

Varendra University



Faculty of Science and Engineering

**DEPARTMENT OF COMPUTER
SCIENCE AND ENGINEERING**

**Syllabus for B.Sc. in Computer Science and Engineering
For students admitted in Spring 2018 or later**

Program Details:

The bachelor degree program requires 151 credits and is extended over a period of 4 years. This program is to be completed in 12 semesters, each year having 3 semesters namely:

Spring : January to April

Summer : May to August

Fall : September to December

Each semester will be of 14 weeks duration (out of 14 weeks 13 weeks for theory/lab classes with midterm examination and the last week of the semester is allocated for final exam). Midterm Examination will be held without hampering normal classes.

1 Credit (Theory) means 60 minutes/week

1 Credit (Lab) means 120 minutes/week

Minimum 151 credits and minimum CGPA 2.50 (Grade C+ (C plus), 50% to less than 55%) out of 4.00 are required to obtain B.Sc. Degree.

Grading System:

Range of Marks	Letter Grade	Grade Point
80 % or above	A+ (A Plus)	4.00
75% to less than 80 %	A (A Regular)	3.75
70 % to less than 75%	A- (A Minus)	3.50
65% to less than 70%	B+ (B Plus)	3.25
60% to less than 65%	B (B Regular)	3.00
55% to less than 60%	B- (B Minus)	2.75
50% to less than 55%	C+ (C Plus)	2.50
45% to less than 50%	C (C Regular)	2.25
40% to less than 45%	D (D Regular)	2.00
Less than 40%	F (Failure)	0.00

CGPA calculation:

Student's performance will be evaluated on the basis of Grade Point Average (GPA) semester wise and Cumulative Grade Point Average (CGPA) of total completed courses.

The CGPA will be computed in the following manner:

$$\text{CGPA} = \frac{\sum(\text{Credit Points} \times \text{Corresponding Course Credits})}{\sum \text{Credits}}$$

Performance Evaluation:

The performance of a student in a course is evaluated on the basis of class assessment (attendance, class test and assignments/viva) and lab/theory exams. Each course will be marked out of 100 distributed as:

Theory Courses		Lab Courses	
Class Attendance	10%	Lab Attendance	10%
Class Test	10%	Quizzes/Viva-voce	30%
Assignment/Viva	10%		
Midterm Examination	30%	Lab Test	60%
Final Examination	40%		
Total	100%	Total	100%

**Syllabus for B.Sc. in Computer Science and Engineering
For Semester Spring 2018 or Later**

Distribution of Courses

Course Type	Credits	% of Credits
Mathematics and Basic Sciences	19	12.58%
(a) Mathematics	12	
(b) Statistics	3	
(c) Physics	4	
Humanities	12	7.94%
(a) Economics	2	
(b) Accounting	2	
(c) English	4	
(d) Law	2	
(e) Bangladesh Culture	2	
Basic and Major Engineering	120	79.47%
(a) Theoretical	87	57.61%
(b) Laboratory	33	20.52%
Total	151	100.00%

Twelve Semester Course Sequence

1st Year 1st Semester

Code	Course Title	Marks	Credit	Page
ENG 111	English Fundamentals	100	3	11
MAT 111	Differential and Integral Calculus	100	3	11
PHY 111	Basic Physics	100	3	12
PHY 112	Basic Physics Lab	100	1	13
CSE 111	Computer Fundamentals	100	3	13
CSE 112	Computer Application Lab	100	1	14
Total		600	14	

1st Year 2nd Semester

Code	Course Title	Marks	Credit	Page
MAT121	Coordinate Geometry & Vector Analysis	100	3	14
CSE121	Electrical Circuits	100	3	15
CSE122	Electrical Circuits Lab	100	1	15
CSE123	Structured Programming Language	100	3	15
CSE124	Structured Programming Language Lab	100	1.5	16
Total		600	11.5	

1st Year 3rd Semester

Code	Course Title	Marks	Credit	Page
MAT131	Differential Equations and Special Functions	100	3	16
CSE131	Discrete Mathematics	100	3	17
CSE133	Object Oriented Programming	100	3	18
CSE134	Object Oriented Programming Lab	100	1.5	18
CSE 136	Software Development Lab I	100	1	19
Total		500	11.5	

2nd Year 1stSemester

Code	Course Title	Marks	Credit	Page
MAT 211	Linear Algebra and Complex Variables	100	3	19
CSE 211	Data Structures	100	3	19
CSE 212	Data Structures Lab	100	1.5	21
CSE 213	Object Oriented Design and Design Patterns	100	3	21
CSE 214	Object Oriented Design and Design Patterns Lab	100	1.5	22
Total		500	12	

2nd Year 2ndSemester

Code	Course Title	Marks	Credit	Page
BAN 221	History of Emergence of Bangladesh	100	3	22
CSE 221	Software Engineering	100	3	22
CSE 223	Electronic Devices and Circuits	100	3	24
CSE 224	Electronic Devices and Circuits Lab	100	1	24
CSE225	Algorithms	100	3	24
CSE226	Algorithms Lab	100	1.5	25
Total		600	14.5	

2nd Year 3rdSemester

Code	Course Title	Marks	Credit	Page
STA 231	Basic Statistics and Probability	100	3	25
CSE 231	Digital Logic Design	100	3	27
CSE232	Digital Logic Design Lab	100	1	28
CSE233	Computer Networks	100	3	28
CSE234	Computer Networks Lab	100	1	29
CSE236	Software Development Lab II	100	1	29
Total		600	12	

3rd Year 1stSemester

Code	Course Title	Marks	Credit	Page
ACC 311	Industrial Management and Accountancy	100	2	29
CSE311	Numerical Method	100	3	30
CSE312	Numerical Method Lab	100	1	31
CSE313	Database Management System	100	3	31
CSE314	Database Management System Lab	100	1.5	32
CSE315	Communication Engineering	100	3	32
Total		600	13.5	

3rd Year 2ndSemester

Code	Course Title	Marks	Credit	Page
LAW 321	Cyber and Intellectual Property Laws	100	2	33
CSE 321	Theory of Computation and Compiler Design	100	3	35
CSE 323	Computer Architecture	100	3	36
CSE 324	Computer Architecture Lab	100	1	37
CSE 325	E-Commerce and Web Programming	100	3	37
CSE 326	E-Commerce and Web Programming Lab	100	1	38
Total		600	13	

3rd Year 3rdSemester

Code	Course Title	Marks	Credit	Page
ECO 331	Economics	100	2	38
CSE 331	Operating System and System Programming	100	3	40
CSE 332	Operating System and System Programming Lab	100	1	41
CSE 333	Microprocessor and Assembly Language	100	3	41
CSE 334	Microprocessor and Assembly Language Lab	100	1	42
CSE 336	Software Development Lab III	100	1	42
Total		600	11	

4th Year 1stSemester

Code	Course Title	Marks	Credit	Page
CSE 411	System Analysis and Design	100	3	43
CSE 413	Artificial Intelligence	100	3	43
CSE 414	Artificial Intelligence Lab	100	1	44
CSE 415	Digital Signal Processing	100	3	44
CSE 416	Digital Signal Processing Lab	100	1	45
CSE 418	Project or Thesis with Seminar Part I	100	1	45
Total		600	12	

4th Year 2ndSemester

Code	Course Title	Marks	Credit	Page
CSE 421	Computer Graphics	100	3	46
CSE 422	Computer Graphics Lab	100	1	47
CSE 423	Digital Image Processing	100	3	47
CSE 424	Digital Image Processing Lab	100	1	48
Option I (T)	Theory: Should be selected from Table-I	100	3	48
Option I (L)	Lab course based on Option-I (T)	100	1	49
CSE 4212	Project or Thesis with Seminar Part II	100	1	48
Total		600	13	

Table-I: Option I

Code	Course Title	Marks	Credit
CSE 425	Microcontroller, Computer Peripherals and Interfacing	100	3
CSE 426	Microcontroller, Computer Peripherals and Interfacing Lab	100	1
CSE 427	Computational Geometry	100	3
CSE 428	Computational Geometry Lab	100	1
CSE 429	Design of VLSI Circuits and Systems	100	3
CSE 4210	Design of VLSI Circuits and Systems Lab	100	1

4th Year 3rd Semester

Code	Course Title	Marks	Credit	Page
CSE 431	Cryptography and Network Security	100	3	51
CSE 432	Cryptography and Network Security Lab	100	1	52
Option II(T)	Theory: Should be selected from Table-II	100	3	53
Option II (L)	Lab course based on Option-II (T)	100	1	54
Option III (T)	Theory: Should be selected from Table-II	100	3	54
Option III (L)	Lab course based on Option-III (T)	100	1	56
CSE 4316	Project or Thesis with Seminar Part III	100	1	52
Total		600	13	

Table-II: Option II and Option III

Code	Course Title	Marks	Credit
CSE 433	Parallel Processing and Distributed System	100	3
CSE 434	Parallel Processing and Distributed System Lab	100	1
CSE 435	Advance Database Management System	100	3
CSE 436	Advance Database Management System Lab	100	1
CSE 437	Multimedia System	100	3
CSE 438	Multimedia System Lab	100	1
CSE 439	Wireless Communication	100	3
CSE 4310	Wireless Communication Lab	100	1
CSE 4311	Robotics	100	3
CSE 4312	Robotics Lab	100	1
CSE 4313	Management Information System	100	3
CSE 4314	Management Information System Lab	100	1

DETAIL DESCRIPTION OF THE COURSES

1st YEAR 1st SEMESTER

ENG 111: English Fundamentals

Grammar: Noun and pronoun, adjective (articles and determiners), verb and tense, subject-verb agreement, clause and sentence structure, making question (wh-question, yes/no questions, tag question), conjunction, preposition, active and passive voice

Reading: Reading Comprehension (scanning and skimming, summarizing, critical reasoning)

Writing: Basics of paragraph and essay writing, CV writing, cover letter, joining and resignation letter

Public Communication: Formal and informal English, spoken discourse, presentation

Books Recommended:

1. Raymond Murphy : Intermediate English Grammar
2. Jahurul Islam : ABC of English Grammar
3. Anne Cole Brown : Houghton Mifflin English Grammar and Composition
4. E.L. Tibbitts : Exercises in Reading Comprehension
5. L. Sue Baugh, Maridell Fryer and David A. Thomas : How to Write First Class Business Correspondence
6. Sasikumar,P. Kiranmai Dutt and Geetha Rajeevan : A course in Listening and Speaking I & II – V.

MAT 111: Differential and Integral Calculus

Functions: Domain, Range, Inverse function and graphs of functions, Composition of function, Limits, Continuity, Indeterminate form.

Ordinary Differentiation: Differentiability, Differentiation, Successive differentiation and Leibnitz theorem.

Expansions of functions: Rolle's Theorem, Mean value theorem, Taylor's and Maclaurin's formulae.

Maximum and minimum of functions of one variable.

Partial Differentiation: Euler's theorem, Tangents and normal asymptotes.

Indefinite Integrals: Method of substitution, Integration by parts, Special trigonometric functions and rational fractions.

Definite Integrals: Fundamental theorem, General properties, Evaluations of definite integrals and reduction formulas.

Multiple Integrals: Determination of lengths, Areas and Volumes.

