**Computer Science**

**Curriculum**

**BSc Engineering**

Session 2021-2022 and Onwards

Published by

Department of Computer Science and Engineering

Bangabandhu Sheikh Mujibur Rahman University, Kishoreganj

Published in December, 2022

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**1. About the University**

Bangabandhu Sheikh Mujibur Rahman University (BSMRU), Kishoreganj has been established in Kishoreganj district in the name of Father of the Nation Bangabandhu Sheikh Mujibur Rahman with the special initiative of His Excellency the President of the People's Republic of Bangladesh, Advocate Md. Abdul Hamid. Bangabandhu Sheikh Mujibur Rahman University, Kishoreganj Act 2020 (Act No. 17 of 2020, September 15, 2020) was enacted to establish the University. The Act was passed by the Parliament of Bangladesh in the year 2020. According to the provisions of this Act the University will be established at Boulai Union of Sadar Upazila of Kishoreganj District. The University will be placed on 103.87 acres of land at Patdha and Raghunandanpur mouzas of Boulai union under Kishoreganj Sadar Upazila of Kishoreganj District. It is located approximately 8.9 km from Kishoreganj city towards Mithamoin road.

The first academic activity of the university has been started from the academic session 2021-2022 along with the four departments (Computer Science and Engineering, Mathematics, English, and Accounting) and the initial enrolment of thirty students in each department. Total forty departments, five institutes, three centers, and eight Interdisciplinary Research Centers (IRCs) are proposed in the academic plan. The forty departments are operated under the six faculties. The name of the faculties are Faculty of Science, Faculty of Engineering, Faculty of Arts, Faculty of Social Science, Faculty of Biological Science, and Faculty of Business Studies.

**Mission of the University**

The mission of Bangabandhu Sheikh Mujibur Rahman University, Kishoreganj is

* To create and disseminate knowledge for the sustainable development of next generation.
* To maintain and achieve equality of higher education with the advanced world in various fields.
* To create and expand opportunities for higher education and research at the national level especially in various fields of modern knowledge practice and reading.
* To provide undergraduate, postgraduate, and doctoral levels of education and research that create knowledge, excellence and distribution in science, engineering, arts, humanities, social sciences, law, business administration and management, including new branches of science and knowledge.
* To conduct online and campus based short and long courses side by side with the graduate and undergraduate levels.

**Vision of the University**

The vision of Bangabandhu Sheikh Mujibur Rahman University, Kishoreganj is

* To create efficient manpower related to industry, business, society, and economics using modern teaching method and technology according to the criterions of higher education, profession, and economical requirement.
* To create the university into a world class university in the quality of higher education and research.
* To develop world-class laboratories and to engage in research jointly with various universities and industries by inviting and collaborating with world-class researchers of different fields of research.

**2. About the Department of Computer Science and Engineering**

The department of Computer Science and Engineering (CSE) offers four years undergraduate program at the very beginning to earn B. Sc Engineering (B. Sc Engg.) degree and subsequently will offer the graduate and doctoral programs under the Faculty of Engineering. This Curriculum is for the undergraduate students in the Department of CSE. The department of CSE at BSMRU, Kishoreganj is committed to produce graduate to meet the ever increasing technological challenges in home and abroad. The Curriculum is so designed as to contain all the necessary study materials so that a graduate can face the real engineering problems successfully after graduation. The Curriculum and curriculum committee of the Department will periodically review the courses and their contents to meet the current demand and trends all over the world.

**3. Major Research Areas**

Major research areas include Algorithms (Parallel and Distributed), Graph Theory and Graph Drawing, Computational Biology and Bioinformatics, Networking and Wireless Communication, [Information Security](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Information%20Security), [Network Security](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Network%20Security), [Safe Net Surfing](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Safe%20Net%20Surfing), [Digital Forensic](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Digital%20Forensic); [Data Mining and Knowledge Discovery](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Data%20Mining%20and%20Knowledge%20Discovery), Artificial Intelligence and Neural Network, [Machine Learning](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Machine%20Learning), [Stream Data Management](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Stream%20Data%20Management), [Web Mining](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Web%20Mining), [Correlation Analysis](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Correlation%20Analysis), [Database Management](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Database%20Management), [Information Retrieval](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Information%20Retrieval); [Data Analytics](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Data%20Analytics), [Statistical Inference](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Statistical%20Inference), [Big Data Management](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Big%20Data%20Management), [Computational Social Science](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Computational%20Social%20Science), [Text Mining](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Text%20Mining), [Cloud Computing](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Cloud%20Computing), [Sensor and Ad Hoc Networks](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Sensor%20and%20Ad%20Hoc%20Networks), IoT, [Green Cellular Networks](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Green%20Cellular%20Networks), [Analysis of Computer Comm](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Analysis%20of%20Computer%20Comm)unication, [MAC and Congestion Control](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=MAC%20and%20Congestion%20Control), [Computer Vision](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Computer%20Vision), Digital Image Processing, Pattern Recognition, Computer Graphics, [VLSI, CAD](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=VLSI%20CAD), [VLSI design](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=VLSI%20design), [Electronic System Design](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Electronic%20System%20Design), [Representations of Logic Functions](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Representations%20of%20Logic%20Functions), [Multiple-valued Logic](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Multiple-valued%20Logic), [FPGAs](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=FPGAs), [Computer Architecture](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Computer%20Architecture), [Logic Synthesis and Formal Verification](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Logic%20Synthesis%20and%20Formal%20Verification), [Reversible Logic Synthesis](http://www.cse.du.ac.bd/research-groups/?page_id=6421&field=Reversible%20Logic%20Synthesis) etc.

**4. Courses requirements for Undergraduate students**

|  |  |  |
| --- | --- | --- |
|  | **Courses** | |
| **Year** | **Semester I** | **Semester II** |
| First Year | Theory = 5 Courses  Lab = 3 Courses | Theory = 5 Courses  Lab = 3 Courses |
| Total : 19.5 Credits | Total : 19.5 Credits |
| Second Year | Theory = 5 Courses  Lab = 3 Courses | Theory = 5 Courses  Lab = 3 Courses |
| Total : 19.5 Credits | Total : 19.5 Credits |
| Third Year | Theory = 5 Courses  Lab = 4 Courses | Theory = 5 Courses  Lab = 4 Courses |
| Total : 21 Credits | Total : 21 Credits |
| Fourth Year | Theory = 4 Courses  Lab = 3 Courses  Project work of 3 Credits | Theory = 4 Courses  Lab = 2 Courses  Project work of 3 Credits |
| Total : 19.5 Credits | Total : 18 Credits |
| Grand Total 157.5 Credits | | |

**5. Details outlines of the courses**

**First Year (Semester-I)**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Title** | **Credits** |
| CSE 1101 | Computer Fundamentals | 3 |
| CSE 1103 | Discrete Mathematics | 3 |
| PHY 1105 | Physics | 3 |
| MAT 1107 | Calculus | 3 |
| ENG 1109 | English | 3 |
| CSE 1102 | Computer Fundamentals Lab | 1.5 |
| PHY 1104 | Physics Lab | 1.5 |
| ENG 1106 | English Lab | 1.5 |
| Total Credit in 1st Year 1st Semester | | 19.5 |

**First Year (Semester-II)**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Title** | **Credits** |
| CSE 1201 | Digital Logic Design | 3 |
| CSE 1203 | Structured Programming | 3 |
| MAT 1205 | Linear Algebra | 3 |
| EEE 1207 | Electrical Circuits | 3 |
| GED 1209 | Bangladesh Studies | 3 |
| CSE 1202 | Digital Logic Design Lab | 1.5 |
| CSE 1204 | Structured Programming Lab | 1.5 |
| EEE 1206 | Electrical Circuits Lab | 1.5 |
| Total Credit in 1st Year 2nd Semester | | 19.5 |

**Second Year (Semester-I)**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Title** | **Credits** |
| CSE 2101 | Object Oriented Programming | 3 |
| CSE 2103 | Data Structure and Algorithms-I | 3 |
| CSE 2105 | Computer Architecture | 3 |
| STA 2107 | Probability and Statistics | 3 |
| EEE 2109 | Electronics | 3 |
| CSE 2102 | Object Oriented Programming Lab | 1.5 |
| CSE 2104 | Data Structure and Algorithms-I Lab | 1.5 |
| EEE 2106 | Electronics Lab | 1.5 |
| Total Credit in 2nd Year 1st Semester | | 19.5 |

**Second Year (Semester-II)**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Title** | **Credits** |
| CSE 2201 | Data Structure and Algorithms-II | 3 |
| CSE 2203 | Numerical Methods | 3 |
| CSE 2205 | Theory of Computing | 3 |
| CSE 2207 | Database | 3 |
| GED 2209 | Accounting | 3 |
| CSE 2202 | Data Structure and Algorithms-II Lab | 1.5 |
| CSE 2204 | Numerical Methods Lab | 1.5 |
| CSE 2206 | Database Lab | 1.5 |
| Total Credit in 2nd Year 2nd Semester | | 19.5 |

**Third Year (Semester-I)**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Title** | **Credits** |
| CSE 3101 | Data Communication | 3 |
| CSE 3103 | Operating System | 3 |
| CSE 3105 | Compiler Design | 3 |
| STA 3107 | Information System Design | 3 |
| EEE 3109 | Artificial Intelligence | 3 |
| CSE 3102 | Operating System Lab | 1.5 |
| CSE 3104 | Compiler Design Lab | 1.5 |
| CSE 3106 | Information System Design Lab | 1.5 |
| CSE 3108 | Artificial Intelligence Lab | 1.5 |
| Total Credit in 3rd Year 1st Semester | | 21 |

