Department of Computer Science and Engineering  
B.Sc. (Engg.) Syllabus

Total Credits Required for Graduation: 160  
No. of Years: 4  
No. of Semesters: 12

**First Year: Semester I**

<table>
<thead>
<tr>
<th>Course No</th>
<th>Course Title</th>
<th>Hours/Week Theory + Lab</th>
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<tbody>
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**First Year: Semester II**

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**First Year: Semester III**

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**Second Year: Semester II**

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<tbody>
<tr>
<td>CSE 221</td>
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**Total**  
12 + 3 = 15  
13.5

### Third Year: Semester I

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### Third Year: Semester II

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### Third Year: Semester III

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**Total**  
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### Fourth Year: Semester II

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**Fourth Year: Semester III**

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**Optional : Option I**

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**Optional : Option II**

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CSE 111 FUNDAMENTALS OF COMPUTERS
3 Hours/Week, 3 Credits

Introduction to computations; early history of computing devices; computers; major components of a computer; Hardware: processor, memory, I/O devices; software: Operating system, application software; Basic architecture of a computer; Basic Information Technology; the Internet, Basic programming concepts: Number system: binary, octal, hexadecimal, decimal; binary arithmetic, program development stages, flow charts, programming constructs: data types, operators, expressions, statements, control statements; functions, array, Computer Networks, Internet, Communication media: twisted pair, coaxial cable, optical fiber, Networking devices.

Books:
1. Computer Science- Warford
3. Inside the PC - P. Norton
4. Introduction to Computers - Subramanian
5. Introduction to Computer - P. Norton
6. Computer Fundamentals- Pradeep K. Sinha

CSE 113 STRUCTURED PROGRAMMING LANGUAGE
3 Hours/Week, 3 Credits

Programming Language: Basic concept, Overview of programming languages, Problem Solving Techniques and Data Flow Diagram. C-Language: Preliminaries, Program constructs, variables and data types in C. Input and output. Character and formatted I/O; Arithmetic Expressions and Assignment statements; Loops and Nested loops; Decision making; Arrays, Functions; Arguments and local variables, Calling Functions and arrays. Recursion and Recursive functions; Structures within structure. Files: File functions for sequential and Random I/O. Pointers: Pointers and structures; Pointer and functions; Pointer and arrays; Operation and Pointer; Pointer and memory addresses; Operations on Bits; Bit Operation; Bit field; Advanced features; Standard and library.

Books:
1. The C Programming Language- Kernigfhan and Ritchie
2. Programming with C, Schaum’s Outline Series, THM – Gotfried
5. The Complete reference, Turbo C/C++ - H. Schieldt
6. Programming with ANSI C- E. Balagurusamy
7. Teach yourself C- H. Schieldt

CSE 114 STRUCTURED PROGRAMMING LANGUAGE LAB
3 Hours/week, 1.5 Credits

Students should be able to solve different easy problems with their analysis using pen and papers and then doing code on computers just like expressing their speech using a language; they should also be able to calculate outputs for different inputs on papers before running the code that will prove their understanding of the logics behind the code.

Introduction: Introductory outputs using C. Data Types and Operator: Declaring variables of different data types and doing different types of operations on them, facing problems when internal result of calculation crosses the boundary of a data type. Data Input/Output: Variation and formats of getting input and giving output. Control Statement: Implementation of all types of control statement structures, odd/even test, find max/min from 2/3 numbers, generate grades from marks, floor, ceiling, absolute value, sum of n numbers using loop and calculate average, test prime, generate Fibonacci sequence. Array, String and Nested Looping: Finding the number of students getting marks above average, finding vowel and consonant from a given string, detecting palindrome, counting words of a string, reversing each words of a sentence, using different functions of string.h library, bubble sort, matrix multiplication, Using Library Functions: Functions from stdio.h, math.h, stlib.h and ctype.h library. Functions: Doing some previous problems using function, implement call by value and call by reference, prime factorization. Recursion: Find Greatest Common Divisor, Fibonacci, Factorial, Tower of Hanoi. Program Structure: Use static and global variable. Pointers: Passing pointer to a function, dynamic memory allocation, arrays of pointers. Structure and Union: Sorting points (first according to x, then
CSE 121 BASIC ELECTRICAL ENGINEERING
3 hours/Week, 3 Credits


Textbook: Introductory circuit analysis by Boylestad

CSE 122 BASIC ELECTRICAL ENGINEERING LAB
3 hours/Week, 1.5 Credits

In this course students will perform experiments to verify practically the theories and concepts learned in EEE-109.
1. To familiar with the operation of different electrical instruments.
2. To verify the following theorems: KCL and KVL theorem, Superposition theorem, Thevenin’s theorem, Norton’s theorem and Maximum power transfer theorem.
3. RL and RC response.
4. Study the frequency response of an RLC circuit and find its resonant frequency.
5. Basic electrical element like fan, bulb, calling bell etc connection from 220v AC single phase supply.
6. Relevant application based on CSE 121.

CSE 123 DISCRETE MATHEMATICS
3 Hours/Week, 3 credits

Set, relations Functions: Set, Function, Representing Relations, Equivalence Relations
Propositional Calculus: Propositions, Predicate and Quantifier,
Algorithms: Complexity, Divisions, Algorithm, Application of Number Theory
Recursion: Sequences and summations, Recursive Definition and algorithm
Combinatorial Analysis: Permutation and Combination, Divide and Conquer Algorithms, Generating Functions
Graphs: Representation, Isomorphism, Connectivity, Euler and Hamilton path, Shortest path, Planer, Coloring, Trees.
Boolean Algebra: Number System, Boolean Function, representing Boolean Function, Logic gate, Minimization of Circuits

Books:
3. Discrete Mathematical Structure – Sharon Ross

CSE 131 DATA STRUCTURES
3 Hours/Week, 3 Credits

Internal Data Representation. Specification, representation and manipulation of basic data structures: arrays, records and pointers, linked lists, stacks, queues, recursion, trees, optimal search trees, heaps, disjoint sets. Graphs and their application, String processing, Searching, Sorting and Hashing techniques.