Books Recommended:

1. B. C. Das and B.N.Mukherjee : **Differential Calculus**, *U. N. Dhur & Sons*
2. B. C. Das and B.N.Mukherjee : **Integral Calculus**, *U. N. Dhur & Sons*
3. F. Ayres and Elliot : **Calculus (Schaum's Outline Series)**, *McGraw-Hill*
4. Joseph Edwards : **Differential Calculus**, *Kessinger Publishing*
5. Md. Abdul Latif and S. Bhattacharjee : **Differential Calculus**, *Chandaapure, Chittagong*

PHY 111: Basic Physics

Electrostatic and Steady Electric Current: Columb's law, Gauss's Law and its application; Electric field in dielectric media, Energy in an electrostatic field, Electrostatic force, Electromotive force.

Magnetic Field and Its Interaction: Magnetic induction, Magnetic force on a charge, Lorenz force, Magnetic field of a current, Torque on a current Loop, Moving coil galvanometer, Biot-Savart law and its applications, Ampere's law, Hall effect.

Electromagnetic Induction: Faraday's induction law, Lenz's law, Induced current and voltage, Self-inductance and mutual inductance, Inductor, Ideal transformer, Energy stored in a magnetic field.

Waves: Types of waves, Equation of Waves, Velocity and Energy, Complex waves, Standing waves, Resonance, Beats, Sound waves, the Doppler Effect.

Interference: Huygen's principle, Interference phenomena, Young's experiment, Michaelson interferometer, Interference involving multiple reflections, Newton's ring, Holography,

Diffraction: Fraunhofer and Fresnel diffraction, Diffraction by single slit; Diffraction gratings and its resolving power.

Polarization of light.

Books Recommended:

1. N. Subrahmanyam, Brij Lal, M.N. Avadhanulu : **A Text Book of Optics**, S. Chand
2. N. Subrahmanyam, Brij Lal : **Waves and Oscillations**, Vani Educational Books
3. B. L. Theraja, A. K. Theraja : **A Textbook of Electrical Technology Vol 1**, S. Chand

PHY 112: Basic Physics Lab

This course explains the very fundamental requirements for scientific experiments, e.g. use of graph papers (Linear-linear, Linear-log and Log-log), error calculations and use of different electronic equipment's like Multi-meter, Oscilloscope and Signal Generator etc.

CSE 111: Computer Fundamentals

Computer Basics: Introduction to Studying Computers, History and development of Computers, Generation of Computers, Types of Computers.

Computer Hardware and Peripherals: Basic Units of Computer Hardware, Keyboard, Mouse, Internal structure of CPU, Functions of RAM, ROM and Cache memory, Basic functional mechanism of HDD and CD-ROM, Different types of Monitors, Impact and Non-impact Printers, Scanner, Plotter, Typical Computer specifications.

Basic Number System: Different data type, Conversion, Standard

Software: Classifications, System software, Operating system concepts and importance, components and basic functions of DOS, Windows operating system, Application software's and Utility programs, Computer Virus.

Data Processing: Concepts of Data, Information, and Database, Traditional File Processing, and DBMS.

Computer Networks: Computer networks and its goals, Basic concepts on LAN, MAN, WAN and Internet systems, Internet services, Functions of Modem in Internet.

Programming Language Basic: Programming languages, basic concepts of compiler, interpreter, algorithm and flowchart.

Simple C: Program structure in C, Program creating, compiling, debugging and running, Basic I/O functions, Identifiers and keywords, Simple data types, variables, constants, operators

Books Recommended:

1. Peter Norton : **Introduction to Computer**, McGraw-hill Publishers
2. J. Stanley Warford : **Computer Systems**, Jones & Bartlett Publishers
3. P. Norton : **Inside the PC**, Sam Publishers
4. L. Rosch : **Hardware Bible**, Braddy Publishing, Indianapolis
5. Subramanian : **Introduction to Computers**, Mcgraw-hill Inc.
6. V. K. Jain : **Switching Theory and Digital Electronics**, Khanna Publishers

CSE 112: Computer Application Lab

Laboratory works based on CSE 111.

1st YEAR 2nd SEMESTER

MAT 121: Coordinate Geometry & Vector Analysis

Co-ordinate Geometry: Co-ordinates; Polar co-ordinates; The straight line; Change of axes; Pair of straight lines; circles; system of circles; Parabola; Ellipse; Hyperbola.

Vector Analysis: Vector algebra; scalar and vector product; Scalar and vector fields; Application of vectors in geometry; Calculus of vector valued function; Differentiation of vectors; Gradient; Divergence and curl of a vectors; Gradient, Divergence and Curl of a vector and their physical significance; Directional derivatives; vector Integration; Green's theorem, Stoke's theorem, Divergence theorem with example.

Books Recommended:

1. Rahman, A.F.M. Abdur, Bhattacharjee, P.K. : **A text book on of coordinate geometry with vector analysis**, S. Bhattacharjee, Chitangang
2. M. R. Spiegel, S. Lipschutz, and D. Spellman : **Vector Analysis and An Introduction to Tensor Analysis**, McGraw-Hill

CSE 121: Electrical Circuits

Fundamental electrical concepts and measuring units.

Direct current: voltage, current, resistance and power. Laws of electrical circuits and methods of network analysis; Network theorem, KCL, KVL superposition theorem, Thevenin's theorem, Norton theorem, Max Power transfer theorem Introduction to magnetic circuits.

Alternating current: instantaneous and r.m.s. current, voltage and power, average power for various combinations of R, L and C circuits, phasor representation of sinusoidal quantities.

Books Recommended:

1. Jacob Millman and Christos C. Halkias : **Electronic Devices and Circuits**, *McGraw-Hill Inc.*
2. Albert D. Helfrick and William David : Modern Electronics Instrumentation and Measurement Techniques, *Prentice Hall*
3. Albert Paul Malvino : **Electronic Principles**, *Career Education*
4. John D. Ryder : **Networks, Lines and Fields**, *Prentice Hall.*

CSE 122: Electrical Circuits Lab

Laboratory works based on **CSE 121**.

CSE 123: Structured Programming Language

Introduction: Programming languages, basic concepts of compiler, interpreter, algorithm and flowchart.

Simple C: Program structure in C, Program creating, compiling, debugging and running, Basic I/O functions, Identifiers and keywords, Simple data types, variables, constants, operators, Bitwise operators, comments, Decision making statements with if and switch, Looping structures with for, while, do-while.

More Data Types: Array, Structures, Union, Pointers, Strings, Dynamic allocation, Static, global, external and registrar, User defined data types

Functions: C Functions and user defined function, Function types, parameters, prototypes, Recursive function.

File Handling: Concepts, Character and File I/O, Basics of simple File I/O, ANSI Standard Libraries.

Others: Pre-processor with define, include, macro, ifdef, Uses of graphics functions.

Books Recommended:

1. Kernighan and Ritchie : **The C Programming Language**, *Prentice Hall*
2. Gotfreid : **Programming with C, Schaum's Outline Series**, *Tata McGraw Hill*
3. D.E. Knuth : **The Art of Computer Programming**, *Addison-Wesley Professional*
4. E. Balagurusamy : **Programming with ANSI C**, *Tata McGraw Hill*
5. H. Schildt : **Teach yourself C**, *McGraw-Hill Publishers*

CSE 124: Structured Programming Language Lab

Laboratory works based on CSE 123.

1st YEAR 3rd SEMESTER

MAT 131: Differential Equations and Special Functions

Differential Equation: ordinary differential equation of 1st order, differential equation, variable separable, exact differential equation, integrating factors, linear differential equation, solution of 2nd order linear differential equation, reducible homogeneous equations.

Beta and Gamma functions: Introduction, the factorial function, definition of Beta Gamma function, reduction formula for Γ^n . Transformation of Gamma function, relation between Beta and Gamma functions.

Fourier series and Fourier Integral: periodic function, Fourier series, determining the co-efficient, Fourier sine and Cosine series.

Legendre's Differential Equation and Legendre's Polynomial: Legendre's Polynomial equations, solution of Legendre's differential equations, Legendre's Polynomials, Process of finding particular Legendre's polynomials.

Bessel's Differential Equations and Bessel's Functions: Bessel's Differential equation, solution of Bessel's differential equation and Bessel's function. Generating of the Bessel's function, recurrence formula for Bessel's function, Bessel integral for Bessel's function.

Books Recommended:

1. Dr. B. D. Sharma : **Differential Equations**, *KNRN Publishers*
2. MD. Abdur Rahaman, : **Mathematical methods : special functions & vector analysis** *Nahar Book Depot & publications*

CSE 131: Discrete Mathematics

Introduction: Logic and Proofs, Mathematical Inductions, Sets, Equivalence relations, Language and recursive definitions.

Counting: Basic principles, sequences, Fibonacci, Eulerian, Bernoulli numbers, permutation, and Pascal's triangle.

Relation and ordering: Relations, properties of Binary relation in a set, composition of binary relation, relation matrix and graph of a relation, partial ordering, path in relation and di-graph.

Ordered relation and structure: Partially ordered set, external element of P.O. set, Lattice, finite Boolean algebra, function on Boolean algebra, Boolean function as Boolean polynomial.

Graph: Introduction to graph, graph terminology, representing graph and graph isomorphism, paths, reachability, connectivity, Euler and Hamilton path, shortest path problems, graph colouring, matrix representation of graph.

Trees: Introduction of trees, application of trees, tree traversal, labeling trees, trees and sorting, spanning trees, minimal spanning tree, and undirected trees.

Algebraic structure: Algebraic system, general properties, some simple algebraic system, ring, semiring, module, semi-module, Homomorphism of semigroups and monoid, Grammars and languages, Formal definition of a language, Definition and examples, homomorphism, product and quotients of group.

Books Recommended:

1. Kenneth H. Rosen : **Discrete Mathematics and Its Applications**, McGraw-Hill.
2. J. P. Tremblay and R. Manohar : **Discrete Mathematics structures with applications to Computer Science**, McGraw Hill
3. C.L. Liu : **Elements of Discrete Mathematics**, McGraw-Hill.
4. Seymour Lipschutz : **Theory and Problems of Discrete Mathematics**, Schaum's Outline Series, McGraw-Hill
5. Bernard Kolman, Robert Busby, Sharon C. Ross : **Discrete Mathematical Structures**, Prentice Hall

CSE 133: Object Oriented Programming

Introduction: Object oriented programming and procedural oriented programming, encapsulation, inheritance, polymorphism, data abstraction, data binding, static and dynamic binding, message passing.

C++ as an object oriented language: Declaration and constants, expression and statements, data types, operator, Functions.

Classes: Structure of classless, public, private and protected members, array of object, argumented member function, and non-augmented objects, nested member class and their object, pointer objects and pointer members, object a argument of function, static class member and static class, Friend function, friend class.

Inheritance: Mode of inheritance, classifications of inheritance, virtual inheritance.

Array of objects of derived class.

Constructor and Destructor: Default constructor, argumented constructor, copy constructor, dynamic constructor, constructor function for derived class and their order of execution, destructor.

Operator and function overloading: Unary and binary operator overloading, run-time and compile time polymorphism, object pointer and pointer to an object, virtual function, dynamic binding.

C++ data file: C++ file stream classes, input and output file, mode of files, file pointer, random file accessing.

Template and Exception handling: Function template and class template, Exception Handling.

Books Recommended:

1. H. Schidt : **C++: A Beginner's Guide**, *McGraw Hill*
2. H. Schidt : **C++: The Complete Reference**, *McGraw Hill*
3. N. Barkakati : **Object Oriented Programming with C++**, *Prentice Hall India*
4. B. Stroustrap : **The C++ Programming Language**, *Addison Wesley*

CSE 134: Object Oriented Programming Lab

Laboratory works based on CSE133

CSE 136: Software Development Lab I

Students will develop software with proper documentation as assigned by Lab teachers based on **courses of 1st year**.

