Course No: 20 Course Title: Introduction to Algorithms

Course Code: CSE 2101 **Total marks: 100**
Credit: 3.00 **Pre-Requisites:** CSE1103, CSE1201
Contact Hours: 3 Hours/Week **Total Marks: 100**

Mark Distribution:

Semester Final Exam: 72 Marks **Class Test:** 20 Marks **Class Attendance:** 08 Marks

11.1 Rationale:

Algorithms are the soul of computing. Algorithmic thinking, unlike the very young electronic machinery it brings alive, is rooted in ancient mathematics. It can be roughly described as creating "recipes" (well defined sequences of computational steps) for getting "things" (computational problems specifying an input-output relation) "successfully" (correctly) "done" (in finite steps and time). This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures. The following important computational problems will be discussed: sorting, searching, elements of dynamic programming and greedy algorithms, advanced data structures, graph algorithms (shortest path, spanning trees, and tree traversals), string matching, elements of computational geometry, NP completeness.

11.2 Objectives:

Algorithm design and analysis provide the theoretical backbone of computer science and are a must in the daily work of the successful programmer. The goal of this course is to provide a solid background in the design and analysis of the major classes of algorithms. At the end of the course students will be able to develop their own versions for a given computational task and to compare and contrast their performance.

11.3 Course Learning Outcomes (CLO):

1. Understand theoretical and mathematical structures, concepts of computer algorithms,
2. Analyze the time complexity, space complexity, asymptotic performance of algorithms, worst, average and best-cases of algorithms.
3. Apply various sorting algorithms to determine the run-time and memory usage required to measure their efficiencies.
4. Demonstrate numerous algorithm design strategies including divide and conquer, greedy method, dynamic programming, backtracking, finding shortest paths, traversing salesman, hamiltonian cycle and implementing those algorithms.
5. Illustrate and analyze various search and graph algorithms, graph coloring, branch and bound algorithms.
6. Evaluate decision problems, the concept of P = NP, NP completeness and Cook's theorem.

11.4		11.5	11.6	11.7
Unit Learning Outcomes (ULO)		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	Define Algorithm	**Introduction** ○ What is an algorithm? ○ Notation for programs ○ Proof techniques	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Define basic notations of algorithms			

		○ Basics review: Sets - Functions - Limits - Simple series		
a.	Discuss fundamental analysis of complexity	**Fundamentals** ○ Instances and problems - Elementary operations. ○ Efficiency ○ Average and worst-case analysis ○ Examples	Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Define asymptotic notation	**Asymptotic notation** ○ Introduction of A notation for "the order of" ○ The omega notation o The theta notation ○ The conditional asymptotic notation	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Discuss different asymptotic notation			
c.	Apply asymptotic notation to represent algorithm complexity.			
a.	Discuss Analysis of algorithms	**Analysis of algorithms** ○ Analyzing control structures ○ Using a barometer ○ Amortized analysis ○ Solving recurrences	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply different methods to analysis algorithms.			
a.	Define Elementary Data Structures	**Data structures** ○ Arrays, stacks and queues ○ Records and pointers ○ Lists, graphs, trees and associative tables ○ Heaps ○ Disjoint set structures	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Discuss Arrays, stacks, queues, graphs, trees.			
c.	Apply stacks, queues to different sorting and searching algorithms.			
a.	Define Greedy algorithms	**Greedy algorithms** ○ Making change ○ General characteristics of Greedy algorithms ○ Graphs MST - Kruskal's and Prim's algorithms ○ Graphs: shortest paths ○ Knapsack problem ○ Scheduling	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Learn Graph MST, Kruskal's and Prim's algorithms, different shortest paths Algorithm, Knapsack problem			
a.	Define Divide - and - Conquer approach of algorithm	**Divide - and - Conquer** ○ Multiplying large integers ○ Binary search ○ Sorting by: merging and quicksort ○ Finding the median ○ Matrix multiplication ○ Exponentiation ○ Quick look at cryptography	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply Divide and Conquer approach on different searching and sorting algorithms.		Lecture, Exercise	Assignment, Quiz, Short Question.

a.	Define Dynamic programming	**Dynamic programming** ○ Making change ○ Principles of optimality ○ The knapsack problem ○ Shortest paths - Floyd's algorithm ○ Chained matrix multiplication	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply Dynamic Programming approach on different algorithm to solve problems		Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Define NP-Completeness	**NP-Completeness** ○ Polynomial time ○ Polynomial time verification ○ NP-Completeness and reducibility ○ NP-Completeness proofs ○ NP-Complete Problem	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Discuss Cook's theorem and NP-Complete problem			
a.	Learn to find the complexity of algorithms.	Introduction to computational complexity	Lecture, Exercise	Assignment, Quiz, Short Question.