Books:
2. Fundamental of Data Structures, Galgotia- E. Horowitz and S. Sahni
3. Data Structures- Reingold

CSE 132 DATA STRUCTURE LAB
4 Hours/Week, 1.5 Credits
Using a programming language, creating and manipulating various linear data structures: linked list, stacks and queues.
Creating and manipulating non-linear data structures: B-trees and heaps, disjoint set.
Implementing sorting, searching and hashing techniques, string processing.

CSE 211 OBJECT ORIENTED PROGRAMMING LANGUAGE
3 Hour/week, 3 Credits

Methods: Introduction, Program Module in Java, Math Class Methods, Method Definitions, Java API Packages, Automatic Variables, recursion, Method Overloading, Method of the Applet Class.
Arrays: Introduction, Arrays, Declaring and Allocating Arrays, Passing Arrays to Methods, Sorting Arrays, Searching Arrays, Multiple-Subscripted Arrays.
Object-Based Programming: Introduction, Implementing a Time Abstract Data Type with a Class, Class Scope, Controlling Access to Members, Utility Methods, Constructors, Using Overload Constructor, Using Set and Get Method, Software Reusability, Friendly Members, Finalizers, Static Class Members, Data Abstraction and Information Hiding.

Books:
1. Java How to Program- H. M. Deitel, P. J. Deitel
2. Core Java (Vol. 1 and 2)- Sun Press
3. Beginning Java 2, Wrox- Ivo Horton
4. Java 2 Complete Reference, Jesse- H. Schildt

CSE 212 OBJECT ORIENTED PROGRAMMING LANGUAGE LAB.
3 Hours/Week, 1.5 Credits

Understanding Java Enterprise Level Works.

CSE 213 ELECTRONIC DEVICES & CIRCUITS
3 hours/Week, 3 Credits

P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a Zener diode, clamping and clipping circuits. Bipolar Junction Transistor (BJT) as a circuit element: current components, BJT characteristics and regions of operation, BJT as an amplifier, biasing the BJT for discrete circuits, small signal equivalent circuit models, BJT as a switch. Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element: structure and physical operation of an enhancement MOSFET, threshold voltage, Body effect, current-voltage characteristics of an enhancement MOSFET, biasing discrete and integrated MOS amplifier circuits, single-stage MOS amplifiers, MOSFET as a switch, CMOS inverter. Operational amplifiers (Op-Amp): Properties of ideal Op-Amps, non-inverting and inverting amplifiers, inverting integrators, differentiator, weighted summer and other applications of Op-Amp circuits. Introduction to photodiode, Laser, Solar cell, Photo detector, LED.

Textbook: Electronics Devices by R. L. Boylestad

CSE 214 ELECTRONIC DEVICES & CIRCUITS LAB
3 hours/Week, 1.5 Credits

Students will also perform different experiments based on CSE 213.
To familiar with electronics devices and Laboratory Equipments.
To study of V-I Characteristics curve of P-N junction diode.
To study of Half-Wave Rectification circuit.
To study of Full-Wave Rectification circuit (Bridge & Center- tap).
To study of Clipping and clamping circuit.
To study MosFET and BJT characteristics.
Speech/ Audio amplification using NPN/PNP Transistor.
MosFET as an amplifier and switch.
Different operational amplifier circuits.

CSE 216 ENGINEERING DRAWINGS
4 hours/Week, 2.0 Credits

The aim of this course is to introduce students the basic concepts and the use of engineering drawing in the design and manufacturing field. The students acquaint with the basic knowledge and skills in engineering drawings and the capability to read and interpret blue prints for manufacturing. The students can also develop an understanding of 2D and 3D computer aided drafting with the requirements of good engineering drawings and be able to apply them to their work.

It is essential to know the technical drawing rules before starting CAD-CAM programs. Using computers at the beginning of the engineering education will help the students visualize engineering components. Appropriate sketching exercises will be done during practice hours by using a package program namely AutoCAD. The CAD software should be perceived by the student as a tool for producing engineering drawings. However, it should be strongly felt that students should design shapes that suited the purpose and manufacturing methods rather than being driven by the software capabilities. Note that CSE 134 is not AutoCAD course but an engineering drawing course.

CSE 221 DIGITAL LOGIC DESIGN
3 Hours/Week , 3.0 Credits

Digital logic: Boolean algebra, De Morgan’s Theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; 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; PLA design; Synchronous and asynchronous logic design; State diagram, Mealy and Moore machines; State minimizations and assignments; Pulse mode logic; Fundamental mode design.

CSE 222 DIGITAL LOGIC DESIGN LAB
3 Hours/Week , 1.5 Credits

Laboratory works based on CSE 221.

CSE 223 THEORY OF COMPUTATION
3 Hours/Week , 3.0 Credits


Books:
2. Concrete Mathematics – Donald L. Graham, Donald E. Knuth, Oren Patashnik.

CSE 231 ALGORITHM DESIGN AND ANALYSIS
3 Hours/Week , 3.0 Credits

Analysis of Algorithm:
Asymptotic analysis: Recurrences, Substitution method, Recurrence tree method, Master method
Divide-and-Conquer: Binary search, Powering a number, Fibonacci numbers, Matrix Multiplication, Strassen’s Algorithm for Matrix Multiplication.
Sorting: Insertion sort, Merge sort, Quick sort, Randomized quick sort, Decision tree, Counting sort, Radix sort.
Order Statistics: Randomized divide and conquer, worst case linear time order statistics.
Graph: Representation, Traversing a graph, Topological sorting, Connected Components.
Dynamic Programming: Elements of DP (Optimal substructure, Overlapping subproblem), Longest Common Subsequence finding problem, Matrix Chain Multiplication.
**Greedy Method:** Greedy choice property, elements of greedy strategy, Activity selector problem, Minimum spanning tree (Prims algorithm, Kruskal algorithm), Huffman coding.