2nd YEAR 1st SEMESTER

MAT 211: Linear Algebra and Complex Variables

Linear Algebra: Determinants, Matrices, Inverse of a Matrices, Rank of a Matrix, Solution of system of linear equations by Cramer's rule and by Matrix inversion, System of linear equation, Linear Transformation, Eigen values and Eigen vectors.

Complex Variables: Complex number, Complex function, Limit and continuity of a complex function, Complex differentiation and integration, Cauchy's integral formula and related theorems, Infinite series, Taylor's and Laurent's series, Residues and residue theorem, Hyperbolic functions, Euler's formula, Exponential and polar forms, Analytic functions, De Mover's theorem.

Books Recommended:

1. Howard Anton, : **Linear Algebra with Application**
Chris Rorres
2. MR Spiegel : **Complex Variables, McGraw-Hill Education**
3. Seymour : **Linear Algebra, Schaum's Outline Series,**
Lipschutz, Marc *McGraw-Hill Education*
Lipson

CSE 211: Data Structures

Data representation: Internal data representation, Abstract data types, Ideas on linear and non-linear data structures, Elementary data structures.

Arrays: Maximization, ordered lists, sparse matrices, representation of arrays.

Stacks, Queues and Recursion: Different types of stacks and queues: Circular, dequeues, etc; evaluation of expressions, multiple stacks and queues.

Recursion: Direct and indirect recursion, depth of recursion, Simulation of Recursion, Removal of recursion; Towers of Hanoi.

Linked Lists: singly linked lists, linked stacks and queues, the storage pool, polynomial addition, equivalence relations, sparse matrices, doubly linked lists and dynamic storage management, generalized lists, garbage collection and compaction.

Trees: Basic terminology, binary trees, binary tree representations, binary tree traversal; Extended binary trees: 2-trees, internal and external path lengths, Huffman codes/algorithms; threaded binary trees, binary tree representation of trees; Application of Trees: Set representation, decision trees, games trees: Counting binary trees.

Graphs: Introduction, definitions and terminology, graph representations, traversals, connected components and spanning trees, shortest path and transitive closure, activity networks, topological sort and critical paths, enumerating all paths.

Symbol Tables: static tree tables, dynamic tree tables; Hash Tables: Hashing functions overflow handling, theoretical evaluation of overflow techniques.

Files: file, queries and sequential organizations: Indexing Techniques: Cylinder-surface indexing hashed indexes, tree indexing-B-trees; Tree indexing.

Books Recommended:

1. E. Horowitz : **Fundamentals of Data Structures**,*Galgotia*.
and S. Sahni
2. Edward M. : **Data Structures**,*Addison Wesley Publishers*
Reingold
&Wilfred J.
Hansen
3. Niklaus Wirth : **Algorithms + Data Structures = Programs**,
Prentice Hall
4. Robert L. : **Data Structures and Program Design**,
Kruse
Prentice Hall
5. Seymour : **Data Structures (Schaum's Outline**
Lipshultz **Series)**,*Tata McGraw-Hill*
6. E. Horowitz : **Computer Algorithms**, *Galgotia*.
and S. Sahni
7. Seymour E. : **Introduction to Design and Analysis of**
Goodman & S. **Algorithms**, *McGraw-Hill*.
T. Hedetniemi

CSE 212: Data Structure Lab

Laboratory works based on CSE 212

CSE 213: Object Oriented Design and Design Patterns

OOP Concepts: Modularity, reusability, functional decomposition, object-based decomposition, abstract data types. Classes and uniform type system, objects and references, memory management, inheritance techniques, generic classes and templates, exception handling.

Software Design with UML: Introduction to UML. Overview of the design process using UML Rational Unified Process. Structured description of system usage and function, requirements capture techniques, identification of scenarios and UML use case diagrams. Description of scenario elements in terms of CRC models - classes, responsibilities and collaborators. Systematic definition of classes, data and system structure. Abstraction, modularization and UML class diagrams. Combining top-down refinement with bottom-up construction. Object interaction, behavior and state. Different varieties of UML interaction diagram. Recognizing coupling between modules and responsibility-driven design. Structuring source code as a design model. Recognition of variable roles. Defensive programming methods including recognition of pre- and post-conditions, invariants, composition and assertions. Rapid and agile prototyping strategies, optimization and debugging techniques.

Design Patterns: Introduction, creational patterns - abstract factory, builder, factory method, prototype, singleton; structural patterns - adapter, bridge, composite, decoder, proxy, facade, flyweight; behavioral patterns-chain, command, interpreter, iterator, mediator, memento, observer, state, strategy, visitor, template method.

Books Recommended:

1. Deitel & Deitel : **Java How To Program, Prentice Hall**
2. Flanagan : **Java in a nutshell : a desktop quick reference**
3. H. Schildt : **Java 2: Complete Reference**
4. McConnell : **Code complete: a practical handbook of software construction**
5. E. Gamma : **Design Patterns: Elements of Reusable OO Software**
6. Allan Shallway : **Design Patterns Explained**
7. Fowler : **UML distilled**
8. Craig Larman: : **Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development**

CSE 214: Object Oriented Design and Design Patterns Lab

Laboratory works based on CSE 213

2nd Year 2nd Semester

BAG 221: History of Emergence of Bangladesh

A brief survey of socio-political condition of pre-partition India since 1905, Partition of India in 1947, Language Movement, Political parties and political personalities, Disparity between two wings of Pakistan, Military rule of Ayub Khan (1958-1969), The Six-point Movement, Mass Upsurge of 1969 and fall of Ayub Khan, Military rule of 1969 and Yehiya Khan, General election of 1970, The historic speech of 7 March by Bangabandhu Shaikh Mujibur Rahman and Non-Cooperation Movement, Genocide of 25 March, Mujibnagar Government, the beginning of Liberation War and the emergence of Bangladesh, Surrender of arms by the 'Mukti Bahine' and withdrawal of Indian forces, Constitution of Bangladesh.

Books Recommended:

1. K.B. Sayeed, *Political System of Pakistan*.
2. W. ↑gv. gvneyei ingvb, *evsjv↑`↑ki BwZnvm, 1947-1971*|
3. ewki Avj ↑njvj, *fvlv Av↑`vj↑bi BwZnvm*|
4. AvwZDi ingvb, *gyw³hy↑×i cÖ`wZce© : Amn↑hv↑Mi w`b,wj*
5. Agy↑j`y ↑`, *^vaxb e½f~wg MV↑bi cÖqvm I cwiYwZ*|
6. wmiVryj Bmjvg (m↑úv.), *evsjv↑`↑ki BwZnvm, 1707-1971, 1g, 2q I 3q LÛ*|
7. Aveyj gvj Avāyj gywnZ, *evsjv↑`k : RvwZiv↑ó^qi DTMçe*|
8. ^mq` Av↑bvqvi ↑nv↑mb, *evsjv↑`↑ki Afz`↑q civkw`i f~wgKv*|

CSE 221 Software Engineering

Introduction: Introduction to software engineering, Importance of software, The Software evolution, Software characteristics, Software components, Software applications, Crisis-Problem and causes.

Software development life-cycle: Requirement analysis, software design, coding, testing and maintenance etc.

Software requirement Specification: Water fall model, prototyping interactive enhancement, spiral model role of management in software development, role of matrices and measurement, Problem analysis, requirement specification, validation, matrices, monitoring and control.

System Design: Problem partitioning, abstraction, top down and bottom up – design, structured approach, functional versus object oriented approach, design specification and verification matrices, monitoring and control, Cohesiveness, coupling, 4 GL. Visio, DFD, Rational Rose, Visio, VS architectural design.

Coding: TOP-DOWN and BOTTOM-UP structure programming, information hiding, programming style, and internal documentation, verification, metrics, monitoring and control, Subversion, Team System, Source Safe

Testing: levels of testing, functional testing, structural testing, test plane, test class specification, reliability assessment, Software testing strategies, Verification and validation, Unit, Integration Testing, Top down and bottom up integration testing, Alpha and Beta testing, System testing and debugging. NUnit for unit testing, Selenium, WebLoad

Software project Management: Cost estimation, project scheduling, staffing, software configuration management, structured Vs unstructured maintenance, quality assurance, project monitoring, risk management. Agile-XP, scrum, Rally, Version One, Bugzilla, Visual Studio Team System, Agile project management, comparison with traditional process, Next generation software engineering

Function oriented and object oriented Software design: Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to real time systems, Object oriented design, Graphical representation of OOD, Generic OO development paradigm.

Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability growth modeling, Software quality, ISO 9000 certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM, NANT, CruiseControl.Net for automated build.

Books Recommended:

1. Roger S. Pressman : **Software Engineering, A practitioner's Approach, McGraw-Hill**
2. Ian Sommerville : **Software Engineering, Pearson Education.**
3. Richard Fairley : **Software Engineering Concepts, McGraw-Hill.**

4. Robert N. Charette : **Software Engineering Environments**, McGraw-Hill.
5. S. L. Pfleeger and J.M. Atlee : **Software Engineering Theory and Practice**, Pearson Education.

CSE 223: Electronics Device and Circuits

Introduction to semiconductors, p-type and n-type semiconductors; p-n junction diode characteristics; Diode applications: half and full wave rectifiers, clipping and clamping circuits, regulated power supply using zener diode.

Bipolar Junction Transistor (BJT): principle of operation, I-V characteristics; Transistor circuit configurations (CE, CB, CC), BJT biasing, load lines; BJTs at low frequencies; Hybrid model, h parameters, simplified hybrid model; Small-signal analysis of single and multi-stage amplifiers, frequency response of BJT amplifier. Field Effect Transistors (FET): principle of operation of JFET and MOSFET; Depletion and enhancement type NMOS and PMOS; biasing of FETs; Low and high frequency models of FETs, Switching circuits using FETs; Introduction to CMOS.

Operational Amplifiers (OPAMP): linear applications of OPAMPs, gain, input and output impedances, active filters, frequency response and noise. Introduction to feedback, Oscillators, Silicon Controlled Rectifiers (SCR), TRIAC, DIAC and UJT: characteristics and applications; Introduction to IC fabrication processes.

Books Recommended:

1. Jacob Millman and Christos C. Halkias : **Electronic Devices and Circuits**, McGraw-Hill Inc.
2. A. Mottershead : **Electronic Devices and Circuits: An Introduction**, Goodyear Pub
3. Sedra / Smith : **Microelectronics Circuits** 5th Edition
4. Mehta, Rohit, V K : **Principles of Electronics**, S. Chand Group Mehta

CSE 224: Electronics Device and Circuits lab

Laboratory works based on CSE 223

CSE 225: Algorithms

Basics of Algorithm: Algorithms as a technology, Analyzing algorithms, Designing algorithms, Time and space analysis of algorithms, Average, best and worst case analysis, different notations.

Sorting: Insertion sort, Heap sort, Quicksort, Counting sort, Radix sort, Bucket sort.

Dynamic programming: Assembly-line scheduling, Matrix-chain multiplication, Longest common subsequence, Optimal binary search trees.

Greedy method: An activity-selection problem, Elements of the greedy strategy, Huffman codes.

Graph algorithms: Depth-first search, Breadth-first search, Topological sort, Minimum spanning tree, Kruskal's and Prim's algorithm, Bellman-Ford algorithm, Dijkstra's algorithm, Floyd-Warshall algorithm, Johnson's algorithm for sparse graphs, Ford-Fulkerson method.

Computational Geometry: Line-segment properties, Determining whether any pair of segments intersects, Finding the convex hull, Finding the closest pair of points.