Recommended Books And Periodicals

	Authors	Book Name
1.	Thomas H. Cormen	Introduction to Algorithms
2.	Aho, Hopcroft and Ullman	The design and Analysis of Computer Algorithms
3	Ellis Horowitz &Sartaj	Fundamentals of Computer Algorithms
4.	D. E. Knuth	The Art of Computer Programming, Vol. 1, Fundamental Algorithms
5.	Sara Baase	Computer Algorithms: Introduction to Design and Analysis

Course No: 21 Course Title: Introduction to Algorithms Lab

Course Code: CSE 2102
Credit: 1.5
Contact Hours: 3 Hours/Week
Pre-Requisites: CSE1103, CSE1201
Total Marks: 100

Mark Distribution:

Lab Final Exam: 60 Marks **Viva:** 30 Marks **Class Attendance:** 10 Marks

11.1 Rationale:

Algorithms are the soul of computing. Algorithmic thinking, unlike the very young electronic machinery it brings alive, is rooted in ancient mathematics. It can be roughly described as creating "recipes" (well defined sequences of computational steps) for getting "things" (computational problems specifying an input-output relation) "successfully" (correctly) "done" (in finite steps and time). This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures. The following important computational problems will be discussed: sorting, searching, elements of dynamic programming and greedy algorithms, advanced data structures, graph algorithms (shortest path, spanning trees, and tree traversals), string matching, elements of computational geometry, NP completeness.

11.2 Objectives:

Algorithm design and analysis provide the theoretical backbone of computer science and are a must in the daily work of the successful programmer. The goal of this course is to provide a solid background in the design and analysis of the major classes of algorithms. At the end of the course students will be able to develop their own versions for a given computational task and to compare and contrast their performance

11.3 Course Learning Outcomes (CLO)

1. To have a collection of usable programs and data structures techniques that could make their future programming tasks/projects easier.
2. Able to implement recursive algorithms using user defined functions.
3. Understand how algorithms and the implemented programs can be applied in a broader context.
4. Develop an understanding of the value and appreciate the skills of algorithm and program performance analysis
5. Will have knowledge to convert a written algorithm or pseudocode to a high level programming languages like C++, JAVA etc.

11.4		11.5	11.6	11.7
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	Define Algorithm	**Introduction** ○ What is an algorithm? ○ Notation for programs ○ Proof techniques ○ Basics review: Sets - Functions - Limits - Simple series	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Define basic notations of algorithms			
a.	Discuss fundamental analysis of complexity	**Fundamentals** ○ Instances and problems - Elementary operations. ○ Efficiency ○ Average and worst-case analysis ○ Examples	Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Define asymptotic notation	**Asymptotic notation** ○ Introduction of A notation for "the order of" ○ The omega notation o The theta notation ○ The conditional asymptotic notation	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Discuss different asymptotic notation			
c.	Apply asymptotic notation to represent algorithm complexity.			
a.	Discuss Analysis of algorithms	**Analysis of algorithms** ○ Analyzing control structures ○ Using a barometer ○ Amortized analysis ○ Solving recurrences	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply different methods to the analysis algorithm.			
a.	Define Elementary Data Structures	**Data structures** ○ Arrays, stacks and queues ○ Records and pointers ○ Lists, graphs, trees and associative tables ○ Heaps ○ Disjoint set structures	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Discuss Arrays, stacks, queues, graphs, trees.			
c.	Apply stacks, queues to different sorting and searching algorithms.			
a.	Define Greedy algorithms	**Greedy algorithms** ○ Making change ○ General characteristics of Greedy algorithms ○ Graphs MST - Kruskal's and Prim's algorithms	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Learn Graph MST, Kruskal's and Prim's			

	algorithms, different shortest paths Algorithm, Knapsack problem	○ Graphs: shortest paths ○ Knapsack problem ○ Scheduling		
a.	Define Divide - and - Conquer approach of algorithm	**Divide - and - Conquer** ○ Multiplying large integers ○ Binary search ○ Sorting by: merging and quicksort ○ Finding the median ○ Matrix multiplication ○ Exponentiation ○ Quick look at cryptography	Lecture, Exercise	Assignment , Quiz, Short Question.
b.	Apply Divide and Conquer approach on different searching and sorting algorithms.		Lecture, Exercise	Assignment , Quiz, Short Question.
a.	Define Dynamic programming	**Dynamic programming** ○ Making change ○ Principles of optimality ○ The knapsack problem ○ Shortest paths - Floyd's algorithm ○ Chained matrix multiplication	Lecture, Exercise	Assignment , Quiz, Short Question.
b.	Apply Dynamic Programming approach on different algorithm to solve problems		Lecture, Exercise	Assignment , Quiz, Short Question.
a.	Define NP-Completeness	**NP-Completeness** ○ Polynomial time ○ Polynomial time verification ○ NP-Completeness and reducibility ○ NP-Completeness proofs ○ NP-Complete Problem	Lecture, Exercise	Assignment , Quiz, Short Question.
b.	Discuss Cook's theorem and NP-Complete problem			
a.	Learn to find the complexity of algorithms.	Introduction to computational complexity	Lecture, Exercise	Assignment , Quiz, Short Question.