**Shortest Path Algorithms:** Dynamic and Greedy properties, Dijkstra’s algorithm with its correctness and analysis, Bellman-Ford algorithm. All pair shortest path: Warshall’s algorithm, Johnson’s algorithm

**Network flow:** Maximum flow, Max-flow-min-cut, Bipartite matching.

**Backtracking/Branch-and-Bound:** Permutation, Combination, 8-queen problem, 15-puzzle problem.

**Geometric algorithm:** Segment-segment intersection, Convex-hull, Closest pair problem.

**And NP Completeness, NP hard and NP complete problems.**

**Books:**
4. Introduction to Design and Analysis of Algorithms- Goodman
5. Algorithms- Robert Sedgewick
7. Introduction to Algorithms- Thomas H. Kormen

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**CSE 232 ALGORITHMS DESIGN AND ANALYSIS LAB**

3 Hours/Week, 1.5 Credits

Using different well known algorithms to solve the problem of Matrix-Chain Multiplication, Longest Common Subsequence, Huffman codes generation, Permutation, Combination, 8-queen problem, 15-puzzle, BFS, DFS, flood fill using DFS, Topological sorting, Strongly connected component, finding minimum spanning tree, finding shortest path (Dijkstra’s algorithm and Bellman-Ford’s algorithm), Flow networks and maximum bipartite matching, Finding the convex hull, Closest pair.

**CSE 200 PROJECT WORK I**

4 Hours/Week, 2.0 Credits

Project focusing on Object oriented programming approach and using standard algorithm is preferable. Every project should maintain a goal so that it can be used as a useful tool in the IT fields. Also innovative project ideas that require different types scripting/programming languages or programming tools can be accepted with respect to the consent of the corresponding project supervisor.

**CSE 311 COMPUTER ARCHITECTURE**

3 Hours/Week, 3.0 Credits

**Introduction to Computer Architecture:** Overview and history; Cost factor; Performance metrics and evaluating computer designs. Instruction set design: Von Neumann machine cycle, Memory addressing, Classifying instruction set architectures, RISC versus CISC, Micro programmed vs. hardwired control unit. Memory System Design: Cache memory; Basic cache structure and design; Fully associative, direct, and set associative mapping; Analyzing cache effectiveness; Replacement policies; Writing to a cache; Multiple caches; Upgrading a cache; Main Memory; Virtual memory- structure, and design; Paging; Replacement strategies. Pipelining: General considerations; Comparison of pipelined and nonpipelined computers; Instruction and arithmetic pipelines, Structural, Data and Branch hazards. Multiprocessors and Multi-core Computers: SISD, SIMD, and MIMD architectures; Centralized and distributed shared memory- architectures; Multi-core Processor architecture. Input/output Devices: Performance measure, Types of I/O device, Buses and interface to CPU, RAID. Pipelining: Basic pipelining, Pipeline Hazards. Parallel Processing.

**Books:**
David A.Patterson and John L.Hennessy, “Computer Organization and Design: The hardware / software interface”

**CSE 313 DATABASE SYSTEM**

3 Hours/Week, 3.0 Credits

**Introduction:** Purpose of Database Systems, Data Abstraction, Data Models, Instances and Schemes, Data Independence, Data Definition Language, Data Manipulation Language, Database Manager, Database administrator, Database Users, Overall System Structure, Advantages and Disadvantage of a Database Systems. Data Mining and analysis, Database Architecture, History of Database Systems

**Relationship Entity-Model:** Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Composite and Multivalued Attributes, Mapping Constraints, Keys, Entity-Relationship Diagram, Reducing of
E-R Diagram to Tables, Generalization, Attribute Inheritance, Aggregation, Alternative E-R Notations, Design of an E-R Database Scheme.

**Relational Model:** Structure of Relational Database, **Fundamental Relational Algebra Operations**, The Tuple Relational Calculus, The Domain Relational Calculus, Modifying the Database.

**Relational Commercial Language:** SQL, Basic structure of SQL Queries, Query-by-Example, Quel., Nested Sub queries, Complex queries, Integrity Constraints, Authorization, Dynamic SQL, Recursive Queries.


**File And System Structure:** Overall System Structure, Physical Storage Media, File Organization, RAID, Organization of Records into Blocks, Sequential Files, Mapping Relational Data to Files, Data Dictionary Storage, Buffer Management.

**Indexing And Hashing:** Basic Concepts, Ordered Indices, B+-Tree Index Files, B-Tree Index Files, Static and Dynamic Hash Function, Comparison of Indexing and Hashing, Index Definition in SQL, Multiple Key Access.


**Concurrency Control:** Schedules, Testing for Serializability, Lock-Based Protocols, Timestamp-Based Protocols, Validation Techniques, Multiple Granularity, Multiversion Schemes, Insert and Delete Operations, Deadlock Handling.

**Distributed Database:** Structure of Distributed Databases, Trade-off in Distributing the Database, Design of Distributed Database, Transparency and Autonomy, Distributed Query Processing, Recovery in Distributed Systems, Commit Protocols, Concurrency Control.

**Data Mining and Information Retrieval:** Data analysis and OLAP, Data Warehouse, Data Mining, Relevance Ranking Using Terms, Relevance Ranking Using Hyperlink, Synonyms, Homonyms, Ontology, Indexing of Document, Measuring Retrieval Efficiencies, Information Retrieval and Structured Data.

**Books:**
4. A First Course in Database Systems - Prentice Hall, 1997

**CSE 314 DATABASE SYSTEM LAB**

3 Hours/Week, 1.5 Credits

**Introduction:** What is database, MySQL, Oracle, SQL, Datatypes, SQL / PLSQL, Oracle Software Installation, User Type, Creating User, Granting.

**Basic Parts of Speech in SQL:** Creating Newspaper Table, Select Command (Where, order by), Creating View, Getting Text Information & Changing it, Concatenation, Cut & paste string(RPAD, LPAD, TRIM, LTRIM, RTRIM, LOWER, UPPER, INIT, LENGTH, SUBSTR, INSTR, SOUNDEX).

**Playing The Numbers:** Addition, Subtraction, Multiplication, Division, NVL, ABS, Floor, MOD, Power, SQRT, EXR, LN, LOG, ROUND, AVG, MAX, MIN, COUNT, SUM, Distinct, SUBQUERY FOR MAX,MIN.

**Grouping things together:** Group By, Having, Order By, Views Renaming Columns with Aliases.

**When one query depends upon another:** Union, Intersect, Minus, Not in, Not Exists.

**Changing Data:** INSERT, UPDATE, MERGE, DELETE, ROLLBACK, AUTOCOMMIT, COMMIT, SAVEPOINTS, MULTI TABLE INSERT, DELETE, UPDATE, MERGE.