Backtracking: 8 queen's problem, Sum of subsets, Graph coloring problem, and Hamilton cycles.

Branch and bound: Least cost search, 15-puzzle problem, Knapsack problem, Traveling salesman problem.

NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete problems.

Recommended Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein : **Introduction to Algorithms**, *The MIT Press*
2. D. E. Knuth : **The Art of Computer Programming, Vol. 1, 2, 3**, *Addison-Wesley*.
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran : **Fundamentals of Computer Algorithms**, *Galgotia Publications*

CSE 226: Algorithm lab

Laboratory works based on **CSE 225**

2nd Year 3rd Semester

STA 231: Basic Statistics and Probability

An introduction: Definition of Statistics; Uses and importance.

Data representation: Classification, Types of classification, Tabular representation, Graphical representation, Pie chart; Histogram, Bar chart, multiple bar charts, line chart.

Measures of central Tendency: Introduction, The arithmetic mean, computing of mean for grouped data, Short cut method of computing mean, Median, mode, Harmonic mean, Geometric mean (Both grouped and non grouped data), Advantages and disadvantages, and uses of all measures.

Measures of Dispersion: Introduction of dispersion, Range, Mean deviation, Standard deviation, Variance, Quartile deviation, Coefficient of Variation. Difference between Absolute and Relative measures of dispersion. Advantages, disadvantages and uses of all measures.

Random variables and probability Distribution: Basic concepts, Discrete and continuous random variables, Density and distributional functions, Mathematical expectation and variance, Joint marginal and conditional density functions, Conditional Expectation and conditional variance, Moments and Cumulant generating functions. Characteristic function. Study of Binomial, Poisson, Normal and Bivariate Normal distribution and Practical examples.

Correlation and Regression: Correlation analysis-Introduction, Types of correlation importance and uses of correlation. Properties of correlation, Rank correlation. Regression analysis- linear Regression, simple regression, Multiple regressions, Importance of regression analysis. Comparison of regression and correlation.

Probability: Concept of probability. Sample Space, Events union and Intersection of Events. Probability of events. Laws of probability, Conditional probabilities, Bayes' Theorem, Chebyshev's Inequality and Practical examples.

Sampling design: Sampling Design (Probability sampling); Simple random sampling; Systematic sampling; Stratified sampling; Cluster sampling; Judgment sampling.

Books Recommended:

1. A. J. B. Anderson : **Interpreting Data.** *Chapman and Hall, London*
2. H. Cramer : **The Elements of Probability Theory.** *Wiley, N. Y*
3. P. Hoel, : **Introductory Statistics,** *Wiley and Sons, N. Y.*
4. D. V. Lindley : **Introduction to Probability and Statistics.** Vol-1 *C. U. P. London*
5. S. Lipschutz : **Probability,** *McGraw-Hill, N. Y.*
6. Mosteller, Rourke : **Probability With Statistical Applications,** *Addison- Wesley*
and Thomas
7. F. L. Wolf : **Elements of Probability and Statistics,** *McGraw-Hill, N. Y.*

8. T. H. Wonnacot : **Introductory Statistics**, *Wiley and Sons. N. Y.*
and R. J.
Wonnacot
9. G. U. Yule, and : **An Introduction to the Theory of Statistics**,
M. G. Kendall *Charles Griffin, London*
- 10 Mr. Nurul Islam : **Statistics & Probability**, ISBN: 984-31-1131-2
- 11 Rabindra nath : **An introduction to the theory of Statistics**
shill

CSE 231: Digital Logic Design

Fundamentals of Digital Logic System: Number Systems, weighted and non-weighted codes, error detection code, Binary addition and subtraction, 2's compliment methods.

Logic Gates and Boolean Algebra, Logic Circuit Design, Adder, Subtractor, Minimization Techniques: Algebraic Simplification, Karnaugh Map Method, Quine-McCluskey method, Consensus method.

Switching Devices, switching characteristics of diodes, transistor and FETs. Integrated Circuit Logic Families: DTL & TTL logic family, standard TTL series characteristics, other TTL series, TTL loading rules, TTL open-collector outputs, tristate TTL. The ECL family. Digital MOSFET circuits, characteristics, CMOS circuits, CMOS tristate logic, TTL driving CMOS, CMOS driving TTL.

Flip-Flops (FF) and related devices: Transistor Latch, NAND gate latch, NOR gate latch, D latch. Clock signals and Clocked FFs: Clocked SR, JK and D Flip-Flops, Master/Slave JK FF, timing diagram of different FFs, Edge-triggered and level-triggered timing diagrams.

555 Timer: Architecture of 555 Timer, different application of 555 timer, 555 as monostable, bistable and astable Multivibrators

D/A Converters: Sample and hold circuit, weighted resistor and R⁻² R ladder D/A Converters, specifications for D/A converters.

A/D converters: Quantization, parallel-comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

Books Recommended:

1. Ronald J. Tocci : **Digital Systems: Principles and Applications**, *Prentice Hall*
2. V. K. Jain : **An Introduction to Switching Theory and Digital Electronics**, *Khanna Publishers, New Delhi*
3. M. Morris Mano : **Digital Logic and Computer Design**, *Prentice Hall*

4. William H. Gothmann : **Digital Electronics**, *Prentice Hall*
5. A. Mottershead : **Electronic Devices and Circuits: An Introduction**, *Goodyear Pub*
6. Mehta, Rohit, V K : **Principles of Electronics**, *S. Chand Mehta Group*

CSE 232: Digital Logic Design Lab

Laboratory works based on CSE 231

CSE 233: Computer Network

Introduction: Computer Networks and Applications, OSI reference model, TCP/IP model and terminology, Connectionless and Connection Oriented services, Service primitives, The ARPANET

Physical Layer: Circuit switching and Packet switching, X-25 protocol, Frame relay and Cell relay, ATM reference model.

Medium Access Sub layer: Pure and slotted ALOHA, Persistent and Non persistent CSMA, CSMA with collision detection and collision free protocols, IEEE standard 802.3 and Ethernet.

Data Link Layer: Types of errors, framing, error detection & correction methods; Flow control, Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC.

Network Layer: Internet address, classful address, subnetting, static vs. dynamic routing, shortest path algorithm, flooding, distance vector routing, link state routing, ARP, RARP, IP, ICMP.

Transport Layer: UDP, TCP, Connection management, Addressing, Establishing and Releasing Connection, Congestion control algorithm, Flow control and Buffering, Multiplexing.

Presentation Layer: Data Compression techniques, Frequency Dependent Coding, Context Dependent Encoding.

Application Layer: Internet and intranets, Internet services and goals, DNS, SMTP, FTP, Telnet, HTTP, World Wide Web (WWW), DHCP and BOOTP.

Networking in Practice: Designing LAN, Cabling, Establishing Client-Server network, Configuring: Directory Server, Proxy server, FTP server, E-mail server, web server, DB server, Firewall, Network troubleshooting, network maintenance, network monitoring, Network programming.

Books Recommended:

1. Behrouz A. Forouzan : **TCP/IP Protocol Suite**, *McGraw-Hill*

2. Andrew S. Tanenbaum : **Computer Networks**, *Prentice Hall*
3. William Stallings : **Data and Computer Communications**, *Prentice Hall*
4. Behrouz A. Forouzan : **Data Communications and Networking**, *McGraw-Hill*

CSE 234: Computer Networks Lab

Laboratory works based on CSE 233

CSE 236: Software Development Project II

Students will develop software with proper documentation as assigned by Lab teachers based on **Courses on 2nd Year**.

3rd YEAR 1st SEMESTER

ACC 311: Industrial Management and Accountancy

Industry: Commerce-Industry: Meaning & Characteristics of Industry, Types of Industry; Business: Meaning & Objectives of Business, Types of Business: Sole Proprietorship, Partnership, Joint Stock Company, State Enterprise and Cooperative Society.

Fundamentals of Management: Meaning of Management, Principles of Management, Functions of Management, Levels of Management, Roles of Management, Scientific Management and Core Management skills.

Factory Location, Plant Layout and Utility: Factors Determining Location of Factory, Steps in Location, Factors Influencing Layout, Types of Layout, Problems of Layout, Plant Utility, Lighting, Ventilation, Air-conditioning, Sanitation and Noise Control.

Accountings: History, Scope and Nature of Accounting, Purpose of Accounting, Information and Uses

Transaction: Meaning and Features, Accounting Equation, Meaning and Classification of Account, Double entry System, Rules for Determining Debit and Credit, Accounting cycle.

Journal, Ledger and Trial Balance: Meaning, Features, Necessity, Rules, Double and Triple Column Cash Book and Practical Problems.

Work Sheet: Meaning, Purpose, Adjustment Entries and 10 Columns Work Sheet.

Cost Terms Concepts and Classification: Meaning of Cost, Manufacturing and Non Manufacturing Costs, Period and Product Costs, Variable and Fixed Costs, Direct and Indirect Costs.

Books Recommended:

1. M. C. Shukla : **Business Organization and Management**, *S. Chand Publisher.*
2. Harold Koontz and Heinz Weihrich : **Management**, *Tata McGraw-Hill.*
3. Krajewski and Ritzman : **Operation Management**, *Addison-Wesley Publishing Company*
4. David A. Decenzo and Stephen P. Robbins : **Human Resource Management**, *John Wiley & Sons publisher.*
5. Hermanson Etar : **Accounting Principles**, *Business Publications*
6. Ray H. Garrison : **Managerial Accounting**, *Irwin Professional Publishing*

CSE 311: Numerical Methods

Floating-point arithmetic: Floating-point representations, General properties, Floating-point exception handling, Rounding methods, Floating-point operations (+, -, ×, /)

Approximations and Errors: Accuracy and Precision, Error Definitions, Round-Off Errors, Truncation Errors.

Roots of Equations: Graphical Methods, The Bisection Method, The False-Position Method, Simple One-Point Iteration, The Newton-Raphson Method, The Secant Method.

Systems of linear algebraic equations: Gauss Elimination, Solving Small Numbers of Equations, Naive Gauss Elimination, Pitfalls of Elimination Methods, Matrix Inversion and Gauss –Seidel, The Matrix Inverse, Error Analysis.

Curve Fitting: Linear Regression, Polynomial Regression, Multiple Linear Regression, Newton’s Divided-Difference Interpolating Polynomials.

Numerical Differentiation and Integration : The Trapezoidal Rule, Simpson’s Rules, Integration with Unequal Segments, Romberg Integration, Gauss Quadrature, High-Accuracy Differentiation Formulas, Richardson Extrapolation, Derivatives of Unequally Spaced Data.

Finite-difference methods for ordinary differential equations: Stability analysis of finite-difference methods: Euler, backward Euler, Midpoint, Trapezoidal, Midpoint-trapezoidal predictor-corrector, Runge-Kutta methods,

Recommended Books:

1. Steven C. Chapra, Raymond P. Canale : **Numerical Methods for Engineers**, *McGraw-Hill*
2. S. S. Kuo : **Computer Applications of Numerical Methods**, *Addison-Wesley*
3. S. S. Sastry : **Introductory Methods of Numerical Analysis**, *Prentice-Hall of India Pvt. Ltd.*
4. Cantrell : **Modern Mathematical Methods for Physicists and Engineers**, *Cambridge University Press.*
5. Press, Teukolsky, Vetterling and Flannery : **Numerical Recipes in C: The Art of Scientific Computing**, *Cambridge University Press.*
6. V. Rajaraman : **Computer Oriented Numerical Method**, *Prentice-Hall of India Pvt. Ltd.*

CSE 312: Numerical Methods Lab

Laboratory works based on **CSE 311**

CSE 313: Database Management System

Introduction: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information, Retrieval, Speciality of Databases, Database Users and Administrators.