**Third Year (Semester-II)**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Title** | **Credits** |
| CSE 3201 | Computer Networking | 3 |
| CSE 3203 | Software Engineering | 3 |
| CSE 3205 | Web and Mobile Application Development | 3 |
| CSE 3207 | Machine Learning | 3 |
| GED 3209 | Engineering Economics | 3 |
| CSE 3202 | Computer Networking Lab | 1.5 |
| CSE 3204 | Software Engineering Lab | 1.5 |
| CSE 3206 | Web and Mobile Application Development Lab | 1.5 |
| CSE 3208 | Machine Learning Lab | 1.5 |
| Total Credit in 3rd Year 2nd Semester | | 21 |

**Fourth Year (Semester-I)**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Title** | **Credits** |
| CSE 4101 | Microprocessor and Microcomputer | 3 |
| CSE 4103 | Digital System Design | 3 |
| CSE 41XX | Optional I | 3 |
| STA 41XX | Optional II | 3 |
| CSE 4102 | Microprocessor and Microcomputer Lab | 1.5 |
| CSE 4104 | Digital System Design Lab | 1.5 |
| CSE 4106 | Software Development Lab-I | 1.5 |
| CSE 4100 | Project | 3 |
| Total Credit in 4th Year 1st Semester | | 19.5 |

**Fourth Year (Semester-II)**

|  |  |  |
| --- | --- | --- |
| **Course Code** | **Course Title** | **Credits** |
| CSE 4201 | Computer Security | 3 |
| CSE 4203 | Entrepreneurship of ICT | 3 |
| CSE 42XX | Optional III | 3 |
| CSE 42XX | Optional IV | 3 |
| GED 4202 | Computer Security Lab | 1.5 |
| CSE 4204 | Software Development Lab-II | 1.5 |
| CSE 4200 | Project | 3 |
| Total Credit in 4th Year 2nd Semester | | 18 |

**List of Optional I and II Courses :**

|  |
| --- |
| CSE 4105: Computer Graphics |
| CSE 4107: Introduction to Data Science |
| CSE 4109: Introduction to Data Mining and Warehousing |
| CSE 4111: Advanced Algorithms |
| CSE 4113: Bioinformatics |
| CSE 4115: Information Retrieval |
| CSE 4117: Graph Theory |
| CSE 4119: Human Computer Interaction |
| CSE 4121: Wireless Networks |

**List of Optional III and IV Courses :**

|  |
| --- |
| CSE 4205: Computer Vision and Image Processing |
| CSE 4207: VLSI design |
| CSE 4209: Natural Language Processing |
| CSE 4211: Computer Ethics |
| CSE 4213: Simulation & Modeling |
| CSE 4215: Digital Signal Processing |
| CSE 4217: Introduction to Robotics |
| CSE 4219: Communication systems |
| CSE 4221: Parallel & Distributed systems |

**6. Details Curriculum for B.Sc. in Computer Science and Engineering**

**First Year Semester-I**

**CSE 1101: Computer Fundamentals (3 Credits)**

Introduction to Computers: Hardware, Software, Operating System, Microprocessor, Memory, File System, Input-Output Devices; Application Software: Introduction to software for Document Processing, Spreadsheet, Presentation, Database**,** Image and Video Editing**,** etc.; Network and Internet: Networking Concepts and Topologies, Network Addresses (MAC, IP and Port), DNS; Browser Software: URL, Security, Email, Network Configuration and Basic Tools (ping, traceroute etc.); Number System: Concept of Bit, Electronic Representation of Bits. Bit- Array: Byte, Word, etc., Binary – to- Decimal Conversion, Binary Arithmetic, Bit- Shifting, Logic Representation (1-Bit, Bit- Array). Hexadecimal Arithmetic, Conversion between Binary, Hexadecimal and Octal Numbers, Representation of Characters by Bit- Array: ASCII and UTF-8; Memory: Concepts of Primary and Secondary Memory, RAM, ROM; System Modeling and Flow Chart; Introduction to Programming: Program Structure, Variables, Constants, I/O, Conditional Statements (If- Else), More about Conditional Statements (Nested If), loops (for, while).

**CSE 1102: Computer Fundamentals Lab (1.5 Credits)**

Contents related to the coursework of Computer Fundamentals

**CSE 1103: Discrete Mathematics (3 Credits)**

Set theory: sets, relations, and partial ordered sets; functions; Mathematical Logic: propositional calculus and predicate calculus; Mathematical reasoning and proof techniques; Counting: permutations, combinations, principles of inclusion and exclusion; Discrete Probability; Recurrence relations and recursive algorithms; Growth of functions; Graph Theory: graphs, paths, and trees; Algebraic structures: rings and groups.

**PHY 1105: Physics (3 Credits)**

Heat and Thermodynamics: Introductory Concepts and Zeroth Law, Energy Considerations, Work and Heat, Units, Thermodynamic Process, Properties and Equilibrium, First Law of Thermodynamics and It’s Applications, Reversible and Irreversible Processes, Second Law of Thermodynamics, Carnot Cycle, Efficiency of Heat Engines and Heat Pump, Carnot’s Theorem, Absolute Scale of Temperature, Entropy. Structure of Matter: Crystalline & Non-Crystalline Solids, Single Crystal and Polycrystal Solids, Unit Cell, Crystal Systems, Co-ordinations Number, Crystal Planes and Directions, Packing Factor, Miller Indices, Bragg’s Law, Defects in Solids, Point Defects, Line Defects, Bonds in Solids, Interatomic Distances, Introduction to Band Theory, Distinction between Metal, Semiconductor and Insulator. Waves and Oscillations: Differential Equation of a Simple Harmonic Oscillator, Total Energy and Average Energy, Combination of Simple Harmonic Oscillations, Issajous’ Figures, Spring- Mass System, Damped Oscillation, Forced Oscillation, Resonance, Two- Body Oscillations, Reduced Mass, Differential Equation of a Progressive Wave, Power and Intensity of Wave Motion, Stationary Wave, Group Velocity and Phase Velocity, Architectural Acoustics, Reverberation and Sabine’s Formula.

**Physical Optics:** Theories of Light, Interference of Light, Young’s Double Slit Experiment, Displacements of Fringes and Its Uses, Fresnel Bi- Prism, Newton’s Rings, Interferometers, Diffraction of Light, Fresnel and Fraunhoffer Diffraction, Resolving Power of Optical Instruments, Diffraction at Double Slit & N – Slits, Diffraction Grating, Polarization, Production and Analysis of Polarized Light.

**MAT 1107: Calculus (3 Credits)**

**Functions:** Graphing Functions, Mathematical Models and Commonly used Functions (Linear, Polynomial, Power), Mathematical Models and Commonly Used Functions (Algebraic, Trigonometric, Exponential, and Logarithmic Functions), Transformations (Scaling, Reflection, Composition), Inverse of Functions, Growth of Functions. **Limits:** Concepts, One Sided Limits, Infinite limits, Limit Laws, Sandwich Theorem, Formal Definition of Limits and Continuity of Functions, Intermediate Value Theorem and Its Application, Limits at Infinity and the Horizontal Asymptotes. **Derivatives:** Derivatives and Rate of Change, Derivatives as Functions, Differentiability of Functions, Rules and Techniques of Differentiation. **Applications of Differentiation:** Rates of Change in Natural and Social Sciences, Exponential Growth and Decay, Linear Approximation and Differentials, Finding Minimum and Maximum Value of Functions and the first and Second Derivative Tests, Indeterminate Forms and L'Hospital's Rule, Curve Sketching. **Integrals:** Riemann Sum and Definite Integrals, Properties of Integrals, Fundamental Theorem of Calculus, Anti-Derivative and Indefinite Integral, Net Change Theorem, Substitution Rule. **Application of Integration:** Finding Area between Curves, Volumes, Volumes by Cylindrical Shells, Average Value of a Function, Mean Value Theorem for Integrals.

**PHY 1104: Physics Lab (1.5 Credits)**

Contents related to the coursework of Physics.

**ENG 1109: English (3 Credits)**

Construction of sentences, some grammatical problems; Comprehension; Paragraph writing; Essay writing; Dialogue writing; Amplification; Report writing; Business communication; English literature: Short stories written by some well-known classic writers.

**ENG 1106: English Lab (1.5 Credits)**

Contents related to the coursework of English.

**First Year Semester-II**

**CSE 1201: Digital Logic Design (3 Credits)**

Digital logic: Boolean algebra, De Morgan's Theorems, logic gates and their truth tables, universal gates, canonical forms, combinational logic circuits, minimization techniques (Karnaugh map, Quince McCluskey method); Arithmetic and data handling logic circuits, decoders and encoders, multiplexers and demultiplexers; Combinational circuit design; Flip-flops, race around problems; Counters: asynchronous counters, synchronous counters and their applications, shift registers; Arithmetic circuits: Half Adder, Full Adder.

**CSE 1202: Digital Logic Design Lab (1.5 Credits)**

Contents related to the coursework of Digital Logic Design.