**Creating And Altering tables & views:** Altering table, Dropping table, Creating view, Creating a table from a table.

**By What Authority:** Creating User, Granting User, Password Management.

**An Introduction to PL/SQL:** Implement few problems using PL/SQL (eg Prime Number, Factorial, Calculating Area of Circle, etc.).

**An Introduction to Trigger and Procedure:** Implement few problems using Trigger and Procedures.

**An Introduction to Indexing:** Implement indexing using a large database and observe the difference of Indexed and Non-Indexed database.

**CSE 315 COMMUNICATION ENGINEERING**

3 Hours/Week, 3.0 Credits

**Introduction:** Data communications, Networks, Internet, Protocols and Standards.

**Network Models:** OSI Model, TCP/IP Protocol suite, Addressing

**Data and Signals:** Analog and Digital data, Analog and Digital Signals, Time and Frequency Domain, Transmission impairments, Data rate limits, Performance

**Digital Transmission:** Digital-to-Digital Conversion, Analog-to-Digital Conversion, Transmission Modes

**Analog Transmission:** Digital-to-Analog Conversion, Analog-to-Analog Conversion.
Multiplexing and Spread Spectrum: FDM, WDM, TDM, STD MD, Digital Subscriber Line, FHSS, DSSS.
Transmission Media: Guided and Unguided Media
Switching: Circuit switching, Packet switching.
Data Link Layer: Error Detection and Correction, Data Link Control, Framing, Flow and Error Control.
Multiple Access: CSMA, CSMA/CD, CSMA/CA, FDMA, TDMA, CDMA.

Books:
1. Data Communications and Networking – Behrouz A. Forouzan (4th edition)
4. Data Communication and Computer Network - Stawling

CSE 317 SIMULATION AND MODELING
3 Hours/Week, 3.0 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 discrete continuous models; Monte Carlo simulation; Simulation of queueing systems. Building valid and credible simulation models: validation principles and techniques, statistical procedures for comparing real-world observations and simulation outputs, input modeling: Generating random numbers and random variates; Output analysis. Simulation languages; Analysis and modeling of some practical systems. Concepts covered in lecture applied in computer laboratory assignments.

CSE 321 MICROPROCESSORS & INTERFACING
3 Hours/Week, 3.0 Credits


CSE 322 MICROPROCESSORS & INTERFACING LAB
3 Hours/Week, 1.5 Credits

1. Registers, JMP, LOOP, CMP instruction, Conditional Jump instruction
2. Implementation of different types of instruction (rotating, shifting)
3. Instructions (MUL, IMUL, DIV, IDIV, CBW, CWD, Arrays, XLAT)
4. String instructions, macro handling
5. BIOS Interrupt, DOS Interrupt
6. The IN, OUT, INS, and OUTS instruction
7. Processor signal from photodiode
8. Control of stepper motor using parallel port
9. Location detection using GPS through USB port

CSE 323 MANAGEMENT INFORMATION SYSTEMS
3 Hours/Week, 3.0 Credits


CSE 325 COMPUTER NETWORKING
3 Hours/Week, 3.0 Credits

Wide Area Network: SONET, Virtual Circuit Networks - Frame Relay, ATM and ATM LANs.

Network Layer: Logical Addressing.


Application Layer: Domain Name System, Abstract Syntax Notation One (ASN.1), Network Management - SNMPv2, Electronic mail - SMTP and MIME, Uniform Resource Locator (URL) and Universal Resource Identifier (URI), Hypertext Transfer Protocol (HTTP).


Books:
1. Data Communications and Networking – Behrouz A. Forouzan (4th edition)
3. Communication and Computer Network - Stallings

CSE 326 COMPUTER NETWORKING LAB
3 Hours/Week, 1.5 Credits

Subnetting and designing a network using Packet Tracer.

Analysis of the TCP/IP behavior.

Packet analysis.

Server configuration: DHCP, SMTP, FTP, Web

Switch and Router Configuration.

Socket Programming

CSE 331 OPERATING SYSTEM and SYSTEM PROGRAMMING
3 Hours/Week, 3.0 Credits


Fundamentals of OS: OS services and components, multitasking, multiprogramming, time sharing, buffering, spooling.


Concurrency control: Concurrency and race conditions, mutual exclusion requirements, semaphores, monitors, classical IPC problem and solutions, Dead locks - characterization, detection, recovery, avoidance and prevention.


Case Studies: Study of a representative Operating Systems,


Books:
CSE 332 OPERATING SYSTEMS and SYSTEM PROGRAMMING LAB
3 Hours/Week, 1.5 Credits

Thread programming: Creating thread and thread synchronization.
Concurrent Programming: Using fork, exec for multi-task programs.
Communicating across processes: Using different signals, Pipes, Message queue, Semaphore, Semaphore arithmetic and Shared memory.

Books:
1. The ‘C’ Odyssey UNIX-The Open, Boundless C – Meeta Gandhi, Tilak Shetty, Rajiv Shah.
2. Beginning Linux Programming – Neil Matthew and Richard Stones
3. Linux System Programming – Robert Love

CSE 333 SOFTWARE ENGINEERING
3 Hours/Week, 3.0 Credits


Books:
2. Software Engineering Concepts- Richard Fairley
4. Software Engineering- Ian Sommerville

CSE 334 SOFTWARE ENGINEERING LAB
3 Hours/Week, 1.5 Credits

Software Engineering lab works is solely designed to attain hands on experience of architectural design, documentation and testing of software so that students can develop the software following the documents only.
Step 1 (Requirement Engineering): Choose a company/institute/client for which software will be developed (make sure that they will provide required information whenever necessary). Follow the steps for eliciting requirements and generate use-case diagram. Also analyze the sufficiency of the requirement engineering outcome for steps to follow.
Step 2 (Analysis model to Architectural and Component level design): Generate Activity diagram, Data flow diagram (DFD), Class diagram, State diagram, Sequence diagram and follow other relevant steps for creating complete architectural and component level design of the target software.
Step 3 (User Interface design, Design evaluation, Testing strategies and Testing Tactics): Perform the user interface design with the help of swimlane diagram. Carry out the design evaluation steps. Generate all test cases for complete checking of the software using black box, white box testing concept.
Step 4 Software testing and debugging
Step 5 (Managing Software Projects): Analyze the estimation and project schedule.