Introduction to the Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema, Diagrams, Relational Query Languages, Relational Operations.

Introduction to SQL: Overview of the SQL Query, Language, SQL Data Definition, Basic Structure of SQL, Queries, Null Values, Aggregate Functions, Modification of the Database.

Intermediate SQL: Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas.

Advanced SQL: Accessing SQL From a Programming, Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features.

Formal Relational Query Languages: The Relational Algebra, The Tuple Relational Calculus, The Domain Relational Calculus.

Database Design and the E-R Model: Overview of the Design Process, Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams.

Relational Database Design: Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Decomposition Using Multivalued Dependencies, More Normal Forms, Domain-Key Normal Form.

Object-Based Databases: Complex Data Types, Structured Types and Inheritance in SQL, Object-Relational Mapping, Object-Oriented versus Object-Relational.

XML: Structure of XML Data, XML Document Schema, Querying and Transformation, Application Program Interfaces to XML, Storage of XML Data, XML Applications.

Books Recommended:

1. A. Silberschatz : **Database System Concepts**, *Mcgraw-Hill*.
2. R. Ramakrishnan, : **Database Management System**, *McGraw-Hill*
Johannes Gehrke *Higher Education*
3. James Martin : **Principles of Database Management**, *Prentice-hall*
4. Ullman : **Database Management systems**, *Prentice-Hall Publication*.
5. Abey : **Oracle 8i a Beginners Guide**, *McGraw Hill*.

CSE 314: Database Management System Lab

Laboratory works based on **CSE 313**

CSE 315: Communication Engineering

Fundamentals: Communication Engineering Fundamentals, Waveforms Spectra, Periodic waveforms and its properties, Fourier series, Noise and its different types.

Amplitude Modulation: Amplitude modulation, Amplitude modulation index, Frequency spectrum for sinusoidal AM, AM broadcast Transmitter.

Frequency Modulation: Frequency Modulation, Sinusoidal FM, Frequency spectrum for Sinusoidal FM, FM transmitter. FM receiver, Phase Modulation.

Pulse Modulation, Pulse Codes Modulation (PCM), Quantization, Compression, PCM Receiver, Differential PCM, Delta Modulation, Sigma-Delta A/D conversion, Pulse Frequency Modulation (PFM), Pulse Time Modulation (PTM), Pulse Position Modulation (PPM).

Digital Communication: Digital Communication, Basic Digital Communication System, Synchronization, Asynchronous Transmission, Probability of Bit Error in Base band Transmission, Matched Filter, Eye Diagrams, Digital Carrier Systems, Amplitude Shift keying, Frequency Shift Keying, Phase Shift Keying, Carrier Recovery Circuits, Differential Phase Shift Keying, Error Control Coding, Block Control, Repetition Encoding, Parity Encoding, Convolution Encoding.

Propagation: Radio Wave Propagation, Mode of Propagation, Microwave Systems, Tropospheric Propagation, VHF/UHF Radio Systems.

Satellite Communication: Satellite Communication, Kepler's First and Second Law, Orbits, Geostationary Orbits, Power System.

Fiber Optic Communication: Fiber Optic Communication, Propagation within a Fiber, Modes of Propagation, Losses in Fibers, Light sources for Fiber optics, Photo detectors.

Books Recommended:

1. Behrouz A. Forouzan : **Data Communications and Networking**, *Tata McGraw-Hill Edition*
2. William Stallings : **Data and Computer Communications**, *Prentice Hall International, Inc.*
3. John M. Senior : **Optical Fiber Communications** , *Prentice-Hall of India Pvt Ltd*
4. F. Halsall : **Data Communication, Computer Network and open systems**, *Addison Wesley*
5. Andrew S. Tanenbaum : **Computer Networks**, *Prentice Hall of India Pvt. Ltd*

3rd YEAR 2nd SEMESTER

LAW 321: Cyber and Intellectual Property Law

Cyber Law

Cyber Law: Definition Nature, Scope, Utility of Cyber Law, Origin and Development of Cyber Law and Internet

ICT Policy in Bangladesh; Internet Service Providers (ISP)- Domain Name, Present Legal Basis of ISP in Bangladesh; e-Readiness in Bangladesh- e-Commerce in Bangladesh, e-Governance in Bangladesh, e-Learning/Education in Bangladesh, e-Journal in Bangladesh, e-Voting in Bangladesh; Electronic Evidence- Digital Signature, The Evidence Act of

1872 Vs. ICT Act-2006, Electronic Evidence in Bangladesh, Legal Effects of Electronic Evidence, UNCITRAL Model Law on Electronic Evidence;

Cyber Crime: Jurisdiction and Cyber Crime, Criminal Justice in Bangladesh and Implications on Cyber Crime; Cyber vandalism, Hacking, Malicious Spreading in Viruses, Password fraud, Cheating, Cyber Pornography, Child Pornography, Protection of Copyrights and Intellectual Property right, Invasion of Privacy, Constitutional basis of Privacy, Unsolicited e-Mail, Defamation, Harassment and e-Mail Abuse, Present Legal Protection;

Human Rights Violation and Internet; The Information and Communication Technology Act, 2006- Objectives, Strengths & Weaknesses of the ICT Law, Regulation of Cryptography;

International Cyber Law- India, Sri Lanka, Japan, Malaysia, Australia and the USA, International Conventions on Cyber Law & Crime

Electronic Commerce- Electronic Money, Online Credit card Payments and Electronic Bills of Lading, UNCITRAL Model Law on Electronic Commerce.

Intellectual Property Law

Intellectual Property Law: Basic Concepts of IP Law, Nature of IPR, Computer-related intellectual property rights; Copyright- Original and development of copyright law, subject matter of copyright protection, Rights protected by copyright, Neighboring rights, Limitations of Copyright protecting, Piracy and infringement, Remedies, Computer Program, New technology and copyright, Software Patents Vs. Copyright, International Convention on Copyright.

Patent- Patents and technological development, Requirements for patentability and ownership of patents, Scope of exclusive rights and duration of protection, Patents infringement, defenses and remedies, Legal arrangement for the transfer of technology, Types of intellectual Property licenses

Trademarks- Reasons for the protection of trademarks, Acquisition of trademark right, Registration procedure, Duration of protection and renewal, Termination, Trademarks in Cyberspace; Domain Name and Meta-tag Controversies.

Books Recommended:

1. Vivck Sood : **Cyber Law Simplified**, *Tata McGraw Hill Publications.*
2. V. D. Dudej : **Information Technology & Cyber Laws**, *Commonwealth Publishers.*
3. Arpad Bogsch : **Universal Copyright Convention: An Analysis and Commentary**, *Bowker*

4. Alan Daubeny : **Copyright in Industrial Designs**, *Sweet and M.*
Russell Clarke

CSE 321: Theory of Computation and Compiler Design

Theory of Computation

Languages and Grammars: Finite Automata - accepting languages, strings, string search algorithm, distinguishing strings, integers, lexical analysis, decision problems and languages, minimizing finite automata.

Regular languages and Expression: Non-deterministic finite automata, Kleene's theorem. Context-free languages, regular languages and grammars. Simplified forms and normal forms. Push-Down Automata- deterministic PDA and non-deterministic PDA, top-down and bottom-up PDA, Parsing - top down and bottom-up parsers. Decision problems and CFL.

Computational Models: Computational tasks - search and decision problems, General model of computation, Turing Machines.

Decision Problems: Undecidable problems, reduction and halting problem, context-free languages. Decision trees. Satisfiability problem.

Computational Complexity: Introduction to complexity theory, Time complexity of a Turing machine, Polynomial-time reductions and NP completeness, NP-hard and NP-complete languages.

Compiler Design

Introduction: Introduction to compiler, compiler and translator, the structure of a compiler.

Parsing: Basic parsing technique, parsers, shift reduce parsing, operator-procedure parsing, top-down parsing, bottom up parsing, predictive parsing.

Syntax: Syntax directed translation, intermediate code generation, polish notation, parse tree and syntax trees, quadruples, triples, Boolean expression.

Symbol Table: Perspective and motivation of symbol table. Symbol table content, operation on symbol table, organization of symbol table.

Code Optimization: Code optimization, sources of optimization, basic blocks, folding, loop optimization, flowgraph, induction variable elimination, reduction in strength, code motion.

Error Handling: Compile time error handling, error detection, error recovery, error repair.

Coding: Code generation, object programs, problems in code generation, a machine model, a simple code generator, register allocation and assignment peephole optimization.

Books Recommended:

1. John C. Martin : **Introduction to Languages and The Theory of Computation.** *McGraw Hill.*
2. Sanjeev Arora and Boaz Barak : **Computational Complexity: A Modern Approach**
3. Oded Goldreich : **Complexity of Algorithms - A Conceptual Perspective**
4. Peter Gacs and Laszlo Lovasz : **Complexity Algorithms**
5. Alfred V. Aho and Jeffrey D. Ullman : **Principles of Compiler Design,** *Addison-Wesley Publication.*
6. A.J. Holub : **Compiler design in C,** *Prentice-Hall of India*
7. Trembly and Sorensen : **Theory and Practices of Compiler Writing,** *McGraw-Hill*
8. Hopcroft and Ulman : **Introduction to Automata Theory, Languages and Computation,** *University of Toronto*

CSE 323: Computer Architecture

Concepts and Terminology: Digital computer components Hardware & Software and their dual nature, recent development, Role of Operating Systems (OS).

Processor Design: Introduction: Processor organization, information representation, number formats; Fixed Point Arithmetic: Addition, subtraction, multiplication, division; ALU Design: Basic ALU organization, floating point arithmetic.

Control Design: Hardwired control: Design methods, multiplier control unit, CPU control unit; Basic concept of Micro programmed Control, Control memory optimization.

Memory Devices and its Organization: Different types of semiconductor memory, magnetic memory, optical memory, virtual memory, memory hierarchies; High-speed Memories: Interleaved memories, caches, associative memories.

System Organization: Communications: Introduction, bus control; IO Systems: Programmed IO, DMA and interrupts, IO processors.

Application HDL for microcomputer design: Description of Adder, ALU by using HDL, implementation of a simple microcomputer system using HDL.

Books Recommended:

1. John P. Hayes : **Computer Architecture and Organization**, *McGraw-Hill*.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky : **Computer Organization**, *McGraw-Hill*.
3. Kai Hwang and Faye A. Briggs : **Computer Architecture and Parallel Processing**, *McGraw-Hill*.
4. William Stallings : **Computer Organization and Architecture: Designing for Performance**, *Prentice Hall*.

CSE 324: Computer Architecture Lab

Laboratory works based on CSE 323

CSE 325: E-Commerce and Web Programming

E-Commerce

E-Commerce Basics: E-Commerce Definition, Internet History and E-Commerce Development, Business-to-Business E-Commerce, Business-to-Consumer E-Commerce, E-Commerce Stages and Processes, E-Commerce Challenges, E-Commerce Opportunities.

E-Commerce Options: Internet Access Requirements, Web Hosting Requirements, Entry-Level Options, Storefront and Template Services, E-Commerce Software Packages, E-Commerce Developers, E-Business Solutions.

Marketing Issues: Online and Offline Market Research, Data Collection, Domain Names, Advertising Options, E-Mail Marketing, Search Engines, Web Site Monitoring, Incentives.

Planning and Development: Web Site Goals, International Issues, Planning Stages, Resource Allocation, Content Development, Site Map Development, Web Site Design Principles, Web Site Design Tools, Web Page Programming Tools, Data-Processing Tools. E-Commerce Components: Navigation Aids, Web Site Search Tools, Databases, Forms, Shopping Carts, Checkout Procedures, Shipping Options.