**CSE 1203: Structured Programming (3 Credits)**

Structured programming language: data types, operators, expressions, control structures; Review of basic programming structures: conditional statements, loops; Functions and program structure: parameter passing conventions, scope rules and storage classes, recursion; Header files; Preprocessor; Pointers and arrays; Strings; Multidimensional array; User defined data types: structures, unions, enumerations; Input and Output: standard input and output, formatted input and output, file access; Variable length argument list; Command line parameters; Error Handling; Dynamic Memory Allocation; Graphics; Linking; Library functions.

**CSE 1204: Structured Programming Lab (1.5 Credits)**

Contents related to the coursework of Structured Programming.

**MAT 1205: Linear Algebra (3 Credits)**

Introduction to vectors, their products, matrices and systems of linear equations; Solving linear equations: Gaussian elimination, inverse and transpose of a matrix, factorization into A = LU; Vector spaces and subspaces: four fundamental subspaces, solving ***Ax = 0*** and ***Ax = b***, independence, basis and dimension, dimensions of the four subspaces; Orthogonality: orthogonality of the four subspaces, projections, least squares, orthonormal bases and Gram-Schmidt; Determinants: properties, formulas, co-factors, Cramer’s rule, inverses and volumes; Eigenvalues and eigenvectors: diagonalization, systems of differential equations, symmetric and positive definite matrices; Singular value decomposition (SVD): bases and matrices in the SVD, geometry of the SVD; Linear transformations: the matrices of linear transformations; Complex vectors and matrices: complex numbers, polar coordinates, Hermitian and unitary matrices; Applications of linear algebra in computer science and engineering.

**EEE 1207: Electrical Circuits (3 Credits)**

Resistor: Properties, Types of Resistors, Ohm’s Law, Power, Energy, Efficiency, etc. Series DC Circuits: Kirchhoff’s Voltage Law, Voltage Divider Rule, Power Distribution, Voltage Regulation, Voltage Sources in Series, etc. Parallel DC Circuits: Conductance and Resistance, Kirchhoff’s Current Law, Current Divider Rule, Open Circuit, Short Circuit, Voltage Sources in Parallel, etc. DC Series-Parallel Network: Reduce and Return Approach, Block Diagram Approach, Ladder Networks. Methods of Analysis for DC Networks: Current Source, Source Conversion, Current Sources in Series and Parallel, Branch- Current Analysis, Mesh Analysis, Nodal Analysis,Bridge Network and Y-∆ and ∆-Y Conversions. Network Theorems (DC): Superposition, Thevenin’s, Norton’s, Maximum Power Transfer, Millman’s, Substitution, Reciprocity, etc. Capacitor: Electric Field, Capacitance, Dielectric Strength, Leakage Current, Types of Capacitors, Charging and Discharging Phase, Energy Stored by a Capacitor, Capacitors in Series and Parallel. **Inductor:** Magnetic Field, Inductance, Types of Inductors, Faraday’s Law and Lenz’s Law, Inductors in Series and Parallel. R-L, R-C and R-L-C Circuits with DC Input. **Introduction to Sinusoidal Alternating Waveforms:** Definitions, General Format for the Sinusoidal Voltage or Current, Phase Relations, Average and RMS Values etc. Ordinary and Frequency Response of Basic R, L and C Elements, Average Power and Power Factor, Rectangular and Polar Form, Phasors.

**EEE 1206: Electrical Circuits Lab (1.5 Credits)**

Contents related to the coursework of Electrical Circuits.

**GED 1209: Bangladesh Studies (3 Credits)**

History of Bangladesh: History and Society of Bengal under British rule and Pakistan rule, The impact of British and Pakistan rules on the economy and education of the people, Language Movement of 1952, Events Leading to the Mass Upsurge of 1969, War of Independence and the Emergence of Bangladesh in 1971; Government and Politics of Bangladesh: Three branches of government- executive, legislative and judiciary, Formation and role of major political parties in Bangladesh and Constitutional development of Bangladesh, Study of Geography and Resources of Bangladesh; Geography of Bangladesh: Location, Area, Boundary, Ecological Settings, River System, Climate, People and Resources of Bangladesh; Social Structure of Bangladesh: Rural society, Urban society, Family, household, and kinship, Women’s role in society Culture of Bangladesh, Language, Literature, Art and Culture of Bangladesh; Economy of Bangladesh: Major Economic Sectors, potentials of various sectors and their prospective challenges; foreign aid and development, role of donor agencies, role of NGOs; Achievements in different sectors of Bangladesh: Economy, Culture, Sports, etc.; Socio-economic problems and prospects of Bangladesh: poverty, health issues, natural disaster, social stratification and gender discrimination.

**Second Year Semester-I**

**CSE 2101: Object Oriented Programming (3 Credits)**

Introduction: Object oriented programming overview. Object Oriented Concepts: Modeling problems using object-oriented concepts. Introduction to UML. Encapsulation, Inheritance and Polymorphism. Object Oriented vs. Procedural programming, Basics of Object-Oriented Programming language. Objects and Classes: Attributes and functions, constructors and destructors, functions or methods, overloading methods, access control, special considerations in different languages. I/O: Stream and files. Inheritance: Inheriting classes, subclass, super class, access control, inheritance hierarchy, overriding, dynamic binding, abstract class, inner classes, special considerations in different languages, multiple inheritance, interface. Exception and exception handling: Exception handling fundamentals, exception types, chained exception, creating own exception subclasses. Generics or Templates: Special considerations in different languages. Package/Namespace: Understanding and implementing package/namespace. Object-oriented Design Principles and examples: Introduction to object-oriented design principles and examples, introduction to object-oriented design. Case Study using Object Oriented Programming.

**CSE 2102: Object Oriented Programming Lab (1.5 Credits)**

Contents related to the coursework of Object Oriented Programming.

**CSE 2103: Data Structure & Algorithms - I (3 Credits)**

Internal data representation; Abstract data types; Introduction to algorithms; Asymptotic analysis: growth of functions, O, Ω and Θ notations;

Correctness proof and techniques for analysis of algorithms; Master

Theorem; Elementary data structures: arrays, linked lists, stacks, queues, trees and tree traversals, graphs and graph representations, heaps, binary search trees; Graph Traversals: DFS, BFS, Applications of DFS and BFS;

Sorting: heap sort, merge sort, quick sort; Lower bound theory; Data structures for set operations; Methods for the design of efficient algorithms: divide and conquer, greedy methods, dynamic programming.

**CSE 2104: Data Structure & Algorithms - I Lab (1.5 Credits)**

Contents related to the coursework of Data Structure & Algorithms-I

**CSE 2105: Computer Architecture (3 Credits)**

Information representation; Measuring performance; Instructions and data access methods: operations and operands of computer hardware, representing instruction, addressing styles; Arithmetic Logic Unit (ALU) operations, floating point operations, designing ALU; Processor design: datapaths - single cycle and multicycle implementations; Control Unit design - hardwared and microprogrammed; Hazards; Exceptions; Pipeline: pipelined datapath and control, superscalar and dynamic pipelining; Memory organization: cache, virtual memory, channels; DMA and Interrupts; Buses; Multiprocessors: types of multiprocessors, performance, single bus multiprocessors, multiprocessors connected by network, clusters.

**STA 2107: Probability and Statistics (3 Credits)**

Complex Variables: Functions of a complex variable; Limits and continuity of functions of complex variable; Complex differentiation and Cauchy-Riemann Equations; Mapping by elementary functions; Line integral of a complex function; Cauchy's Integral Theorem; Cauchy's Integral Formula; Liouville's Theorem; Taylor's Theorem and Laurent's theorem; Singular points; Residue; Cauchy's Residue Theorem; Contour integration; Mapping.

**Statistics:**

Frequency distribution; Measures of central tendency; Standard deviation and other measures of dispersion; Moments, Skewness and kurtosis; Elementary probability theory; Random variables, Mathematical expectations; Discontinuous probability distribution: Binomial, Poisson and Negative binomial; Continuous probability distribution: Normal and Exponential; Hypothesis testing and regression analysis.

**EEE 2109: Electronics (3 Credits)**

Introduction to Semiconductors: Properties, bonds and types of semiconductors. Semiconductor Diodes and Special Purpose Diodes: The pn junction diode: formation, properties and V-I characteristics, Basic constructions, characteristics, operations and uses of special diodes: Light-emitting diode (LED), Zener diode etc. Diode Application: Half-wave and full-wave rectifiers – operation and efficiency, Ripple factor, Filter circuits – capacitor input filter, LC filter and Π-filter, Clipping and Clamping circuits, Voltage regulation and regulator circuits - Zener diode and transistor voltage regulator. Bipolar Junction Transistors: npn and pnp transistors, amplifying and switching actions of transistor, transistor characteristics in CB, CE & CC configurations, transistor load line and Operating point. BJT Biasing: Faithful amplification, inherent variation of transistor parameters and thermal runway, stabilization and stability factor, methods of BJT biasing, analysis and design of biasing circuits. Single Stage Transistor Amplifier: Single stage amplifier circuit, phase reversal, dc and ac equivalent circuits, load line analysis, voltage gain and power gain, classification of amplifiers, amplifier equivalent circuits. Field Effect Transistors: Classification of FET, construction, operation and characteristics of JFET and MOSFET, transfer characteristics and Shockley’s equation DC biasing DC biasing of JFET. **Power Electronics:** operations, characteristics and applications of industrial electronics devices: SCR (Silicon Controlled Rectifier), TRIAC, DIAC etc. Feedback Techniques and Op-amps: Concepts- negative and positive feedback, characteristics and gain with negative voltage and current feedback, emitter follower, basic op-amps- characteristics, inverting, non-inverting, integrators, differentiators, summing amplifiers. Oscillators: Theory of oscillation and characteristics of different oscillators. Introduction to IC fabrication.

