatics Lab	1.5
7	CSE 3215	Mobile Application Development	3.0
8	CSE 3216	Mobile Application Development Lab	1.5
9	CSE 3217	Simulation and Modeling	3.0
10	CSE 3218	Simulation and Modeling Lab	1.5
11	CSE 3219	Computer Graphics	3.0
12	CSE 3220	Computer Graphics Lab	1.5
13	CSE 3221	Wireless Networks	3.0
14	CSE 3222	Wireless Networks Lab	1.5
Total	(One theory course and its lab will be chosen by a student)		4.5

ELECTIVE II courses with laboratories

Sl	Course Code	Course Title	Credit
1	CSE 4211	Deep Neural Network	3.0
2	CSE 4212	Deep Neural Network Lab	1.0
3	CSE 4213	Natural Language Processing	3.0
4	CSE 4214	Natural Language Processing Lab	1.0
5	CSE 4215	Data Mining	3.0
6	CSE 4216	Data Mining Lab	1.0
7	CSE 4217	Digital Forensics	3.0
8	CSE 4218	Digital Forensics Lab	1.0
9	CSE 4219	Software Security	3.0
10	CSE 4220	Software Security Lab	1.0
11	CSE 4221	Compiler Design	3.0
12	CSE 4222	Compiler Design Lab	1.0
13	CSE 4223	Cloud Computing	3.0
14	CSE 4224	Cloud Computing Lab	1.0
Total	(One theory course and its lab will be chosen by a student)		4.0

ELECTIVE III courses without laboratory

Sl	Course Code	Course Title	Credit
1	CSE 4225	Big Data Analytics	3.0
2	CSE 4227	Information Retrieval	3.0
3	CSE 4229	Human Robot Interaction	3.0
4	CSE 4231	Computer Vision	3.0
5	CSE 4233	Software Testing and Quality Assurance	3.0
6	CSE 4235	VLSI Design and Formal Verification	3.0
7	CSE 4237	Parallel and Distributed Database Systems	3.0
8	CSE 4239	Applied Cryptography	3.0
9	CSE 4241	Wireless Network Security	3.0
10	CSE 4243	Graph Theory	3.0
11	CSE 4245	Operations Research	3.0
12	CSE 4247	Quantum Computing	3.0
13	CSE 4249	Game Theory	3.0
14	CSE 4251	Human Computer Interaction	3.0
Total	(One theory course will be chosen by a student)		3.0

iv. Final Year Design Project and Internship (as applicable for the discipline/academic program)

Sl	Course Code	Course Title	Credit
1	CSE 4100	Internship	3.0
2	CSE 4110	Final Year Project - Part A	2.0
3	CSE 4210	Final Year Project - Part B	4.0
Total			9.0

16 Year/Level/Semester/Term wise distribution of courses

The courses of the Bachelor of Science in Computer Science and Engineering are arranged and distributed among eight semesters based on the importance and hierarchical need of the courses. In the following, semester-wise courses are listed along with relevant information.

16.1 1st Year, 1st Semester

Sl	Course Code	Course Title	Credit	Prerequisite
1	CSE 1101	Discrete Mathematics	3.0	
2	CSE 1103	Computational Problem Solving	3.0	
3	CSE 1104	Computational Problem Solving Lab	1.5	
4	EEE 1105	Electrical Circuits	3.0	
5	EEE 1106	Electrical Circuits Lab	0.75	
6	MATH 1107	Differential and Integral Calculus	3.0	
7	HUM 1109	History of Emergence of Bangladesh	2.0	
Total		(5 Theory and 2 lab courses)	16.25	

16.2 1st Year, 2nd Semester

Sl	Course Code	Course Title	Credit	Prerequisite
1	CSE 1201	Structured Programming	3.0	CSE 1103
2	CSE 1202	Structured Programming Lab	1.5	
3	CSE 1203	Digital Logic Design	3.0	
4	CSE 1204	Digital Logic Design Lab	0.75	
5	PHY 1205	Physics	3.0	
6	PHY 1206	Physics Lab	0.75	
7	MATH 1207	Linear Algebra	3.0	
8	EEE 1209	Electronic Devices and Circuits	3.0	
9	EEE 1210	Electronic Devices and Circuits Lab	0.75	
Total		(5 Theory and 3 lab courses)	18.75	

16.3 2nd Year, 1st Semester

Sl	Course Code	Course Title	Credit	Prerequisite
1	CSE 2101	Data Structures and Algorithms	3.0	CSE 1201
2	CSE 2102	Data Structures and Algorithms Lab	1.5	
3	CSE 2103	Object Oriented Design and Programming	3.0	CSE 1201
4	CSE 2104	Object Oriented Design and Programming Lab	1.5	
5	CSE 2105	Computer Architecture and Microprocessor	3.0	
6	CSE 2106	Microprocessor and Assembly Language Lab	1.5	
7	MATH 2107	Differential Equations, Laplace Transform and Fourier Analysis	3.0	
8	CSE 2109	Data and Telecommunication	3.0	
Total		(5 Theory and 3 lab courses)	19.5	