Payment Processing: Electronic Payment Issues, E-Cash, Credit Card Issues, Merchant Accounts, Online Payment Services, Transaction Processing.

Mobile Commerce: Over view of M-Commerce, advantages and limitations, WML.

Security Issues: Security Issues and Threats, Security Procedures, Encryption, Digital Certificates, SSL and SET Technologies, Authentication and Identification, Security Providers, Privacy Policies.

E-Core values: Ethical, legal, taxation and International issues.

Customer Service: Customer Service Issues, E-Mail Support, Telephone Support, Live Help Services, Customer Discussion Forums, Value-Added Options.

Web Programming

An Introduction to the World Wide Web, Web Browsers, Web Navigation, Web Searching & Researching; The history of the Internet and World Wide Web; Understanding Hypertext Environments; Trends in Web development; Writing HTML Code; Using Editors and Converters; Web servers and posting web pages; Main Components, navigations, information Architecture, Page Design, Site Design; Using tables, frames and Forms; Images; Backgrounds: Adding Multimedia – Audio, Video, Graphics.

Books Recommended:

1. Elias M. Awad : **Electronic Commerce: From Vision to Fulfillment**, *Prentice-Hall Inc.*
2. Jeffrey F., Rayport, Bernard J. Jaworsk : **E-Commerce**, *McGraw-Hill*
3. David Kosiur : **Understanding Electronic Commerce**, *Microsoft Press.*
4. Jeffrey F. Rayport, et al. : **Introduction to E-Commerce**, *McGraw-Hill.*
5. Debra Cameron : **E-Commerce Security Strategies: Protection the Enterprise**, *Computer Technology Research Corp*
6. Charles Trepper : **E-Commerce Strategies**, *Phi Learning Pvt. Ltd*
7. Dave W. Mercer, Steven D. Nowicki : **Beginning PHP 5**, *Wrox publication.*

CSE 326: E-Commerce and Web Programming Lab

Laboratory works based on CSE 325

3rd Year 3rd Semester

ECO 331: Economics

Basic Concepts of Economics: Definition and subject matter of Economics; Microeconomics vs macroeconomics; Law of Economics; Central economic problems of every society; Different economic systems; Economics and Engineering.

Theory of Demand, Supply and Consumer Behavior: Law of Demand; Demand schedule and demand curve; Supply law, Supply schedule and supply curve; Shift in demand and supply; Equilibrium in the market; Elasticity of demand and supply.

Production and Costs and Theory of the Firm: Meaning of production; Factors of production; Concepts of total, average and marginal costs, fixed and variable costs.

Theory of the Firm: Perfect competition and monopoly; Total, average and marginal revenue of a firm; Average and marginal revenue under perfect competition and monopoly; Firm's Equilibrium; Equilibrium of firm under perfect competition and monopoly.

The Input-Output Analysis: Meaning of input-output analysis; Input-output analysis model; balance equation; coefficient matrix; Determination of final demand vector.

Basic Concepts of Macroeconomics: Growth; Unemployment; Inflation; Philips Curve, Business cycle; Circular flow of economics; Two, three and four sector economics.

National Income accounting and determination: Concepts of GNP, GDP and national income; Methods of national income accounting; Problems of national income accounting; Keynesian model of national income determination; The multiplier; Effect of fiscal policy in the Keynesian model.

Budgets of Bangladesh: The revenue at the capital budget; Income, expenditure of the government; direct and indirect taxes.

Development Planning in Bangladesh: Need for planning in Bangladesh; Various five year plans in Bangladesh; Development strategies in the five year plans of Bangladesh.

Books Recommended:

1. K. K. Dewett : **Modern Economic Theory**, *S. Chand Publishers*
2. H.L Ahuja : **Advanced Economic Theory**, *S. Chand Publishers*
3. A. Asimakopulos : **An Introduction To Economic Theory: Microeconomics**, *OxfordUniversity Press*
4. A. Koutsoyiannis : **Modern Microeconomics**, *Palgrave Macmillan*

CSE 331: Operating System and System Programming

Introduction: Introduction to OS, Operating system functions, evaluation of OS, Different types of OS: batch, multi-programmed, time-sharing, real-time, distributed, parallel.

System Structure: Computer system operation, I/O structure, storage structure, storage hierarchy, different types of protections, operating system structure (simple, layered, modular), virtual machine, O/S services, system calls.

Process Management: Processes: Concept of processes, process scheduling, operations on processes, co-operating processes, interprocess communication.

Threads: overview, benefits of threads, user and kernel threads.

CPU scheduling: scheduling criteria, preemptive & non-preemptive scheduling, scheduling algorithms (FCFS, SJF, RR, priority), algorithm evaluation, multi-processor scheduling.

Process Synchronization: background, critical section problem, critical region, synchronization hardware, classical problems of synchronization, semaphores, monitor.

Deadlocks: system model, deadlock characterization, methods for handling deadlocks, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock.

Storage Management: Memory Management: Background, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging.

Virtual Memory: background, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU), allocation of frames, thrashing.

File Systems: file concept, access methods, directory structure, file system structure, allocation methods (contiguous, linked, and indexed), free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency & performance.

I/O Management: I/O hardware, polling, interrupts, DMA, application I/O interface (block and character devices, network devices, clocks and timers, blocking and nonblocking I/O), kernel I/O subsystem (scheduling, buffering, caching, spooling and device reservation, error handling), performance.

Disk Management: Disk reliability, disk formatting, boot block, bad blocks.

Protection & Security: Goals of protection, domain of protection, security problem, authentication, one time password, program threats, system threats, threat monitoring, encryption.

Books Recommended:

1. A. Silberschatz and Peter Baer Galvin : **Operating Systems Concepts**, Wiley Publisher.
2. Tanenbaum : **Operating Systems**, Prentice-Hall
3. Madnick and J. Donovan : **Operating systems**, McGraw-Hill
4. B. Hausen : **Operating System Principles**, Prentice-Hall of India
5. Donovan : **Systems Programming**, McGraw-Hill.
6. Maurice. J. Bach : **The design of the Unix operating system**, Prentice-Hall.
7. M. MilenKovic : **Operating System Concept and Design**, Tata McGraw Hill.
8. Terrence : **Unix System Programming in C++**, Prentice Hall Publication

CSE 332: Operating System and System Programming Lab

Laboratory works based on **CSE 331**

CSE 333: Microprocessor and Assembly Language

Microprocessor Fundamentals: Architecture of a microprocessor, Data bus, address bus, control bus, I/O units and memory.

Architecture: Architecture of Intel 8086 Microprocessor, its execution unit and bus-interface unit, its registers and flags.

Programming Model: Programming model of 8086 processor, segment-offset address and physical address calculations, even and odd addressing, introduction of different addressing modes, Operating systems and BIOS, Memory organization of PC.

Assembly Language: Introduction to IBM PC Assembly Language, Assembly Language syntax, Program Data, Variables, Named constants, program structure, memory models, Input/Output instruction, Running program, Program Segment Prefix.

Status Register: The processor status and the Flag register, Overflow condition, Debugging a program.

Flow control: Flow control instructions, Conditional jumps, signed versus unsigned jumps, High-level language structures, branching and looping structures.

Logic Operation: Logic, Shift and Rotate Instruction, some common applications of Shift and Rotate operations.

Data Structure: The Stack and Introduction to Procedures, Basic stack operations, Procedures Declaration, Communication between procedures, calling a procedures.

Arithmetic Operation: Multiplication and Division Instructions, signed versus unsigned multiplications, Divide overflow, Signed Extension of Dividend.

Arrays: Arrays and related addressing modes, DUP operator, Register indirect modes, Based and Indexed addressing modes.

String Manipulation: The string instructions, director flag, Moving a string, storing a string, Loading a string, scanning a string, comparing strings, substring operation.

Books Recommended:

1. Ytha Yu and Charlers Marut : **Assembly Language Programming and Organization of the IBM PC**, *McGraw-Hill*
2. Rafiquzzaman : **Microprocessor and Microcomputer based System Design**, *Crc Press Publication*
3. D. V. Hall : **Microprocessors and Interfacing**, *McGraw-Hill*
4. Y. Liu and G. A. Gibson : **Microcomputer Systems: 8086/8088 Family**, *Prentice-Hall*
5. Artwick : **Microcomputer Interfacing**, *Prentice-Hall series.*
6. Ramesh Goanker : **Microcomputer Interfacing**, *McGraw-Hill*

CSE 334: Microprocessor and Assembly Language Lab

Laboratory works based on CSE 333

CSE 336: Software Development Lab III

Students will develop software with proper documentation as assigned by Lab teachers based on **courses of 3rd year.**

4th YEAR 1st SEMESTER

CSE 411: System Analysis and Design

Introduction: Introduction to information systems, general design consideration of information systems.

Overview: system concepts and the information systems environment, information needs, the concepts of MIS, the system development life cycle, the role of the systems analysis.

Systems Analysis: Systems planning and the initial investigation, information gathering, the tools of structured analysis, feasibility study, cost benefit analysis.

Systems Design: The process and stages of systems design, input/output and forms design, file organization and data base design.

System Implementation: system testing and quality assurance, implementation and software maintenance, hardware/software selection, project scheduling and software, Security, disaster/recovery, and ethics in system development.

Case study: Case studies of various information systems such as: Library management system, inventory system, voter identity management system, payroll system, etc.

Books Recommended:

1. E.M. Awad : **System Analysis and Design, Galgotia Publication Ltd**
2. P. Edwards : **System Analysis & Design, McGraw-Hill**
3. J.G. Burch Jr., F.R. Strater, G. Grundnitski : **Information Systems: Theory and Practice, John Wiley & Sons.**
4. G. Scott. : **Principles of Management Information Systems, McGraw-Hill**
5. A. Daniels, D. Yeates : **Basic System Analysis, Galgotia**

CSE 413: Artificial Intelligence

Introduction: History of AI - Intelligent agents – Structure of agents and its functions - Problem spaces and search - Heuristic Search techniques – Best-first search - Problem reduction - Constraint satisfaction - Means Ends Analysis.

Knowledge Representation: Approaches and issues in knowledge representation- Knowledge - Based Agent- Propositional Logic – Predicate logic – Unification – Resolution - Weak slot - filler structure – Strong slot - filler structure.

Reasoning under uncertainty: Logics of non-monotonic reasoning - Implementation- Basic probability notation - Bayes rule – Certainty factors and rule based systems-Bayesian networks – Dempster - Shafer Theory - Fuzzy Logic.

Planning and Learning: Planning with state space search - conditional planning-continuous planning - Multi-Agent planning. Forms of learning - inductive learning - Reinforcement Learning - learning decision trees - Neural Net learning and Genetic learning.

AI programming languages: Introduction to PROLOG, knowledge representation, Space domain, predicate, clauses, database, back tracking, unification, list, and compound object using prolog.

Introduction to selected topics in AI: Neural Networks, Expert system, Robotics and Fuzzy logic.