**EEE 2106: Electronics Lab (1.5 Credits)**

Contents related to the coursework of Electronics.

**Second Year Semester-II**

**CSE 2201: Data Structure & Algorithms – II (3 Credits)**

Graph algorithms: MST algorithms, shortest path algorithms, maximum flow and maximum bipartite matching; Lower bound theory; Advanced data Structures: balanced binary search trees (AVL trees, red-black trees, splay trees, skip lists), advanced heaps (Fibonacci heaps, binomial heaps); Hashing; NP-completeness; NP-hard and NP-complete problems; coping with hardness: backtracking, branch and bound, approximation algorithms; String matching algorithms.

**CSE 2202: Data Structure & Algorithms - II Lab (1.5 Credits)**

Contents related to the coursework of Data Structure & Algorithms- II.

**CSE 2203: Numerical Methods (3 Credits)**

Introduction; Solution of Non-linear Equations: Fixed Point Iteration, Bi-Section method, False Position method, Newton-Raphson method, Bairstow’s Method; Solution of Linear equations: Triangular systems and back substitution, Gauss-Jordan elimination method, Pivoting, LU-factorization, Cholesky’s method, Dolittle and Crout factoriza- tion; Interpolation and Approximation: Taylor’s Series, Lagrangian interpolation, Divided differences formula, Newton’s forward and backward interpolation, Spline interpolation; Differentiation: Numerical differentiation, Richardson’s extrapolation; Integration: Newton’s-Cote integration, Trapezoidal rule, Simpson’s rule, Romberg’s integration; Ordinary Differential Equations: Euler’s method, Picard’s method, Milne’s method, Taylor’s series method, Runge-Kutta method; Curve Fitting: Least squares lines, Least square polynomials, Non-linear curve fitting; Numerical Optimization: Golden Ratio search, Newton’s search, Powell’s method, Gradient search. Reference Tools: Matlab. Codes are to be written as well in Matlab.

**CSE 2204: Numerical Methods Lab (1.5 Credits)**

Contents related to the coursework of Numerical Methods.

**CSE 2205: Theory of Computation (3 Credits)**

Language theory; Finite automata: deterministic finite automata, nondeterministic finite automata, equivalence and conversion of deterministic and nondeterministic finite automata, pushdown automata; Context free languages; Context free grammars; Turing Machines: basic machines, configuration, computing with Turing machines, combining Turing machines; Undecidability.

**CSE 2207: Database (3 Credits)**

Introduction: General overview and purpose of Database Management Systems (DBMSs), advantages, applications, common features and overall structure of the database. Data modeling (Relational model): structure of relational model, key constraints, referential integrity constraints, general constraints, Relational algebra: fundamental, additional and extended operations, aggregate functions, outer joins and database modification using RA. ER model: entity and relationship sets, constraints – key, mapping cardinality and participation constraints, strong and weak entity sets, E-R diagram, class hierarchies, aggregation, conceptual database design with the ER model, converting ER to relational model. Database application development (SQL): data definition and data manipulation languages, integrity constraints, basic queries, nested and complex queries, modification of the database, Views: definition, update on views, cursors, Extending DBMS functionality: stored procedures, assertions and triggers, embedded and dynamic SQL, DBMS administration: DBA, users, privileges, security etc. Relational database design: Features of good relational design, functional dependency theory – basic concept, uses, closure of a set of FDs, closure of attribute sets, canonical cover, algorithms for FDs, decomposition using FDs & its desirable properties, Normalization: atomic domains and first normal form, BCNF and 3NF, multi-valued dependencies and fourth normal form, decomposition algorithms for different normal forms, database design process. DBMS implementation technology: Storage and file structure: different storage types, RAID and RAID levels, file and record organization, data dictionary storage, Indexing and hashing: basic concepts, ordered indices, B+-tree index files, B-tree index files, static & dynamic hashing, comparison of ordered indexing & hashing.

**CSE 2206: Database Lab (1.5 Credits)**

Contents related to the coursework of Database.

**GED 2209: Accounting (3 Credits)**

**Financial Accounting:** Objectives and importance of accounting; Accounting as an information system; computerized system and applications in accounting; Recording system: double entry mechanism; Accounts and their classification; Accounting equation; Accounting cycle: journal, ledger, trial balance; Preparation of financial statements considering adjusting and closing entries; Accounting concepts (principles) and conventions.

Financial statement analysis and interpretation: ratio analysis.

**Cost and Management Accounting:** Cost concepts and classification; Overhead cost: meaning and classification; Distribution of overhead cost; Overhead recovery method/rate; Job order costing: preparation of job cost sheet and quotation price; Inventory valuation: absorption costing and marginal/variable costing technique; Cost-Volume-Profit analysis: meaning, breakeven analysis, contribution margin approach, sensitivity analysis. Short-term investment decisions: relevant and differential cost analysis. Long-term investment decisions: capital budgeting, various techniques of evaluation of capital investments.

**Third Year Semester-I**

**CSE 3101: Data Communication (3 Credits)**

Introduction: Communication model, data communication tasks, data communication network standards and organizations. Physical Layer: Analog and digital data transmission, spectrum and bandwidth, transmission impairments, data rate and channel capacity. Transmission Medium: Characteristics and applications of various types of guided medium. Wireless Transmission: Characteristics and applications of wireless transmission-terrestrial and satellite microwave, radio waves, etc.; Digital transmission: Line coding techniques NRZ, RZ, Manchester, and differential Manchester encoding, AMI, Block coding, analog to digital conversion based on PCM, delta modulation, etc.; Analog transmission: ASK, FSK, PSK, QPSK, QAM encodings, AM, PM, FM, etc.; Data Transmission: Synchronous and asynchronous data transmission techniques. Multiplexing: FDM, TDM; Spread Spectrum: Frequency hopping spread spectrum, direct sequence spread spectrum, code division multiple access. Data Link Layer: Error Detection and Correction; parity check, CRC, forward error correction technique, linear block code, hamming code, etc. Data Link Control: Line configurations, flow control and error control techniques- sliding window, stop and wait ARQ, selective reject ARQ.

**CSE 3103: Operating System (3 Credits)**

Operating System: its role in computer systems; Operating system concepts; Operating system structure; Process: process model and implementation, Inter-Process Communication (IPC), classical IPC problems, process scheduling, multiprocessing and time-sharing; Memory management: swapping, paging, segmentation, virtual memory; Input/Output: I/O Devices, I/O Bus architecture and controller, interrupts, DMA, programmed I/O. Disk I/O management: low level disk formatting, Disk arm scheduling; Deadlock: resource allocation and deadlock, deadlock detection, prevention and recovery; File Systems: files, directories, security, protection; File System Implementation: implementing file, allocation strategy, directory implementation, UNIX i-node, block management; Case study of some operating systems.

**CSE 3102: Operating System Lab (1.5 Credits)**

Contents related to the coursework of Operating System.

**CSE 3105: Compiler Design (3 Credits)**

Basic issues, compiler structure, front end, back end; Lexical analysis: Tokens, patterns, and lexemes, input buffering, transition diagrams, lexical-analyzer generator; Syntax analysis: Elimination of left recursion, left factoring, FIRST and FOLLOW, LL(1) grammars, nonrecursive predictive parsing, parser generators; Syntax-directed translation:

Syntax-directed definitions, inherited and synthesized attributes, dependency graphs, syntax-directed translation schemes; Semantic analysis: Type expressions, type equivalence, type-checking; Run-time environments: Storage organization, static versus dynamic storage allocation, activation trees, activation records; Intermediate code generation: Directed acyclic graphs for expressions, three-address code, quadruples, triples, static single-assignment form; Code generation; Code optimization: Basic blocks and flow graphs, next-use information, optimization of basic Blocks.

**CSE 3104: Compiler Design Lab (1.5 Credits)**

Contents related to the coursework of Compiler Design.

**CSE 3107: Information System Design (3 Credits)**

Requirement Collection and Analysis techniques; Business Process Modelling using BPMN; Designing mock UI/prototyping; database design; Designing data flow diagrams; Object oriented systems analysis and design using UML: Usecase, Class Diagram, Sequence and collaboration diagram, State diagram; Software engineering processes; Software architecture: different layered, modular and microservice architecture; Deployment architecture and Devops engineering; Version control and management; Software project management: software process and project metrics, software project planning, risk analysis and management, project scheduling and tracking, software cost analysis, COCOMO model

**CSE 3106: Information System Design Lab (1.5 Credits)**

Contents related to the coursework of Information System Design.

**CSE 3109: Artificial Intelligence (3 Credits)**

Introduction: Agents and environment; Problem solving by searching: Uninformed Search Strategies: Breadth first search, Uniform cost search, Depth-first search, Depth limited search; Iterative deepening and bidirectional search. Informed search algorithms: heuristic techniques, Best-first search, A\* search, Beam search, Memory Bounded Search; Local Searches: Hill Climbing, Simulated Annealing; Constraint Satisfaction Problems; Genetic Algorithm: selection, crossover, mutation and fitness. Game Playing: min-max search, resource limits and heuristic evaluation, α-β pruning; Logic: propositional logic, logical inference: resolution, forward and backward chaining, First Order Logic: quantifiers, model, validity, inference, substitution, unification and Herbrand theorem. Planning: Planning problems, partial order planning, planning as logical inference planning; Probabilistic reasoning: uncertainty, probability, independence, Bayes’ rule, Bayesian network, inference in Bayesian network, Knowledge representation: ontological engineering, categories and objects, events, reasoning systems; Expert systems and knowledge engineering; Machine learning basics: supervised learning, unsupervised learning, reinforcement learning, decision trees, neural networks; Application: Computer vision, Natural Language Processing, Robotics.