CSE 335 TECHNICAL WRITING AND PRESENTATION
3 Hours/Week, 3.0 Credits
Issues of technical writing and effective oral presentation in Computer Science and Engineering; Writing styles of definitions, propositions, theorems and proofs; Preparation of reports, research papers, theses and books: abstract, preface, contents, bibliography and index; Writing of book reviews and referee reports; Writing tools: LATEX; Diagram drawing software; presentation tools.

**CSE 300 PROJECT WORK II**

*4 Hours/Week, 2.0 Credits*

Projects must possess innovative ideas which reflect contemporary IT trends. Supervisor have to ensure that every accepted project contain basic level of research work. Students have to give a presentation on their project works. Departments should take appropriate steps to archive all the projects and keep tracks to maintain the genuineness of the projects.

**CSE 411 ARTIFICIAL INTELLIGENCE**

*3 Hours/Week, 3.0 Credits*


AI Programming Language: Python, Prolog, LISP

**Books**

1. Introduction to Artificial Intelligence and Expert Systems- Dan W. Patterson
4. An Introduction to Neural Computing, Adam Hilger Pub - C. F. Chabris and T. Jackson

**CSE 412 ARTIFICIAL INTELLIGENCE LAB**

*3 Hours/Week, 1.5 Credits*

Students will have to understand the functionalities of intelligent agents and how the agents will solve general problems. Students have to use a high-level language (Python, Prolog, LISP) to solve the following problems: Backtracking: State space, Constraint satisfaction, Branch and bound. Example: 8-queen, 8- puzzle, Crypt-arithmetic. BFS and production: Water jugs problem, The missionaries and cannibal problem. Heuristic and recursion: Tic-tac-toe, Simple bock world, Goal stack planning, The tower of Hanoi. Question answering: The monkey and bananas problem.

**CSE 413 WEB ENGINEERING**

*3 Hours/Week, 3.0 Credits*


**Books:**

1. Web Engineering: The Discipline of Systematic Development of Web Applications Editors: Gerti Kappel, Birgit Pröll, Siegfried Reich, Werner Retschitzegger
2. Web Engineering: A Practitioner's Approach, Roger Pressman, David Lowe
3. MIT Open Course Materials for the course Software Engineering for Web Applications
4. MIT Open Course Materials for the course Database, Internet, and Systems Integration Technologies
CSE 414 WEB ENGINEERING LAB
3 Hours/Week, 1.5 Credits

Understanding the Web application: Web Engineering introduces a structured methodology utilized in software engineering to Web development projects. The course addresses the concepts, methods, technologies, and techniques of developing Web sites that collect, organize and expose information resources. Topics covered include requirements engineering for Web applications, design methods and technologies, interface design, usability of web applications, accessibility, testing, metrics, operation and maintenance of Web applications, security, and project management. Specific technologies covered in this course include client-side (XHTML, JavaScript, and CSS) and server-side (Perl and PHP). Using the described concepts students should be able to understand the Web engineering concepts behind the frameworks of Joomla, Drupal, Wordpress.


JavaScript Exercise: The goal of this assignment is to allow you to explore and use as many of JavaScript's objects, methods, and properties as possible in a small assignment. Some functions must be written from scratch. Other functions, appropriately attributed, may be downloaded from the web and used as a part of the system or as the basis for your own functions. PHP Exercise: Build a set of PHP scripts that perform some dynamic server-side functionality. Understanding plug-ins: Develop a Firefox extension.

CSE 421 COMPILER CONSTRUCTION
3 Hours/Week, 3.0 Credits


Books:

CSE 422 COMPILER CONSTRUCTION LAB
3 Hours/Week, 1.5 Credits

How to use scanner and parser generator tools (e.g., Flex, JFlex, CUP, Yacc, etc). For a given simple source language designing and implementing lexical analyzer, symbol tables, parser, intermediate code generator and code generator.

CSE 423 COMPUTER GRAPHICS
3 Hours/Week, 3.0 Credits


Books:
5. Texture and Modeling: by David S. Ebert.

CSE 424 COMPUTER GRAPHICS LAB
3 Hours/Week, 1.5 Credits
Tool to use for lab: OpenGL

1. Line Drawing: Bresenham's
2. Region Filling: Scan Line Algorithm
3. Transformation: 2D and 3D translation, Rotation, Scaling
4. Clipping: Line and Polygon
5. Projection: Perspective and Parallel
6. Animation: Morphing

CSE 425 CYBER AND INTELLECTUAL PROPERTY LAW
3 Hours/Week, 3.0 Credits

Course Description: An in-depth examination of the law dealing with computers and the Internet. Topics will include such issues as US and international jurisdiction, computer security, intellectual property rights management, copyrights, patents law, electronic commerce, information privacy, freedom of expression, and cyber crime. Included are detailed analyses of significant legal case studies plus review of applicable federal and state legislation as applied to compliance of international standards.

CSE 400 THESIS/PROJECT I
4 Hours/Week, 2.0 Credits

Thesis/Project work based on all major courses.

CSE 402 THESIS/PROJECT II
4 Hours/Week, 2.0 Credits

Thesis/Project work based on all major courses. This course can be a continuation of CSE 400.

CSE 404 VIVA VOCE
3 Hours/Week, 1.5 Credit

Comprehensive viva based on all studied major courses.

CSE 431 DIGITAL SIGNAL PROCESSING
3 Hours/Week, 3.0 Credits


CSE 432 DIGITAL SIGNAL PROCESSING LAB
3 Hours/Week, 1.5 Credits

Laboratory works based on theory classes.

OPTIONS:

CSE 433 DIGITAL IMAGE PROCESSING
3 Hours/Week, 3.0 Credits

Digital image fundamentals, perception, representation; image transforms: Fast Fourier Transform (FFT), Discrete Cosine Transform (DCT), Karhunen and Loeve Transform (KLT), Wavelet transform and sub-band decomposition; image enhancement and restoration techniques, image compression techniques, image compression standards: JPEG, MPEG, H.261, and H.263.