Books Recommended:

1. Elaine Rich, Kevin Knight and Shivashankar B.Nair : **Artificial Intelligence**,*Tata McGraw-Hill*
2. Stuart J. Russel and Peter Norvig : **Artificial Intelligence: A modern Approach**, *Pearson Education Asia*
3. D. W. Patterson : **Introduction to Artificial Intelligence and Expert System**,*Prentice-Hall of India*
4. Patrick Henry Winston : **Artificial intelligence**, *Pearson Education Inc.*
5. N. P. Padhy : **Artificial Intelligence and Intelligent System**, *OxfordUniversity Press*
6. Carl Townsend : **Introduction to Turbo Prolog**, *Sybex Inc.*
7. Bratko, I : **Prolog Programming for Artificial Intelligence**,*Addison Wesley.*

CSE 414: Artificial Intelligence Lab

Laboratory works based on CSE413

CSE 415: Digital Signal Processing

Introduction: signals, systems and signal processing, classification of signals, the concept of frequency in continuous time and discrete time signals, analog to digital and digital to analog conversion, Sampling and quantization.

Discrete time signals and systems: Discrete time signals, discrete time systems, analysis of discrete-time linear time-invariant systems. Discrete time systems described by difference equations, implementation of discrete time systems, correlation and convolution of discrete time signals.

The z-transform: Introduction, definition of the z-transform, z-transform and ROC of infinite duration sequence, properties of z-transform inversion of the z-transform, the one-sided z-transform.

Frequency analysis of signals and systems: Frequency analysis of continuous time signals, Frequency analysis of discrete time signals, Properties of Fourier transform of discrete time signals, Frequency domain characteristics of linear time invariant system, linear time invariant systems as frequency selective filters, Inverse systems and deconvolution.

The Discrete Fourier Transform: The DFT, Properties of the DFT, Filtering method based on the DFT, Frequency analysis of signals using the DFT.

Fast Fourier Transform Algorithms: FFT algorithms, applications of FFT algorithm.

Digital Filters: Design of FIR and IIR filters.

Adaptive filters: Adaptive system, kalman filters, RLS adaptive filters, the steepest-descent method, the LMS filters.

Application of DSP: Speech processing, analysis and coding, Matlab application to DSP.

Books Recommended:

1. J. G. Prokis : **Digital Signal Processing**, *Prentice-hall Of India*
2. Defatta : **Digital Signal Processing**, *Wiley India Pvt Ltd*
3. R. G. Lyon : **Understanding Digital Signal Processing**, *Orling Kindersley India*
4. P. R. Babu. : **Digital Signal Processing**, *Scitech Publication..*

CSE 416: Digital Signal Processing Lab

Laboratory works based on CSE415

CSE 418: Project or Thesis with Seminar Part I

Each student has to complete one Project or Thesis in the combined duration of three semesters of 4th year. In course CSE 418 (Part-I), a student has to make a proposal defense at the end of the semester. The defended project has to be completed in the continuation course CSE 4212 (Part-II) and CSE 4316 (Part-III) in next two semesters.

4th Year 2nd Semester

CSE 421: Computer Graphics

Introduction to Computer Graphics and Graphics systems: Overview of computer graphics, representing pictures, preparing, presenting and interacting with pictures for presentations; Visualization and image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active and Passive graphics devices; Computer graphics software.

Scan conversion: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

2D transformation and viewing: Basic transformations: translation, rotation, scaling; Matrix representations and homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.

3D transformation and viewing: 3D transformations: translation, rotation, scaling and other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, view port clipping, 3D viewing.

Curves: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic Bspline curves, rational B-spline curves.

Hidden surfaces: Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods, fractal - geometry.

Color and shading models: Light & color model; interpolative shading model; Texture.

Books Recommended:

1. Donald Hearn and M. Pauline Baker : **Computer Graphics, Prentice Hall**
2. Steven Harrington : **Computer Graphics: A Programming Approach, McGraw-HillCollege.**
3. F. S. Hill : **Fundamentals of Computer Graphics, Prentice Hall**
4. Plastock and Kalley : **Computer Graphics, Mcgraw-hill.**
5. Zhigang Xiang & Roy : **Computer Graphics, Mcgraw-hill.**
Plastock

CSE 422: Computer Graphics Lab

Laboratory works based on CSE421

CSE 423: Digital Image Processing

Introduction and Fundamental to Digital Image Processing: What is Digital Image Processing, Origin of Digital Image Processing, Examples that use Digital Image Processing, Fundamental steps in Digital Image Processing, Components of Digital Image Processing System, Image sensing and acquisition, Image sampling, quantization and representation, Basic relationship between pixels.

Image Enhancement in the Spatial Domain & Frequency domain: Background, Basic gray level transformation, Histogram processing, Basics of spatial filtering, Smoothing and Sharpening Spatial filters, Introduction to Fourier Transform and the Frequency Domain, Discrete Fourier Transform. Smoothing and Sharpening Frequency-Domain filters.

Image Restoration: Image Degradation/Restoration Process, Noise models, Restoration in presence of noise, Inverse Filtering, Minimum Mean Square Filtering, Geometric mean filter, Geometric transformations.

Color Image Processing: Color Fundamentals, Color models, Basis of full color image processing, Color transformations.

Image Compression: Fundamentals, Image compression models, Error free compression, Lossy compression.

Morphological image processing: Preliminaries, Dilations and Erosion, opening and closing, Some basic morphological algorithms.

Image Segmentation: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.

Representation, Description and Recognition: Representation-chain codes, polygonal approximation and skeletons, Boundary descriptors-simple descriptors, shape numbers, Regional descriptors- simple, topological descriptors, Pattern and Pattern classes-Recognition based on matching techniques.

Books Recommended:

1. Rafeal C. Gonzalez & Richard E. Woods : **Digital Image Processing, Prentice-Hall Publication**
2. A. K. Jain : **Fundamentals of Digital Image Processing, Academic Press.**
3. Mark S. Nixon & Albert S. Aguado : **Feature Extraction and Image Processing, Academic Press**
4. William K. Pratt : **Digital Image Processing, Wiley-Interscience,**

CSE 424: Digital Image Processing Lab

Laboratory works based on CSE423

Option I (T): Theory

Should be selected from **Table-I**

Option I (L): Lab

This course based on **Option-I (T)**

CSE 4212: Project or Thesis with Seminar Part II

This course is a continuation of the course CSE 418 (Part-I) from the first semester. A student has to make the project presentation to show progress of the project by the end of the semester

Table-I: Option I

CSE 425: Microcontroller, Computer Peripherals and Interfacing

Basic concepts of microprocessor interfacing: reviews of address decoding concepts, Input and Output port design, decoder, encoder, multiplexer, demultiplexer.

Interfacing peripherals: Peripheral I/O and memory mapped I/O, Interfacing with external memory, microprocessor controlled data transfer and peripheral controlled data transfer, Peripheral I/O instruction for Intel 8085 Microprocessor and its timing diagram. Interfacing with LED, seven segment display, Push-button keys, Matrix keyboard, AD and DA converter.

Programmable Interface device: 8212, Programmable devices with Handshake signals, 6155/8156 multipurpose programmable devices, Interfacing seven segment LED using 8155, 8155 timer, 8155 I/O ports in Handshake modes and its interfacing example, Interfacing 8355/8755 Programmable I/O ports, 8279 programmable keyboard/display interface and its interfacing example, 8255 Programmable peripheral interface, Block diagram of 8255, its different mode of operation, Interfacing A/D converter using 8255, Application of 8255 in Handshake mode, 8253 Programmable interval timer, programming 8263, 8253 as counter, 8259 programmable interrupt controller and its priority mode and other features, programming the 8259, 8257 DMA controller and its block diagram, example of application of 8257 DMA controller.

Serial I/O and data communication: Synchronous and asynchronous transmission, Parity check, BAUD, RS 232 standard, Software versus programmable hardware approach, software controlled asynchronous serial I/O, 8085 serial I/O SOD and SID, Hardware controlled serial I/O using

programmable chips, 8251 programmable communication interface and its block diagram, interfacing RS 232 Terminal using the 8251A.

Books Recommended:

1. Rafiquzzaman : **Microprocessor and Microcomputer based System Design**, *CRC-Press*
2. D. V. Hall : **Microprocessors and Interfacing**, *McGraw-Hill*
3. Y. Liu and G. A. Gibson : **Microcomputer Systems: 8086/8088 Family**, *Prentice-Hall*
4. Artwick : **Microcomputer Interfacing**, *Prentice Hall*.
5. James E. Powell : **Designing User Interfaces**, *Microtrend Books San Marcos, CA, USA*
6. M. A. Mazidi, : **Microcontroller & Embedded Systems**, *J. G. Pearson*
7. M. A. Mazidi, R. Mckinlay, J. G. Mazidi : **Microcontroller & Embedded Systems Using Assembly and C**, *J. G. Pearson*
8. Warwick A. Smith : **C Programming for Embedded Microcontrollers**

CSE 426: Microcontroller, Computer Peripherals and Interfacing Lab

Laboratory works based on CSE425

CSE 427: Computational Geometry

Introduction: historical perspective, geometric preliminaries. Convex hulls algorithms in 2d and 3d, lower bounds.

Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs;

Voronoi diagrams: construction and applications, variants;

Delayney triangulations: Divide- and- conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties;

Geometric searching: pointlocation, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees;

Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems;

Arrangements of lines: arrangements of hyperplanes, zone theorems, many-faces complexity and algorithms;

Combinatorial geometry: Ham-sandwich cuts, Helly's theorems, k-sets, polytopes and hierarchies, polytopes and linear programming in d-dimensions, complexity of the union of convex sets, simply connected sets and visible regions;

Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements;

Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing; Applications of computational geometry.

Books Recommended:

1. M. d. Berg, O. Schwarzkopf, M. v. Kreveld and M. Overmars : **Computational Geometry: Algorithms and Applications**, Springer.
2. F. P. Preparata and M. I. Shamos : **Computational Geometry: An Introduction**, Springer.
3. J. O. Rourke : **Computational Geometry in C**, Cambridge University Press.

CSE 428: Computational Geometry Lab

Laboratory works based on CSE427

CSE 429: Design of VLSI Circuits and Systems

VLSI design methodology: top-down design approach, technology trends.

MOS technology: Introduction to MOS technology, operation of MOS transistor as a switch and amplifier, MOS, NMOS, CMOS inverters, pass transistor and pass gates, DC and transient characteristics.

Overview of fabrication process: NMOS, CMOS, Bi-CMOS process.

NMOS and CMOS layout: Stick diagram, and design rules.

CMOS circuit characteristics: Resistance and capacitance, rise and fall time, power estimation.

Introduction to Bi-CMOS circuits: Shifter, adder, counter, multipliers. Data Path and memory structures, Buffer circuit design.

Design style: FPGA and PLDs.

Books Recommended:

1. K. Eshraghian & D. A. Pucknell : **Basic VLSI design: System & Circuit**, *Prentice-Hall*
2. R. K. Brayton : **Logic Minimization Algorithms for VLSI Synthesis**, *Kluwer Academic Publishers Norwell, MA, USA.*
3. F. Lombardi and M. G. Sami : **Testing and Diagnosable Design of VLSI and ULSI**, *Springer.*
4. C. A. Mead and L. A. Conway : **Introduction to VLSI Systems**, *Addison-Wesley.*

CSE 4210: Design of VLSI Circuits and Systems Lab

Laboratory works based on CSE429

4th Year 3rd Semester

CSE 431: Cryptography and Network Security

Cryptography

Overview: Cryptography Overview and Terminologies.

Symmetric Ciphers: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Simplified DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Block Cipher Design Principles, Evaluation Criteria for AES, The AES Cipher, Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, RC4 Stream Cipher, Placement of Encryption Function, Traffic Confidentiality, Key Distribution.

Number theory: Fields, algebraic closures, Integers - divisibility, primes, testing primes, factorization, Euclidean algorithm

Public-Key Encryption: Principles of Public-Key Cryptosystems, The RSA Algorithm, Key Management.