**CSE 3108: Artificial Intelligence Lab (1.5 Credits)**

Contents related to the coursework of Artificial Intelligence.

**Third Year Semester-II**

**CSE 3201: Computer Networking (3 Credits)**

Protocol hierarchies; Data link control: HLDC; DLL in Internet; DLL of ATM; LAN Protocols: Standards IEEE 802.\*; ARP, RARP; Hubs, Bridges, and Switches, FDDI, Fast Ethernet; Routing algorithms; Congestion control; Internetworking, WAN; Fragmentation; IPV4, IPV6, Mobile IP, Network layer of ATM; Transport protocols; Transmission control protocol: connection management, transmission policy, congestion control, timer management; UDP; AAL of ATM; Gigabit Ethernet; Domain Name System: Name servers; Application layer protocols: SMTP, SNMP, HTTP, World Wide Web, DHCP

**CSE 3202: Computer Networking Lab (1.5 Credits)**

Contents related to the coursework of Computer Networking.

**CSE 3203: Software Engineering (3 Credits)**

Concepts of software engineering: software engineering paradigms, different phases of software system development, GoF design patterns: Creational DP: Factory, Abstract Factory, Singleton, Builder, etc., Structural DP: Adapter, Decorator, Façade, Composite, etc, Behavioral DP: State, Strategy, Observer, Chain of Responsibility, Mediator, etc; Software testing: white box and black box testing, Software testing strategies: Equivalence partitioning, unit testing, integration testing, Regression testing, Performance and security testing, Alpha and Beta testing; Software quality assurance: quality factors. Software quality measures, cost impact of software defects, concepts of software reliability, availability and safety; Code coverage; Code smell.

**CSE 3204: Software Engineering Lab (1.5 Credits)**

Contents related to the coursework of Software Engineering.

**CSE 3205: Web and Mobile Application Development (3 Credits)**

Introduction To HTML, JavaScript & CSS, Server Side Programming: HTTP Server, Application Server, MVC Web Framework, Web Services; Review of Database related concepts; Basics of Web Security: Denial of Service, Buffer Overflow, Cross Site Scripting, Authentication and Access Control; Mobile platforms: anatomy of mobile devices, mobile OS (e.g., Android,iOS), mobile programming (e.g., Java, Objective C); Android programming basics: SDKs, activities, life cycles, views, intent, resource, storage, UIs; Android advanced programming: SQLite, networking, maps, multimedia; iOS programming basics: objective C, SDKs, views, view controllers, gestures, storage; iOS advanced programming: memory management, data management, networking, location technologies.

**CSE 3206: Web and Mobile Application Development Lab (1.5 Credits)**

Contents related to the coursework of Web and Mobile Application Development.

**CSE 3207: Machine Learning (3 Credits)**

Supervised and Unsupervised Learning, issues in machine learning: parametric and non-parametric models, curse of dimensionality, over-fitting, and model selection. Linear Models for Regression: Maximum Likelihood and least squares, regularized least squares,

Bias variance decomposition, Bayesian linear regression. Linear Models for classification: Fisher's linear discriminant, probabilistic generative models -parametric (maximum likelihood and Bayesian) and non-parametric density estimation. Probabilistic discriminative models: logistic regression, log-linear models, Kernel methods and Sparse Kernel Machines. Decision tree, Bayesian, k-NN, Neural Network and SVM classifiers. Metrics for evaluating classifier performance: accuracy, precision, recall, F-measure. Ensemble Methods: bagging, boosting, random forests. Clustering, mixture models and Expectation Maximization algorithm. Sequential data and Markov models.

**CSE 3208: Machine Learning Lab (1.5 Credits)**

Contents related to the coursework of Machine Learning.

**GED 3209: Engineering Economics (3 Credits)**

Economics and engineering; microeconomics and macroeconomics; theory of demand and supply and their elasticities; demand estimation; price determination; indifference curve technique; theory of production; theory of cost and cost estimation; market structure; national income accounting; depreciation; circular flow of income and expenditure; cost-benefit analysis; payback period, net present value (NPV), internal rate of return (IRR), inflation; economic feasibility of engineering undertakings; development economics.

**Fourth Year Semester-I**

**CSE 4101: Microprocessor and Microcontroller (3 Credits)**

Evolution of microprocessor, **8086 Microprocessor**: architecture, instruction sets, interrupts and 8259A, higher versions of 8086 (80286, 80386, 80486). **Pentium Microprocessor**: architecture, register sets, cache, floating point operations, addressing modes, paging, instruction set, opcode, interrupt, protected mode operations. **Next Generation Microprocessors**: Intel Core architecture, Intel dual core, core 2 duo, core 2 quad, core i3, core i5, core i7, mobile microprocessors, helio, atom, ARM Processor: Cortex M3/M4 processor: architecture, register sets, instruction sets, operation modes, addressing modes, memory system, interrupts, NVIC and exceptions, memory protection unit, floating point unit, debug architecture, DSP for cortex M4 processor. **Microcontrollers:** Microcontroller & embedded systems, 8051 microcontroller architecture, operation and instruction set, memory and I/O interfacing, interfacing to external devices. STM32F4xx Microcontroller architecture, bus architecture, memory mapping, clock, timer, Interfacing: I/O and external device, USART, I2C, SPI. **Programmable Logic Controller (PLC):** Basic Structures, I/O, Programming, Mnemonics and Timers, Relays and Counters, Master and Jump control, Data Control, Analog I/O Control.

**CSE 4102: Microprocessor and Microcontroller Lab (1.5 Credits)**

Contents related to the coursework of Microprocessor & Microcontroller.

**CSE 4103: Digital System Design (3 Credits)**

Designing I/O system; I/O devices; Designing Microprocessor based system with interfacing chips; Programmable peripheral interface (interface to A/D and D/A converter); Keyboard/display interface; Programmable timer; Programmable interrupt controller, DMA controller; Design using MSI and LSI components; Design of memory subsystem using SRAM and DRAM; Design of various components of a computer: ALU, memory and control unit - hardwired and micro programmed; Microprocessor based designs.

**CSE 4104: Digital System Design Lab (1.5 Credits)**

Contents related to the coursework of Digital System Design.

**CSE 41XX: Optional 1 (3 Credits)**

**CSE 41XX: Optional 2 (3 Credits)**

**CSE 4106: Software Development Lab – I (1.5 Credits)**

Design and development of a web or mobile application or desktop application using standard framework and architecture and appropriate software engineering methods. The techniques and principles covered in Software Engineering and Information System Design will be followed.

**CSE 4100: Project (3 Credits)**

This is the first part of the final year project/thesis. Each student can perform either a project or a thesis. The student will demonstrate their project/thesis progress through presentations and demonstrations. At the end of the semester, a progress report will be submitted.

**Fourth Year Semester-II**

**CSE 4201: Computer Security (3 Credits)**

Fundamental concepts: confidentiality, integrity, availability, non-repudiation, authenticity and anonymity; threats and attacks, security principles; Cryptographic concepts: encryption, digital signatures, simple attacks on cryptosystems, cryptographic hash functions, digital certificates; Cryptography: symmetric cryptography, public-key cryptography, cryptographic hash functions, digital signatures, details of AES and RSA cryptography; Security: Operating systems concepts, process security, memory and file system security, physical security, network security concepts, browser security, physical security, applications security, Security Attacks: buffer overflow, cross-site scripting, sql injection and other vulnerabilities due to insecure programming and their mitigation; vulnerability scanning techniques, foot printing, social engineering , Trojans and backdoors, sniffing, denial of service, session hijacking, session fixation, threats on components like webservers, web Applications, mobile platforms, wireless networks, Security Measures: Firewall, Intrusion detection and prevention; Attacks exploiting protocols like ARP, DHCP, etc.; Security testing.

**CSE 4202: Computer Security Lab (1.5 Credits)**

Contents related to the coursework of Computer Security.

**CSE 4203: Entrepreneurship for ICT Ventures (3 Credits)**

The foundations of entrepreneurship; Inside the entrepreneurship mind: from ideas to reality; The rewards and challenges of entrepreneurship: driving forces behind small business, ethics and social responsibility, creativity and innovation; New business planning process: conducting a feasibility analysis, designing a competitive business model, building a solid strategic plan and crafting a winning business plan; Forms of business ownership: franchising and the entrepreneur, buying an existing business; Building a marketing plan: building a bootstrap marketing plan, creative use of advertising and promotion, pricing and credit strategies, global marketing strategies, e-commerce; Building a financial plan: creating a successful financial plan, managing cash-flow, sources of financing-equity and debt; Building an operational plan: location, layout and physical facilities, supply chain management, managing inventory, staffing and leading a growing company; Legal aspects of small business: succession,ethics, business law and government regulation; Strategic plan and risk management; Global aspects of entrepreneurship; Building a new venture team and planning for the next generation.

**CSE 42XX: Optional 3 (3 Credits)**

**CSE 42XX: Optional 4 (3 Credits)**

**CSE 4204: Software Development Lab – II (1.5 Credits)**

Design and development of a web or mobile application or desktop application using standard framework and architecture, automatic deployment and testing. Adding advanced components such as Business Intelligence and analytics, machine learning based modules, dashboards to the application. The techniques and principles covered in Software Engineering and Information System Design will be followed.