CSE 434 DIGITAL IMAGE PROCESSING LAB
3 Hours/Week, 1.5 Credits

Laboratory works based on CSE 433. Students investigate image processing algorithms in Matlab or C.

CSE 435: PATTERN RECOGNITION
3 Hours/Week, 3.0 Credits
Pattern Recognition: introduction, importance; Statistical and Neural Pattern Recognition: Bayesian classifier, Bayes decision theory, discriminant functions and decision surfaces; Bayesian classifier for normal distributions; Linear classifiers: discriminant functions and decision hyperplanes, Perceptron algorithm and its variants, Kesslerâ€™s construction; Nonlinear classifiers: two and three layer perceptrons, backpropagation algorithm and its variants; Template matching: optimal path searching techniques, dynamic programming methods, correlation based matching and 2D log search algorithm for image matching; Context dependent classification: Viterbi algorithm, channel equalization, observable and hidden Markov models, three problems of HMM and their application in speech recognition; Syntactic Pattern Recognition: introduction to Syntactic Pattern Recognition, grammar-based approach, parsing, graph-based approach; Unsupervised classification: basic concepts of clustering, proximity measures, categories of clustering algorithms, sequential clustering algorithms.

Books:

CSE 436: PATTERN RECOGNITION LAB
3 Hours/Week, 1.5 Credits

Laboratory works based on CSE 435.

CSE 437 FIBER OPTICS
3 Hours/Week, 3.0 Credits


CSE 438 FIBER OPTICS LAB
3 Hours/Week, 1.5 Credits

1. Study of optical fibers
2. Multimode behavior of a optical fiber
3. Measurement of Bend Loss
4. Study of an optical attenuator
5. L-I curve of a Laser
6. Construction of a power meter
7. Fiber optic Data Communication
8. BER plot of fiber optic system
9. Project on fiber optic system

CSE 439 ADVANCED DATA STRUCTURE AND ALGORITHM
3 Hours/Week, 3.0 Credits

Red-Black Tree, Binary Index Tree, Segment Tree, Range minimum query, lowest common ancestor, k-d Tree, Interval tree, R-tree.
Advanced Application of Dynamic Programming and Backtracking.
Computational Geometry: Line Sweeping algorithms, Binary Space Partition Trees and Painter’s algorithm (other advanced computational geometry).
Optimization of network flow: Dinic’s algorithm, Hungarian algorithm, Min cost max flow, min cut, graph coloring.
Genetic algorithm and its different applications, Basic Game theory, Linear programming, Polynomials and Fast Fourier Transform, Encryption and Decryption.

CSE 440 ADVANCED DATA STRUCTURE AND ALGORITHM LAB
3 Hours/Week, 1.5 Credits
Red-Black Tree, K-d Tree, Suffix Tree, Suffix Array, Line Sweeping algorithms, Painter’s algorithm, Hungarian algorithm, Dinic’s algorithm, Min cost max flow and the selected problem assign by the corresponding instructor.

**CSE 441 CLOUD COMPUTING**
3 Hours/Week, 3.0 Credits.

**Introduction to different types of computing:** Edge computing, Grid computing, Distributed Computing, Cluster computing, Utility computing, Cloud computing. **Cloud computing architecture:** Architectural framework; Cloud deployment models; Virtualization in cloud computing; Parallelization in cloud computing; Green cloud. Cloud Bus; **Cloud service models:** Software as a Service (SaaS); Infrastructure as a Service (IaaS); Platform as a Service (PaaS). **Foundational elements of cloud computing:** Virtualization; Cloud computing operating System; Browser as a platform; Advanced web technologies (Web 2.0, AJAX and Mashup); Introduction to autonomic systems; Service Level Agreements(SLA); Security/Privacy; Cloud economics; Risks assessment; Current challenges facing cloud computing. **Case studies.**

**Practical sessions:** Creating Windows servers on the cloud; Creating Linux servers on the cloud; Deploying applications on the cloud; Major cloud solutions.

**CSE 442 CLOUD COMPUTING LAB**
3 Hours/Week, 1.5 Credits.

Laboratory works based on CSE 441.

**CSE 443 ADVANCED DATABASE SYSTEM**
3 Hours/Week , 3.0 Credits

**Introduction :** Object oriented Database, Data Model, Design, Languages; **Object Relational Database:** Complex data types, Querying with complex data types, Design; **Distributed Database:** Levels of distribution transparency, Translation of global queries to fragment queries, Optimization of access strategies, Management of distributed transactions, Concurrency control, reliability, Administration; **Parallel Database:** Different types of parallelism, Design of parallel database; **Multimedia Database Systems:** Basic concepts, Design, Optimization of access strategies, Management of Multimedia Database Systems, Reliability; **Database Warehousing/Data mining:** Basic concepts and algorithms.

**Book:** *Oracle Advanced PL/SQL Programming with CD-ROM*, by Scott Urman.

**CSE 444 ADVANCED DATABASE SYSTEM LAB**
3 Hours/Week, 1.5 Credits

Laboratory works based on theory classes.

**CSE 445 MOBILE AND WIRELESS COMMUNICATION**
3 Hours/Week, 3.0 Credits

Aspects of radio wave propagation for fixed and mobile communication systems, and cellular system design. Large-scale and small-scale propagation models, multipath fading, link-budget, interference and frequency reuse, multiple access schemes and system capacity. Trunking and grade of service, wireless network planning and operation. Architecture and operation of 2G cellular mobile systems, 2.5 G and 3G technologies. Special techniques/Diversity, Equalization, Interleaving, and Smart Antenna.

**CSE 446 MOBILE AND WIRELESS COMMUNICATION LAB**
3 Hours/Week, 1.5 Credits.

Laboratory works based on CSE 445.