Network Security

Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures, Authentication Protocols.

Network Security Practice: Kerberos, Pretty Good Privacy, S/MIME, IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Web Security Considerations, Secure Socket Layer and Transport Layer Security.

System Security: Intruders, Intrusion Detection and Prevention, Password Management, Viruses and Related Threats, Virus Countermeasures, Firewalls.

Books Recommended:

1. W. Stallings : **Cryptography and Network Security Principles and Practice**, *Prentice Hall*.
2. Behrouz Forouzan : **Cryptography and Network Security**, *McGraw-Hill*
3. Bruce Schneier : **Applied Cryptography**, *John Wiley & Sons*.
4. Dieter Gollmann : **Computer Security**, *John Wiley and Son*.
5. Edward Amoroso : **Fundamentals of Computer Security Technology**, *Prentice Hall*.
6. E. Biham and A. Shamir : **Differential Cryptanalysis of the Data Encryption Standard**, *Springer Verlag*.
7. D. Denning : **Cryptography and Data Security**, *Addison Wesley*.
8. N. Koblitz : **A Course on Number Theory and Cryptography**, *Springer Verlag*.

CSE432: Cryptography and Network Security Lab

Laboratory works based on CSE 431

Option II (T): Theory

Should be selected from **Table-II**

Option II (L): Lab

This course based on **Option-II (T)**

Option III (T): Theory

Should be selected from **Table-II**

Option III (L): Lab

This course based on **Option-III (T)**

CSE 4316: Project or Thesis with Seminar Part III

This course is a continuation of the course CSE 418 (Part-I) and CSE 4212 (Part-II) from the previous two semester. A student has to complete the defended project proposal, submit it by the end of the semester and make an oral defense of the project.

Table-II: Option II and Option III

CSE 433: Parallel Processing and Distributed System

Introduction: Trends towards parallel processing, Parallel processing mechanism, Multiprogramming and Time sharing, Parallel Computer Structures, Parallelism and Pipelining, Parallel processing applications, Speedup Performance Laws, Parallel Random Access Machines (PRAM) and VLSI model.

Hardware Technology: Advanced processor Technology, Superscalar and Vector processor, Shared memory organization, Design of Linear and Non linear Pipeline processor, Multiprocessor System Interconnects.

Pipelining and Vector Processing: Principles of Pipelining, Classification of pipelined processors, Instruction and Arithmetic pipeline design, Vector Processing principles, Vector processing requirements, Designing Pipelined processors, Compound Vector processing, Recent Vector processors, Vectorization and Optimization methods.

Parallel Programming: Parallel Programming models, Parallel Languages and Compilers, Code Optimization and Scheduling, Loop Parallelization and Pipelining, Parallel Programming Environments, Shared-variable program structures, mapping programs onto Multicomputers.

Distributed System: Introduction, Distributed System Architectures, Communication in Distributed Systems, Distributed Middleware, Client/Server Design Issues, Inter-process communication, RPC , Distributed Objects and Remote Invocation , Virtualization & Code Migration, Naming, Distributed Synchronization & Coordination, Consistency & Replication in Distributed Systems, Fault Tolerance, Distributed Transactions , Security, P2P Systems, Cloud Computing, Grid Computing.

Distributed System Programming: Java RMI, CORBA, P2P, COM, DCOM, Multi Agent System, SOAP, Web Service.

Books Recommended:

1. Kai Hwang (Senior Consulting Edition) : **Advanced Computer Architecture Parallelism, Scalability, Programmability**, McGraw Hill.
2. Kai Hwang, Faye A. Briggs : **Computer Architecture and Parallel Processing**, McGraw Hill
3. R. J. Cypser : **Communication Architecture for distributed system**, Addison-Wesley.
4. James Martin : **Design and Strategy for distributed data processing**, Prentice Hall.

5. Tanenbaum and Van Steen. : **Distributed Systems: Principles and Paradigms.** *Prentice Hall.*
6. George Coulouris, Jean Dollimore, and Tim Kindberg, : **Distributed Systems: Concepts and Design,** *Addison-Wesley.*

CSE 434: Parallel Processing and Distributed System Lab

Laboratory works based on CSE433

CSE 435: Advance Database Management System

Storage and File Structure: Overview of Physical Storage Media, Magnetic Disk and Flash Storage, RAID, Tertiary Storage, File Organization, Organization of Records in Files, Data-Dictionary Storage, Database Buffer.

Indexing and Hashing: Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices, Index Definition in SQL

Query Processing: Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions.

Query Optimization: Transformation of Relational Expressions, Estimating Statistics of Expression Results, Choice of Evaluation Plans, Materialized Views, Advanced Topics in Query Optimization.

Transactions: Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements.

Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes, Snapshot Isolation, Insert Operations, Delete Operations, and Predicate Reads, Weak Levels of Consistency in Practice, Concurrency in Index Structures

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations, ARIES, Remote Backup Systems.

Database-System Architectures: Centralized and Client-Server Architectures, Server System Architectures, Parallel Systems, Distributed Systems, Network Types.

Parallel Databases: I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors.

Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed, Transactions, Commit Protocols, Concurrency Control in Distributed Databases, Availability, Distributed Query Processing, Heterogeneous Distributed Databases, Cloud-Based Databases, Directory Systems

Advanced Application Development: Performance Tuning, Performance Benchmarks, Other Issues in Application Development, Standardization.

Spatial and Temporal Data and Mobility: Motivation, Time in Databases, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases

Advanced Transaction Processing: Transaction-Processing Monitors, Transactional Workflows, E-Commerce, Main-Memory Databases, Real-Time Transaction Systems, Long-Duration Transactions.

CaseStudy (Any one)

1. **PostgreSQL:** User Interfaces, SQL Variations and Extensions, Transaction Management in PostgreSQL, Storage and Indexing, Query Processing and Optimization, System Architecture.
2. **Oracle:** Database Design and Querying, Tools, SQL Variations and Extensions, Storage and Indexing, Query Processing and Optimization, Concurrency Control and Recovery, System Architecture, Replication, Distribution, and External Data, Database Administration Tools, Data Mining.
3. **IBM DB2 Universal Database:** Database-Design Tools, 29.3 SQL Variations and Extensions, Storage and Indexing, Multidimensional Clustering, Query Processing and Optimization, Materialized Query Tables, Autonomic Features in DB2, Tools and Utilities, Concurrency Control and Recovery, System Architecture, Replication, Distribution, and External Data, Business Intelligence Features.
4. **Microsoft SQL Server:** Management, Design, and Querying Tools, SQL Variations and Extensions, Storage and Indexing, Query Processing and Optimization, Concurrency and Recovery, System Architecture, Data Access, Distributed Heterogeneous Query Processing, Replication, Server Programming in .NET, XML Support, SQL Server Service Broker, Business Intelligence.

Books Recommended:

1. A. Silberschatz : **Database System Concepts**, *McGraw-Hill*.
2. Raghu : **Database Management System**, *McGraw-Hill Higher Education*
Ramakrishnan,
Johannes Gehrke
3. James Martin : **Principles of Database Management**,
Prentice-hall Of India Pvt Ltd
4. Ullman : **Database Management systems**, *Prentice-Hall Publication*.
5. Abey : **Oracle 8i a Beginners Guide**, *McGraw Hill*.

CSE 436: Advance Database Management System Lab

Laboratory works based on CSE435

CSE 437: Multimedia System

Multimedia systems: introduction; Coding and compression standards; Architecture issues in multimedia.

Operating systems issues in multimedia: real-time OS issues, synchronization, interrupt handling.

Database issues in multimedia: indexing and storing multimedia data, disk placement, disk scheduling, searching for a multimedia document.

Networking issues in multimedia: Quality-of-service guarantees, resource reservation, traffic specification, haping and monitoring, admission control; Multicasting issues; Session directories; Protocols for controlling sessions;

Security issues in multimedia: digital water-marking, partial encryption schemes for video streams.

Multimedia applications: audio and video conferencing, video on demand, voice over IP.

Networked virtual environment(NVE): Networked virtual environment overview; forms of distributed interaction; example systems; NVE technologies and challenges; origins of NVE.

Books Recommended:

1. Ze-Nian Li, Mark S. : **Fundamentals of Multimedia**, *Pearson*
Drew
2. John Villamil-Casanova : **Multimedia: An Introduction**,
and Louis Molina : *Prentice Hall India*.

3. Tay Vaughan : **Multimedia: Making It Work,**
McGraw-Hill
4. John Villamil-Casanova : **Multimedia: Graphics,***Prentice Hall*
and Leony Fernandez-
Elias *India.*
5. Jose Lozano, Louis : **Multimedia Sound and Video,**
Molinaand John Willif *Prentice Hall India.*

CSE 438: Multimedia System Lab

Laboratory works based on **CSE437**

CSE 439: Wireless Communication

Introduction To Wireless Communication Systems: Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems.

Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks.

Introduction to Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems.

Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Multiple Access Techniques For Wireless Communication: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems.

Wireless Networking: Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, common channel signaling, ISDN (Integrated Services digital Networks), advanced intelligent networks. Wireless LAN Technogy - IEEE 802.11 Wireless LAN Standard - Bluetooth.

Intelligent Cell Concept And Application: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.

Books Recommended:

1. William Stallings : **Wireless Communications and Networks**, *Prentice Hall*
2. Theodore S. Rappaport : **Wireless Communications**, *Pearson Education*
3. John G. Proakis : **Digital Communications**, *McGraw-Hill International*
4. W.C.Y.Lee; : **Mobile Cellular Telecommunication**, *McGraw Hill*
5. Jochen Schille : **Mobile Communications**, *Pearson*

CSE 4310: Wireless Communication Lab

Laboratory works based on **CSE439**

CSE 4311: Robotics

Robotics: History, Present Status and future Trends.

Robot Kinematics: Robot Drives, Actuators and Control, Robot End-effectors, Sensors and Intelligent Robots.

Robot Languages and Programming:

Basic Electronics and Computer Interfacing, Flexible Automation Technology, Quantitative Techniques for Economic Performance, Applications of Robots.

Books Recommended:

1. S R Deb : **Robotics Technology and Flexible Automation**, *Tata McGraw-Hill*
2. AJ.Critchlow : **Introduction to Robotics**, *MacmilanPub.Co.*
3. J Duffy,Edward : **Mechanisms and Robot Manipulators**, *Arnold Ltd*
4. Mikell P. Grover : **Industrial Robotics Technology, Programming and Applications**, *McGraw-Hill*

CSE 4312: Robotics Lab

Laboratory works based on **CSE4311**

CSE 4313: Management Information System

Introduction to Management Information System (MIS). Role and Importance of Management. Process of Management. Organization Structure and Theory.

Basis of Management Information System, Decision Making, Information, Systems, System Analysis and Design, Development of MIS.

Application of Management Information System, Application in Manufacturing Sectors, Decision Support System, Enterprise Management System,

Electronic Commerce (e-commerce), Fundamentals of e-commerce, Models of e-commerce, Retailing in e-commerce, Models of Business to Business e-commerce.

Technology in Management Information System, Business Process Re-engineering.

Books Recommended:

1. W.S. Jawadekar : **Management Information Systems**, *Tata McGraw-Hill*
2. Efraim Turban, Jae Kuy Lee, Jae Kyu Lee, Michael Chung : **Electronic Commerce: A Managerial Perspective**, *Prentice Hall*
3. James A. O'Brien, George M. Marakas : **Management Information Systems**, *McGraw-Hill*

CSE 4314: Management Information System Lab

Laboratory works based on **CSE4313**