**CSE 4200: Project (3 Credits)**

This is the second part of the final year project/thesis. The student will demonstrate their project/thesis progress through presentations and demonstrations. At the end of the semester, a final project report/ thesis will be submitted.

**Optional Courses I and II**

**CSE 4105: Computer Graphics (3 Credits)**

Basics of computer graphics and its applications; Graphics Hardware Display devices; Vector graphics and raster graphics system; Scan conversion algorithms: Mid-point Line, Circle and ellipse Creation Algorithms. Slope independent line drawing using mid-point line algorithm; Polygons: Difference type of polygons, polygon filling algorithms, triangulation; Windowing and Clipping: Window Viewpoint, Zooming, panning, line, text and polygon, clipping algorithms; Transformation: Homogeneous coordination, Transformation in 3D, Transformation matrices, translation, rotation, scaling; Projection: Parallel and perspective, standard projection matrices; Hidden Surface removal: Painter's algorithm, Z-Buffering, Visible surface ray-tracing algorithm; Illumination and Shading: Light Models, Ambient light, diffuse and specular reflection, light attenuations, Goraud and Phong shading, Recursive Ray Tracing; Monochrome and colored light: monochrome light, additive and subtractive light, Colored light- RGB, CMY, YIQ, HSV and HLS color model. Image File Format: PPM file, BMP file. Representing curves and surfaces: Polygonal surfaces, Parametric Cubic Curves- Hermite, Bezier and B-spline curves; Parametric bi-cubic surfaces: bicubic splines; Application development using OpenGL.

**CSE 4107: Introduction to Data Science (3 Credits)**

Data collection and extraction, Preprocessing: Data quality, Data cleaning: missing values, noisy data, Data Storage and integration: SQL and NoSQL databases, redundancy and correlation analysis, tuple duplication, conflict detection and resolution, Data Reduction: overview, wavelet transformation, principal component analysis, attribute subset selection, regression and log-linear models, histograms, classification, clustering, sampling, Data cube aggregation; Data Transformation and Discretization: overview, normalization, binning, histogram analysis, concept hierarchy generation, Data visualization, Exploratory Data Analysis, Introduction to data modeling.

**CSE 4109: Introduction to Data Mining and Warehousing (3 Credits)**

**Data warehousing:** Basic concepts: difference between operational DB and DW, multi-tiered architecture of DW, enterprise warehouse, data mart and virtual warehouse; Data warehouse modeling: data cube and OLAP; Data cube: A multidimensional data model; Stars, Snowflakes, and Fact Constellations: schemas for multidimensional databases; Dimensions and Measures, Typical OLAP operations: roll-up, slice and dice; Data warehouse design and usage, Data warehouse implementation, Data generalization by attribute oriented indexing. **Mining frequent patterns:** Definitions and background, Market basket analysis, Methods for mining frequent patterns (i) Apriori algorithm (mining frequent itemsets using candidate generation, Improving the efficiency of Apriori), (ii) FP-growth algorithm (mining frequent itemsets without candidate generation), (iii) Mining frequent itemsets using vertical data format; Mining closed and maximal frequent itemsets; Mining frequent patterns in data streams. **Mining association rules and correlation:** Mining association rules, generating association rules from frequent itemsets, Mining correlations from association rules, Significance of correlation mining in presence of association rules, Pattern evaluation methods, Various correlation measures: lift, chi-square, all\_conf, max\_conf, cosine and Kulc; their performance and applicability analysis. **Mining sequential patterns:** Concepts and primitives, applications, domains; mining methods in transactional databases (i) Apriori based approaches (GSP, SPADE), (ii) Pattern growth based (PrefixSpan); closed and maximal sequential patterns; Mining sequential patterns in biological databases, web access databases and time series databases. **Mining dynamic data and data streams:** Basic ideas of mining incremental and dynamic data, handling high speed stream data, different windowing techniques for data streams such as tilted and sliding window. **Classification and Regression:** Basic concepts of supervised learning; Classification methods: decision tree, Bayesian classification, rule-based classification, k-NN; Model evaluation and selection: metrics for evaluating classifier performance: accuracy, precision, recall, F-measure; random subsampling, cross-validation, bootstrap; model selection using statistical tests of significance, ROC-curves, Ensemble Methods: bagging, boosting, random forests; Handling class-imbalanced data; Basic concepts of linear and non-linear regression, measures for regression: mean absolute error and root mean square error. **Clustering:** Basic concepts of unsupervised learning; Measuring data similarity and dissimilarity; Clustering methods: partitioning methods: k-Means, k-Medoids; Hierarchical Methods: agglomerative and divisive, BIRCH and Chameleon; Density-based methods: DBSCAN and OPTICS; Grid-Based Methods; Evaluation of Clustering.

**CSE 4111: Advanced Algorithms (3 Credits)**

Randomized Algorithms: Las Vegas and Monte Carlo Algorithms; Randomized Data Structures: Skip Lists; Amortized Analysis: Different methods, Applications in Fibonacci Heaps; Lower Bounds: Decision Trees, Information Theoretic Lower Bounds, Adversary Arguments; Approximation Algorithms: Approximation Schemes, Hardness of Approximation; Fixed Parameter Tractability: Parameterized Complexity, Techniques of designing Fixed Parameter Algorithms, Examples; Algorithms for combinatorial optimization, Online Algorithms, Examples of algorithms in various fields like Bioinformatics, Grid Computing, VLSI design etc.

**CSE 4113: Bioinformatics (3 Credits)**

Graph algorithms for bioinformatics: DNA sequencing, DNA fragment assembly, Spectrum graphs; Sequence similarity; Suffix tree and its variants with applications; Genome Alignment: maximum unique match, LCS, mutation sensitive alignments; Database search: Fast A, BLAST and its variations, Locality sensitive hashing; Multiple sequence alignment: Local and Global alignment; Phylogeny reconstruction: Species trees and gene trees, Maximum likelihood and maximum parsimony based phylogenetic tree estimation techniques, distance-based phylogenetic tree estimation, Phylogeny comparison: similarity and dissimilarity measurements, consensus tree problem; Genome rearrangement: types of genome rearrangements, sorting by reversal and other operations; Motif finding; RNA secondary structure prediction; Peptide sequencing; Population genetics.

**CSE 4115: Information Retrieval (3 Credits)**

Boolean Retrieval: Inverted Index, Processing boolean queries, extended Boolean retrieval; Term Vocabulary and Postings lists: Document delineation and character sequence decoding, Tokenization, Dropping common terms: stop words, Normalization (equivalence classing of terms), Stemming and lemmatization, skip pointers, Biword indexes, Positional indexes; Dictionaries and tolerant retrieval: Search structures for dictionaries, General wildcard queries, k-gram indexes for wildcard queries, Spelling correction; Index Construction: Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing; Scoring and Ranking: Parametric and zone indexes, Term frequency and weighting, The vector space model for scoring, variant tfidf functions; Computing scores in a complete search system: Efficient scoring and ranking, Components of an information retrieval system; Evaluation in information retrieval: Evaluation of unranked retrieval sets, Evaluation of ranked retrieval results, Assessing relevance, Results snippets; Relevance feedback and query expansion: The Rocchio algorithm for relevance feedback, Relevance feedback on the web, Evaluation of relevance feedback strategies, Global methods for query reformulation; Language models for information retrieval; Enterprise Information Retrieval: Explore the capacity of Apache Lucene as a text search framework.

**CSE 4117: Graph theory (3 Credits)**

Graphs: simple graphs, digraphs, subgraphs, vertex-degrees, walks, paths and cycles; Trees, spanning trees in graphs, distance in graphs; Complementary graphs, cut-vertices, bridges and blocks, k-connected graphs; Euler tours, Hamiltonian cycles, Chinese Postman Problem, Traveling Salesman Problem; Chromatic number, chromatic polynomials, chromatic index, planar graphs, perfect graphs.

**CSE 4119: Human Computer Interaction (3 Credits)**

Introduction to HCI. Cognitive Models. Socio – Organizational Issues.Understanding the Users: Need finding, Communicating with the Users, Observation, Interviewing.Prototyping. Research Method – I: Qualitative Approaches: Survey Design, Introduction to Decision Analytic Approaches, Mental Models. Design Heuristic and Evaluation Learning Strategies. Research Method – II: Quantitative Approaches:Statistical Thinking, Introduction to Data Analytics, Uncertainty. Design Issues with the New Media: Online Education, Introduction to Second Life. Design Issues with Mobile Systems. Social Usability: Analyzing the Social Network. Introduction to Complex Network. Research Methods – III: Introduction to Data Scientific Processes, Introduction to Various Machine Learning Tools and Algorithms. Visual Design: Representation, Visual Layout, Typography, Information Design. Designing for Children and the Society: Playful User Interface, Interface Designs that invite Social and Physical Interactions, Games for Change, Personalization and Teaching, Health and Sports, Designing Interactions for Children, Perils of Children’s Digital Life, Pro– Poor User Interface, Designing for Development. Crowd Computing: Designing Software for Collaboration, Augmented Reality, Wearable.