**CSE 447 VLSI DESIGN**
3 Hours/Week, 3.0 Credits

VLSI design methodology: top-down design approach, technology trends. NMOS, CMOS inverters, pass transistor and pass gates: dc and transient characteristics. Brief overview of fabrication process: NMOS, CMOS, Bi-CMOS process. NMOS and CMOS layout, stick diagram and design rules. CMOS circuit characteristics and performance estimation: resistance and capacitance, rise and fall time, power estimation. Buffer circuit design. Introduction to Bi-CMOS circuits.

CSE 448 VLSI DESIGN LAB
3 Hours/Week, 1.5 Credits

Laboratory works based on theory classes.

CSE 449 BIO-INFORMATICS
3 Hours/Week, 3.0 Credits


CSE 450 BIO-INFORMATICS LAB
3 Hours/Week, 1.5 Credits

Laboratory works based on CSE 449.

CSE 451 NEURAL NETWORKS and FUZZY SYSTEMS
3 Hours/Week, 3.0 Credits

Fundamentals of Neural Networks; Back propagation and related training algorithms; Hebbian learning; Cohonien-Grossberg learning; The BAm and the Hopfield Memory; Simulated Annealing; Different types of Neural Networks: Counter propagation, Probabilistic, Radial Basis Function, Generalized Regression, etc; Adaptive Resonance Theory; Dynamic Systems and neural Control; The Boltzmann Machine; Self-organizing Maps; Spatiotemporal Pattern Classification, The Neocognition; Practical Aspects of Neural Networks. Basic Concepts of Fuzzy set theory; Fuzzy numbers; Aggregation operations of Fuzzy sets; Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Regression and Optimization, Supervised Learning Neural Networks, Neuro-Fuzzy Modeling, ANFIS, Neuro-Fuzzy Control, ANFIS Applications.

CSE 452 NEURAL NETWORKS and FUZZY SYSTEMS LAB
3 Hours/Week, 1.5 Credits

Laboratory works based on CSE 451.

CSE 453 NATURAL LANGUAGE PROCESSING
3 Hours/Week, 3 Credits

Introduction; Word Modeling: Automata and Linguistics, Statistical Approaches and Part of Speech Tagging; Linguistics and Grammars; Parsing Algorithms; Parsing Algorithms and the Lexicon; Semantic; Feature Parsing; Tree Banks and Probabilistic Parsing; Machine Translation; Evolutionary Models of Language Learning and Origins.

CSE 454 NATURAL LANGUAGE PROCESSING LAB
3 Hours/Week, 1.5 Credits

Processing of words, Phrase structure parsing, Semantic Interpretation with Phrase Structure Grammars

Books:
CSE 455 MACHINE LEARNING
3 Hours/Week, 3.0 Credits.


CSE 456 MACHINE LEARNING LAB
3 Hours/Week, 1.5 Credits.

ID3 Algorithm for Decision Tree
Regression using LSE and estimating MSE
kNN Algorithm as Nearest Neighbor Classifier
Apply NB Classifier for a Classification Task
Application of the MLP-BP ANN algorithm.
A application of GA for solving a problem
Exclusive clustering: K-means algorithm
Agglomerative clustering: Hierarchical algorithm
Overlapping clustering: Fuzzy C-means algorithm

Books:
2. Introduction to machine learning (2nd edition), Alpaydin, Ethem, MIT Press, 2010
3. An Introduction to Support Vector Machines and Other Kernel-based Learning Methods, Nello Cristianini and John Shawe-Taylor, Cambridge University Press

CSE 457 PARALLEL PROCESSING AND DISTRIBUTED COMPUTING SYSTEMS


CSE 458 PROCESSING AND DISTRIBUTED COMPUTING SYSTEMS
3 Hours/Week, 1.5 Credits
Laboratory works based on CSE 457.

**CSE 459 CONTEMPORARY COURSE ON COMPUTER SCIENCE AND ENGINEERING**

*3 Hours/Week, 3.0 Credits*

This course covers a contemporary title in Computer science and Engineering decided by the department.

**CSE 460 CONTEMPORARY COURSE ON COMPUTER SCIENCE AND ENGINEERING LAB**

*3 Hours/Week, 1.5 Credits*

Laboratory works based on CSE 457.

**Non Major Courses:**

**MAT 101 MATRICES, VECTOR ANALYSIS AND GEOMETRY**

*3 Hours/Week, 3.0 Credits*


**Vector Analysis**

Definitions of line, surface and volume integrals, Gradient of a scalar function, Divergence and curl of a vector function, Physical significance of gradient, Divergence and curl. Various formulae, Integral forms of gradient, Divergence theorem, Stoke’s theorem, Green theorem and Gauss’s theorem.

**Co-Ordinate Geometry**

Co-Ordinate Geometry of two dimensions, Change of axes, Transformation of co-ordinates, Pairs of straight line, General equation of second degree, Co-ordinate Geometry of three dimensions, System of co-ordinates, Distances of two points, Section formula, Projection, Direction cosines, equations of planes and lines.

**ENG 101 BASIC ENGLISH LANGUAGE**

*3 Hours/Week, 3.0 Credits*

Developing Writing, Reading, Listening, and Speaking Skills:

1. **Problems with:** (a) Main Verbs; (b) Tense; (c) Modals and Modal-related patterns; (d) Causatives; (e) Conditionals; (f) Subjunctives; (g) Infinitives; (h) Have + Participle; (i) Auxiliary Verbs; (j) Pronouns, Relative Pronouns, Nouns and Adjectives, Nouns functioning as Adjectives and other Parts of Speech; (k) Determiners; (l) Comparatives; (m) Prepositions and prepositional idioms; (n) Point of View for Syntactical Pattern; (o) Agreement of verbs; (p) Introductory verbal, Modifiers; (q) Sentences and Clauses; (r) Word Choice – Vocabulary – Antonym, Synonym, Homonym, Homograph, Homophone; (s) Wh. Questions; (t) Punctuations: Full stop, comma, colon, semi colon, apostrophe, capital letter, hyphen, quotation marks, titles etc.; (u) Proofreading;

2. One Reading Comprehension of 20 marks (6 questions carrying 2.5 marks each) 3. One Paragraph

**CHE 101 GENERAL CHEMISTRY**

*3 Hours/Week, 3.0 Credits*

1. Atoms, molecules and ions: Atomic Theory, components of atoms.

2. Electronic Structure: The quantum theory, the atomic spectrum of hydrogen and the Bohr model, Quantum numbers, Energy levels and orbitals, Electronic configuration, Chemical bonding and molecular structure.