16.4 2nd Year, 2nd Semester

Sl	Course Code	Course Title	Credit	Prerequisite
1	CSE 2201	Database Management System	3.0	CSE 2101
2	CSE 2202	Database Management System Lab	1.5	
3	CSE 2203	Design and Analysis of Algorithms	3.0	CSE 2101
4	CSE 2204	Design and Analysis of Algorithms Lab	1.5	
5	CSEA 2205	Microcontroller and Embedded System	3.0	CSE 2105
6	CSE 2206	Microcontroller and Embedded System Lab	1.5	
7	STAT 2207	Probability and Statistics	3.0	
8	CSE 2209	Numerical Methods	3.0	
Total		(5 Theory and 3 lab courses)	19.5	

16.5 3rd Year, 1st Semester

Sl	Course Code	Course Title	Credit	Prerequisite
1	CSE 3101	Software Engineering	3.0	CSE 2201
2	CSE 3102	Software Design and Development Project	1.5	
3	CSE 3103	Web Engineering and Technology	3.0	
4	CSE 3104	Web Engineering and Technology Lab	1.5	
5	CSE 3105	Algorithm Engineering	3.0	CSE 2203
6	STAT 3107	Random Processes	3.0	
7	CSE 3109	Operating System	3.0	
8	CSE 3110	Operating System Lab	1.5	
Total		(5 Theory and 3 lab courses)	19.5	

16.6 3rd Year, 2nd Semester

Sl	Course Code	Course Title	Credit	Prerequisite
1	CSE 3201	Computer Network	3.0	CSE 2109
2	CSE 3202	Computer Network Lab	1.5	
3	CSE 3203	Artificial Intelligence	3.0	
4	CSE 3204	Artificial Intelligence Lab	1.5	
5	CSE 3205	Information Security	3.0	
6	CSE 3206	Information Security Lab	1.5	
7	CSE 3207	Theory of Computation	3.0	
8		Elective I ^a	3.0	
9		Elective I Lab	1.5	
Total		(5 Thoery and 4 lab courses)	21.0	

^aTwo or more courses will be offered based on the availability of human and physical resources. A student chooses one of them within the first two weeks of the semester. The minimum number of registered students to run an undergraduate elective course is 12.

16.7 4th Year, 1st Semester

Sl	Course Code	Course Title	Credit	Prerequisite
1	CSE 4100	Internship ^a	3.0	
2	CSE 4101	Machine Learning	3.0	CSE 3203
3	CSE 4102	Machine Learning Lab	1.5	
4	CSE 4103	Internet of Things	3.0	CSE 3201
5	CSE 4104	Internet of Things Lab	1.5	
6	HUM 4105	Professional Ethics and Environment	2.0	
6	CSE 4110	Project - Part A ^b	2.0	
Total		(1 internship, 3 Theory and 2 lab courses, and 1 project)	16.0	

^aInternship is mandatory for all students and they will work in the relevant industry for 3 months as part-time or full-time. Students will start their internship just after completing their third year second semester final examinations. A detailed plan of implementation is available in the course outline.

^b2 students will make a group and submit a topic of interest to the committee either on a design/development project or a research project specifying two names of intended supervisors in order of preference. The expected outcomes of part A of the final year design project are a literature study, identifying limitations of the existing systems or application services, objectives of the work, problem statement or list of novel features of the system, research questions and methodology or list of steps and tools to be used for the design and development project, a Gantt chart for the project, and a list of apparatus to be used along with their costs. The supervisors will take the initiative to engage industry partners with the projects, wherever applicable.

16.8 4th Year, 2nd Semester

Sl	Course Code	Course Title	Credit	Prerequisite
1	CSE 4201	Parallel and Distributed Systems	3.0	
2	CSE 4202	Parallel and Distributed Systems Lab	1.5	
3	MIS 4203	IT Project Management	2.0	
4	BUS 4205	ICT Business Entrepreneurship	2.0	
5		Elective II	3.0	
6		Elective II Lab	1.0	
7		Elective III	3.0	
8	CSE 4210	Project - Part B ^a	4.0	
Total		(5 Theory and 2 lab courses, and 1 project)	19.5	

^aThe expected outcomes of part B of the project are a usable software system or a comprehensive prototype of any application service comprising of hardware, software and network tools, or a publishable research article/conference paper with sufficient investigation, results and propositions. The students need to submit a complete project report, and a software/ prototype/ collected data/simulation or test-bed implementation codes/proof of work in an acceptable form. Finally, they will present and defend their system design, development, and results.