**CSE 4121: Wireless Networks (3 Credits)**

Cellular concepts: frequency reuse, handoff strategies, interference and system capacity, grade of service, improving capacity and coverage, call blocking probability; Propagation effects: outdoor propagation models, indoor propagation models, power control, Dopplerâ€™s effect, small and large scale fades; Wireless LAN Technology; IEEE 802.11: standard, protocol architecture, physical layer and media access control; Mobile IP; Wireless Application Protocol; IEEE 802.16 Broadband Wireless Access; Brief review of 2nd and 3rd generation wireless: GSM, GPRS, CDMA; Cordless system; Wireless local loop; Bluetooth: overview and baseband specifications.

**Optional Courses I and II**

**CSE 4205: Computer Vision and Image Processing (3 Credits)**

Introduction; Digitization of images and its properties; Data structures for image analysis; Image processing; Segmentation: detection of discontinuities, edge linking and boundary detection, thresholding, region oriented segmentation, use of motion in segmentation; Image transforms: Z-transform, 2D Fourier transform, discrete cosine transform, Hadamard transform, Walsh transform, Slant transform; Image compression: run-length coding, transform coding, standards; Feature detection and matching: Edge detection, Interest point and corners, local image features, Feature matching: Hugh transform, model fitting, RANSAC; Feature Tracking - KLT tracker, Optical Flow; Image Segmentation: Split and Merge methods, Mean shift and mode finding methods, Graph cuts and energy based methods; Object Detection and Recognition: Eigenfaces, Instance Recognition: bag of words, part based methods.

**CSE 4207: VLSI design (3 Credits)**

VLSI design methodology: top-down design approach, technology trends and design automation algorithms; Introduction to CMOS inverters and basic gates; Brief overview of CMOS fabrication process: layout and design rules; Basic CMOS circuit characteristics and performance estimation; Buffer circuit design; Complex CMOS gates, CMOS building blocks: adder, multiplier; data path and memory structures.

Hardware modeling: hardware modeling languages, logic networks, state diagrams, data-flow and sequencing graphs, behavioral optimization.

Architectural Synthesis: circuit specification, strategies for architectural optimization, data-path synthesis, control unit synthesis and synthesis of pipelined circuits.

ASIC design using FPGA and PLDs.

**CSE 4209: Natural Language Processing (3 Credits)**

Introduction: Overview of NLP, Ambiguity and uncertainty in language. Language modeling and Naive Bayes: Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Part of Speech Tagging: The concept of parts-of-speech, examples, usage, The Penn Treebank and Brown Corpus; Probabilistic (weighted) finite state automata; Hidden Markov models (HMMs); Context Free Grammars: Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing; Probabilistic Context Free Grammars: Weighted context free grammars. Weighted CYK. Pruning and beam search. Machine Translation: Probabilistic models for translating French into English. Alignment, translation, language generation. IBM Model #1 and #2; Overview of NLP applications; text-to-speech, speech-to-text, text summarization, sentiment analysis, etc.; Issues of Bangla NLP.

**CSE 4211: Computer Ethics (3 Credits)**

Introduction to Ethics, Morals, Integrity, Ethical use of Information Technology, Ethics for IT Workers and IT Users - Trade secret, Whistle blowing, fraud, misrepresentation, bribery, professional code of ethics, IT professional malpractice and Common Ethical issues for IT users, Computer and Internet Crime - Exploit, Viruses, Phishing and Types of perpetrators, Privacy - Information privacy, fair information practices, EU data protection directive, key privacy and anonymity issues, Freedom of Expression - Right to freedom of expression, obscene speech, hate speech, defamation, controlling access to information on the internet, anonymity on the internet, corporate blogging and pornography, Intellectual property - Copyright, fair use doctrine, patent, software patents, trade secret and key intellectual property issues, Impact of IT on society, Social networking ethical issues, Ethics for IT organization.

**CSE 4213: Simulation & Modeling (3 Credits)**

Simulation modeling basics: systems, models and simulation; Classification of simulation models; Steps in a simulation study; Concepts in discrete-event simulation: event-scheduling vs. process- interaction approaches, time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discreet-continuous models; Monte Carlo simulation; Simulation of queuing systems. Building valid and credible simulation models: validation principles and techniques, statistical procedures for comparing real-world observations and simulated outputs, input modeling; Generating random numbers and random variates; Output analysis; Simulation languages; Analysis and modeling of some practical systems.

**CSE 4215: Digital Signal Processing (3 Credits)**

Discrete time signals and systems: Fourier and Z transforms, DFT, 2-dimensional versions; Linear time invariant discrete time systems; Digital signal processing topics: flow graphs, realizations, FFT, quantization effects, linear prediction; Digital filter design methods: windowing, frequency sampling, S-to-Z methods, frequency-transformation methods, optimization methods, 2-dimensional filter design; Quantization of signals and filter coefficients; Oversampling techniques for ADC and DAC.

**CSE 4217: Introduction to Robotics (3 Credits)**

Introduction: Definition and Classification of Robots, Applications of Robots, Basic Components of Robot Systems; Mechanical Design of Robots: Links and Joints, Kinematic Chain, Mechanisms and Machines, Degrees of Freedom, Robot End Effectors; Spatial Descriptions and Transformations: Description of Position, Orientation and Frames, Homogeneous Transformations; Manipulator Kinematics: Link Parameters and Link Co-ordinate Systems, D-H Homogeneous Transformation Matrices, Forward and Inverse Kinematics of Serial Manipulators; Manipulator Dynamics: Recursive Newton-Euler Formulation of Serial Manipulator, Lagrangian Formulation of Serial Manipulator;Jacobian Analysis; Robot Control Architecture: Trajectory Planning, Control of Manipulators, Motor Control, Robot Sensors, Low Level Robot Vision, Robot Programming.

**CSE 4219: Communication systems (3 Credits)**

Communication link engineering: Fundamental noise processes, Bright-ness and antenna noise, Polarization-wave and antenna, Wave propagation, Channel impairment effects, Receiver system noise, Receiver types and sub-assembly survey, Low noise antenna design; Signal power budgets and system design techniques; Interference and frequency reuse; System-and circuit-level design and implementation of communication hardware: mixers, RF amplifiers, filters, oscillators, and frequency synthesizers, modulators and detectors, carrier and symbol timing recovery subsystems; Issues in software-defined radio transmitter and receiver implementation.

**CSE 4221: Parallel and Distributed systems (3 Credits)**

**Distributed System Models:** High Performance Computing, Grid Computing, Cloud Computing, Many core Computing, Many Task Computing, **Programming Systems and Models:** Processes and threads, MapReduce, Workflow Systems, Virtualization Techniques, **Distributed Storage & Filesystems:** Data Intensive Computing, Distributed Hash Tables, **Consistency and Replication:** Reasons for replication, Consistency Models, Data Centric Consistency Models, Client Centric Consistency Models, Consistency Protocols, **Fault Tolerance:** Byzantine failure and k-fault tolerant systems, Performance analysis and tuning, scalability and performance studies, scheduling, storage systems, synchronization, and tools (Cuda, Swift, Globus, Condor, Amazon AWS, OpenStack, Cilk, gdb, threads, MPICH, OpenMP, Hadoop, FUSE), **Parallel architectures:** parallel algorithms & architectures, parallel I/O, performance analysis and tuning, power, programming models (data parallel, task parallel, process-centric, shared/ distributed memory), **Multithreaded programming:** GPU architecture and programming, Message passing interface (MPI), heterogeneity, interconnection topologies, load balancing, memory consistency model, memory hierarchies.

**7. Rules and Guidelines for B.Sc Engineering Program**

The rules and guidelines for the B.Sc. Engineering programs (B.Sc Engineering in CSE) will be applicable from the Session 2021-2022 and onward.

**7.1. The B.Sc Engineering Program**

The B.Sc Engineering program under the Faculty of Engineering is a four academic year program. The program comprises eight semesters, each having duration of six academic calendar months to be distributed as follows:

* Classes : Fifteen active weeks
* Preparatory Leave : Maximum two weeks
* Semester Final Exam : Two-three weeks
* Vacation : Only the usual vacation of the University will be applicable
* Result publication : Within one months from the end of the theory course examination.

**7.2 Admission**

* Students will be admitted to the respective department as per the University rules.
* Each year application requirements will be defined by the Central Admission Committee of the University.
* Departments can define specific requirements of subject-wise score in admission test with the approval of the Central Admission Committee.

**7.3 Definition of Credit**

* Fifteen class-hour of fifty minutes each is defined as one credit for theoretical courses
* Thirty lab hours work is defined as one credit for practical or lab courses

**7.4 Credit Requirements for the B.Sc Engineering Program**

* Total credits : 157.5
* Credits for core courses (theory) : 93
* Credits for practical courses : 28.5
* Credits for general education : 12
* Credit for physics, mathematics, and statistics : 18
* Credits or projects/thesis : 06

**7.5 Course Identification**

The undergraduate students of different years of this department have to follow the course schedule given. The letter prefix in any course number indicates the department offering the courses or the discipline viz. CSE for Computer Science and Engineering, PHY for Physics, MAT for Mathematics, STA for Statistics, ENG for English and GED for General Education.

Each course is designated by a three letters word identifying the department (details described earlier) which offers it followed by a four digit number with the following criteria:

The first digit corresponds to the year in which the course is taken by the student.

The second digit represents the semester in which the course is taken by the student.

The last two digits are ‘odd’ for a theoretical course and ‘even’ for a laboratory or sessional course.

The minimum credits to be completed for obtaining the degree of B.Sc. in Computer Science and Engineering are 157.5

**7.6 Teaching of the courses**

For each credit of a theory course, there will be 1 class per week of 1 hour duration.