3. The periodic Table: Development of the periodic table, Electron arrangements and the periodic table, Summarized chemical properties of s-block, p-block, d-block elements.


5. Acids and Bases: Theories and Modern definition of acids and bases, Dissociation constant, strength, pH, Buffer solution etc.

6. Introduction to Chemical Kinetics: Rate laws, rate constant, equilibrium constant, order of reaction etc.
8. Food: Preservatives, Flavor/Coloring materials; Dye, etc.
9. Introductory Electrochemistry: Electrochemical cell and concentration cell, Cell reaction and derivation of Nernst equation. Measurement of emf of a cell. factors affecting electrode potential, rates of electrode potential, different parameters determined by potential measurements, Different types of cells used in practical purpose, Some modern cells and their action, Rechargeable cells.
10. Modern Perspective of Chemistry: Memory materials, Electronic Industries e.g. LCD, pure Silicon for IC, Semiconductor, insulator, etching materials etc.

Books:
2. Haque and Mollah, Physical Chemistry
3. Raymond Chang, General Chemistry

PHY 101 MECHANICS, WAVES, HEAT AND THERMODYNAMICS
3 Hours/Week, 3.0 Credits

Mechanics: Motion in two dimensions; projectile motion; Newton’s laws of motion; conservation theorems (momentum and energy); collisions; circular motion; rotational dynamics of rigid bodies; central forces and gravitation; Kepler’s laws. Waves: Simple harmonic motion; damped and forced vibrations; waves in elastic media; sound waves; Doppler effect; Fourier’s theorem and its applications. Heat and thermodynamics: Principles of thermometry; measurement of high and low temperature; zeroth law of thermodynamics, kinetic theory of ideal gas; first and second laws of thermodynamics; entropy; black body radiation. Wein’s law and Planck’s law.
**MAT 103 CALCULUS**  
3 Hours/Week,  3.0 Credits

**Differential calculus:**

**Integral calculus:**
Definitions of integration, integration by method of substitution, Integration by part, Standard integrals, Integration by the methods of successive reduction, Definite integrals, Its properties and use in summing series, Wallis’s formulae, Improper integrals, Beta function and Gamma functions, Area under a plane curve in cartesian and polar co-ordinates, Area of the region enclosed by two curves in Cartesian and polar co-ordinates.

**PHY 103 ELECTROMAGNETISM AND OPTICS**  
3 Hours/Week,  3.0 Credits

Electromagnetism: Different electrical units; Coulomb’s law; electric field; Gauss’s law and its applications; electric potential and potential energy; capacitance, dielectrics and Gauss’s Law, three electric vectors, energy storage in an electric field, magnetic field and field strength; magnetic forces on a current; torque on a current loop; Hall effect; Ampere’s Law; Biot-Savart Law and their applications. Faraday’s Law of induction; Lenz’s Law; time-varying magnetic field; inductance; energy in magnetic field. Maxwell’s equations; EM energy; Poynting Vector; Scalar and vector potentials; the wave equations. Plane EM waves in non-conducting media; waves in conducting media; boundary conditions; reflection and refraction at boundaries of two non-conducting media; total internal reflections.


**ECO 201 PRINCIPLES OF ECONOMICS**  
3 Hours/Week,  3.0 Credits

**MICRO**
1. **Introduction:** Definition and scope of economics; basic concepts and tools used in economics; economic problems - scarcity and resources.
2. **Demand, Supply, and Market:** Concept of demand, supply and equilibrium; determinants of demand and supply; shifting of demand and supply curves; application of demand and supply; elasticity of demand and supply.
3. **Theory of Consumer Behaviour:** Concepts of utility; paradox of value; law of diminishing marginal utility; indifference curve; budget constraint; consumer’s equilibrium.
4. **Theory of Firm:** Production function; law of diminishing return; stages of production; law of variable proportion; short run and long run production and costs.
5. **Market:** Structure of markets; characteristics of different types of markets; perfect competition and monopoly - price and output determination, monopolistic competition.

**MACRO**
1. **Introduction to Macroeconomics:** Definition: macroeconomic performance: measuring national product & national income-GNP, NNP, NI; personal disposable income; national & real GNP; circular flow of Income, value added approach.
2. **Determination of national income:** Components of aggregate demand & planned spending; aggregate demand; equilibrium output/Income Multiplier model of income and spending.
3. **Money & banking:** Definition & functions of money, components of money supply and money demand, multiple deposit creation, commercial banks & the money stock; functions of central bank, open market operations; high-powered money.
4. **Inflation and Unemployment:** Types and causes of inflation, expected & unexpected inflation: cost of inflation: money supply & the price level: velocity & quantity equation, types and causes of unemployment, remedial measures, Phillips Curve.
MAT 201 NUMERICAL METHODS
3 Hours/Week, 3.0 credits


Books:
Numerical Methods for Engineers - Steven C. Chapra, Raymond P. Canale

BBA 201 COST & MANAGEMENT ACCOUNTING
3 Hours/Week, 3.0 Credits


STA 201 BASIC STATISTICS AND PROBABILITY
3 Hours/Week, 3.0 credits

MAT 203 COMPLEX VARIABLES, LAPLACE TRANSFORM AND FOURIER SERIES
3 Hours/Week, 3.0 Credits


**Fourier series** : Real and complex form. Finite transformation. Fourier integral. Fourier transforms.

GED 101 BANGLADESH STUDIES
3 Hours/Week, 3.0 Credits

**Fundamental concepts** : state, power, sovereignty, law, liberty government, institution, nationalism, constitution, democracy, dictatorship, unity and federal government, society and politics, war of liberation, nature of leadership, political process, constitutional framework of public administration, public service commission, ministry, secretariat, bureaucracy and local government.

**Economy of Bangladesh** : Socio-economic indicators of Bangladesh-GDP, Savings and Investment-Prices, wages and employment-agriculture-industry-power & Energy-transport & Communication-Human Resource Development-Poverty

**List of Examiners**:
All the teacher of relevant subjects of all the private and public universities