Total classes in a semester for each credit of a theory course will be 15 (15×1).

Total Contact Hours in a semester for each 1.0 credit theory course: 15×1=15.

For each 1.0 credit lab course, there will be 1 class per week of 2 hours duration.

Total classes in a semester for each 1.0 credit lab course in 15 weeks: 15×1=15.

Total Contact Hours in a semester for each 1.0 credit lab course: 15×2=30.

**7.7 Grades and Grade Points**

The UGC (of Bangladesh) approved grading system applies to calculate grade and grade points. Grades and grade points will be awarded on the basis of marks obtained in the written, oral and practical Exam according to the following table:

|  |  |  |
| --- | --- | --- |
| **Marks** | **Letter Grade** | **Grade Point** |
| 80% and Above | A+ | 4.00 |
| 75% to < 80% | A | 3.75 |
| 70% to < 75% | A- | 3.50 |
| 65% to < 70% | B+ | 3.25 |
| 60% to < 65% | B | 3.00 |
| 55% to < 60% | B- | 2.75 |
| 50% to < 55% | C+ | 2.50 |
| 45% to < 50% | C | 2.25 |
| 40% to < 45% | D | 2.00 |
| Less Than 40% | F | 0.00 |
|  | I | Incomplete |
|  | W | Withdrawn |

* Only “D” or higher grade will be counted as credits earned by a student.
* A student obtaining “F” grade in any course will not be awarded degree.
* In the tabulation process, only the total marks of a student in any course will be rounded-up to next number and the published result of the program will show only the grades earned and the Cumulative Grade Point Average (CGPA) at the end of each semester.

## 7.8 Calculation of GPA and CGPA

Grade Point Average (GPA) is the weighted average of the grade points obtained of all the courses passed/completed by a student. For example, if a student passes/completes *n* courses in a term having credits of *C*1*, C*2*, . . . , Cn* and his grade points in these courses are *G*1*, G*2*, . . . , Gn* respectively then,



The Cumulative Grade Point Average (CGPA) is the weighted average of the GPA obtained in all the terms passed/completed by a student. For example, if a student passes/completes n terms having total credits of *TC*1*, TC*2*, . . . , TCn* and his GPA in these terms are GPA1*,* GPA2*, . . . ,* GPA*n* respectively then,



**7.9 Marks Distribution for a Course:**

**a. Theory Course**

(i) Attendance : 05%

(ii) In-course exam, quiz/assignment/presentation : 25%

(iii) Final exam : 70%

**Total Marks 100%**

**b. Lab Course**

(i) Lab attendance : 10%

(ii) Continuous evaluation : 50%

(iii) Final exam : 40%

**c. Project**

(i). Defense : 60%

(ii) Report /Thesis : 40%

**7.10 Guideline for Attendance Mark**

|  |  |
| --- | --- |
| **Attendance (%)** | **Marks (05)** |
| 90 and above | 05 |
| 85 to 89 | 04 |
| 80 to 84 | 03 |
| 75 to 79 | 02 |
| 60 to 74 | 01 |
| Less than 60 | 00 |

**7.11 Exam Committee Formation**

* At the beginning of each academic semester/session, an exam committee shall be formed for that semester/session by the academic committee of respective department. Chairman of the exam committee will act as a course coordinator for that semester/session. The role of a course coordinator is to monitor the academic activities. He/She will report to the respective chairman of the department to ensure class conduction properly for the theory and lab courses.
* The exam committee will consist of four members proposed by the academic committee of the respective department.
* The committee members are a chairman, two internal members from the respective department and one external member outside of the department.
* The exam committee will be responsible for all exam related activities as per university rules.

**7.12 Evaluation of the Courses**

The performance of a student in a course will be evaluated in the following ways:

1. For a theory course the evaluation will be made on the basis of attendance, quiz/assignment/ presentation, in-course exam and final exam.

(b) For any courses attendance, quiz/assignment/presentation, in-course exam will be evaluated by the course teacher/s and the result must be submitted to the exam committee and controller of exam before commencement to the semester final examination.

(c) The percentage of attendance of students for each course (according to the format supplied by the chairman) along with the attendance sheet must be submitted to the chairman of the department before commence to the semester final examination.

(d) The in-course exam scripts must be shown to students before the last class of a semester.

(e) If more than one in-course exam is taken final mark will be calculated by averaging all of them.

(f) For theory course final exams, generally there will be two examiners: course teacher will be the first examiner and the second examiner will be within the department or from a relevant department of the University. If a suitable examiner is not found from the University, a second examiner may be appointed from other universities with prior permission from the Vice Chancellor.

(g) (i) The answer scripts of final exam will be evaluated by two examiners and the average mark will be considered as the mark obtained, if the difference of two examiner marks not exceeded 20%.

(ii) In case of a difference of marks between the two examiners is more than 20% then the script will be evaluated by a third examiner. Marks of nearest two examiners will be taken for average.

(iii) If the differences of marks of third examiner from the first and second examiner become equal then average of three examiners marks will be obtained mark.

(h) The assessment of laboratory /practical /field course will be made by observing overall performance of a student during practical (continuous evaluation), attendance, viva-voce, assignments and evaluation of lab final exam (set by the department).

(i) For fourth year project evaluation will be made on the basis of presentation on project defense and project report.

(j) For field study evaluation will be made on the basis written examination or presentation on that field study and field study report.

**7.13 Requirement to Sit for Course Final Exam**

1. Students having 70% or more attendance on average is eligible to appear in the semester final Exam.
2. Student having average 60-69% attendance will be allowed to sit for the exam with a fine Tk. 1000.00 (one thousand) in the University central account.
3. Student having average attendance below 60% will not be allowed to sit for the semester final Exam but may seek re-admission in the program.
4. The semester final exam will be arranged centrally by the controller of examination of the University.
5. The duration of theory course final exams will be as follows:

|  |  |
| --- | --- |
| **Credit** | **Duration of Exam** |
| 3 Credits Course | 3 Hours |

1. Duration of lab exam will be defined by the respective department.

**7.14 Promotion to the Next Academic Year**

A student has to attend courses required for a particular semester, appeared at the annual exams and scored a minimum specified CGPA for promotion to the next year.

Promotion to the next year will be given if a student scores minimum CGPA as follows:

|  |  |
| --- | --- |
| **Year Description** | **CGPA** |
| 1st Year to 2nd Year | CGPA: 2.00 |
| 2nd Year to 3rd Year | CGPA: 2.25 |
| 3rd Year to 4th Year | CGPA: 2.50 |

**7.15 Requirements for the Award of the B.Sc Engineering Degree**

(a) The student must earn required credits in a maximum period of six academic years starting from the date of admission at 1st year 1st semester.

(b) The student must obtain CGPA of at least 2.5 out of 4.00 to achieve the B.Sc Engineering degree without “F” grade in any course.

**7.16 Tabulations**

(a) Examiners will upload their course marks directly through online in the result processing system.

(b) The examiners will submit the hard copy of the marks sheet to the chairman of the Exam committee and the Controller of Examination.

(c) The exam committee will appoint two tabulators.

(d) Tabulators will receive marks of all courses from the chairman of the Exam committee.

(e) The two tabulators will independently check the tabulation sheets according to the examiners’ mark sheets through online and then submit to the office of the Controller of Examination through the Chairman of Exam committee.

(f) The Controller of Exam will publish the results and students will get their result through email and SMS.

**7.17 Improvement Examination**

1. A student will be allowed a single earliest available chance to clear “F” grade/grades complying with the time requirement for the degree. A student will not be allowed for grade improvement if he or she passes and the final semester result is published.
2. A student may sit for improvement exam for courses where grade obtained is less than or equal to “C+” (C plus) and the best grade that a student can be awarded is B+ (B plus). However, if the grade is not improved the previous grade will remain valid.
3. Improvement exam for all odd semesters will always be held with immediate next even semester and the same exam committee will conduct the improvement exam (for example, 1st semester improvement exam will be held on immediate 2nd semester, 3rd semester in improvement exam will be held on immediate 4th semester, 5th semester improvement exam will be held on immediate 6th semester, 7th semester improvement exam will be held on immediate 8th semester. Improvement exam for all even semesters will always be held with immediate next academic session or batch.
4. In case of improvement exam in addition to usual fees a fine will be charged by the department through their Academic Committee.

(e) A student will be allowed to seat both for the final and in-course/others exam for the course.

**7.18 Re-admission and Dropout**

(a) A student may be allowed re-admission for a maximum of two times to complete the B.Sc. Engineering program.

(b) A student may seek re-admission provided he or she has at least 30% (thirty percent) attendance in the previous semester or year.

(c) A student who is unable to get minimum required CGPA even after taking re-admission twice will be dropped out from the academic program.

**7.19 Dean’s Award**

In recognition of excellent academic performance students may be given Dean’s Merit Award for every batch after completion of the B.Sc Engineering program as per following criteria.

1. An awardee must not have appeared in any improvement exam during his or her study period.
2. An awardee must have CGPA 3.75 or above.
3. However, the number of awardees of each department will not exceed two. In case of equal CGPA the final semester CGPA will be considered to break the tie.

**7.20 Other General Regulations**

(a) The existing rules of Bangabandhu Sheikh Mujibur Rahman University, Kishoreganj will be applicable if any matter does not cover in the above guidelines.

(b) Disciplinary and punishable actions will be applied according to the existing rules of the university.