Recommended Books And Periodicals

	Authors	Book Name
1.	Thomas H. Cormen	Introduction to Algorithms
2.	Ellis Horowitz	Fundamentals of Computer Algorithms

Course No: 22 Course Title: Object Oriented Programming

Course Code: CSE2103
Credit: 3.00
Contact Hours: 3 Hours/Week

Pre-Requisites: Nil
Total Marks: 100

Mark Distribution:

Semester Final Exam:	72 Marks	**Class Test:**	20 Marks	**Class Attendance:**	08 Marks

11.1 Rationale:

This course is designed to teach Object-Oriented programming concepts, techniques, and applications using the Java programming language.

11.2 Objectives:

1. The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism.
2. Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections.
3. How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
4. How to test, document and prepare a professional looking package for each business project using javadoc.

11.3		11.4	11.5	11.6
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	Explain OOP	Philosophy of Object Oriented Programming (OOP). Advantages of OOP over structured programming	Lecture	Essay Question
b.	Differentiate between OOP and structure language			
a.	Create class and object	Concepts of classes and objects, Encapsulation, access specifiers, static and non-static members	Lecture, Exercise	Short Question, Multiple Choice, Assignment.
b.	Explain encapsulation			
c.	Distinguish access modifier			
d.	Define static and no static member			
a.	Explain control structure	JAVA applications; event handling; control structures.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply event handling in software development			
a.	Differentiate constructor and destructor	Methods; Overloaded Methods, Constructors, destructors,Single Multi-Dimension Arrays.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply single and multidimensional array in development			
c.	Define overloaded			
a.	Discuss interface in respect of OOP	Object Based Programming Object oriented Programming interface.	Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Explain heritance	Inheritance: single and multiple inheritance.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Create inheritance based program			
c.	Apply inheritance			
a.	Differentiate between method overload and override	Polymorphism: overloading, abstract classes, virtual functions and overriding.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Contrast between abstract class and interface.			
a.	Define exception	Exceptions Handling	Lecture, Exercise	Assignment, Quiz,
b.	Discuss different types of exception			

c.	Create custom exception			Short Question.
a.	Define string	String manipulation.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Manipulate string operation			
c.	Create string processing algorithm			
a.	Create GUI	Introduction to graphical user interface; handling mouse and keyboard events.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply mouse and keyboard event			
a.	Design multithread program	Multi-Threading;Client Server programming	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Design client server program			
c.	Define thread			

Recommended Books And Periodicals

	Authors	Book Name
1.	H. M. Deitel& P. J. Deitel	Java™ How to Program
2.	Y. D. Liang	Introduction to Java Programming, Comprehensive: International Edition
3.	D. Barnes&M.Kolling	Objects First with Java: A Practical Introduction using BlueJ
4.	J. Farrell	Programming Logic and Design, Comprehensive, 3rd edn

Course No: 23 Course Title: Object Oriented Programming Lab

Course Code: CSE2104 **Pre-Requisites: Nil**

Credit: 1.50

Contact Hours: 3 Hours/Week **Total Marks: 100**

Mark Distribution:

Lab Final Exam: 60 Marks **Viva:** 30 Marks **Class Attendance:** 10 Marks

11.1 Rationale:

This course is designed to teach Object-Oriented programming concepts, techniques, and applications using the Java programming language.

11.2 Objectives:

1. The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism.
2. Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collections.
3. How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
4. How to test, document and prepare a professional looking package for each business project using javadoc.

11.3	11.4	11.5	11.6

Learning Outcomes		Course Content	Teaching Strategy/ Learning Experience	Assessment Strategy
a.	Basic programming	Study basic concept of OOP	Exercise	Practice And Coding
a.	Write OOP program	Study access modifier, class creation, object creation	Exercise	Practice And Coding
a.	Simple logic implementation in OOP	Study different control structure, event handling	Exercise	Practice And Coding
a.	Create OOP program with OOP feature	Study constructor,overloadedconstructor,array programming	Exercise	Practice And Coding
b.	Learn Array programming			
a.	Implement interface in writing of OOP program	Study interface	Exercise	Practice And Coding
a.	Implement inheritance in OOP program	Study inheritance	Exercise	Practice And Coding
a.	Implement polymorphism in writing of OOP program	Study method overloading and method overload	Exercise	Practice And Coding
a.	Handling exception	Study different types of built in and custom exception	Exercise	Practice And Coding
a.	Apply string to solve big mathematical problem like big integer problem	Study string manipulation	Exercise	Practice And Coding
a.	Create GUI based program	Study GUI	Exercise	Practice And Coding
a.	Apply threading in writing advanced OOP program	Study threading and client server architecture	Exercise	Practice And Coding

Recommended Books And Periodicals

	Authors	Book Name
1.	H. M. Deitel& P. J. Deitel	Java™ How to Program
2.	Y. D. Liang	Introduction to Java Programming, Comprehensive: International Edition
3.	D. Barnes&M.Kolling	Objects First with Java: A Practical Introduction using BlueJ
4.	J. Farrell	Programming Logic and Design, Comprehensive, 3rd edn

Course No: 24 **Course Title:** **Computer Architecture and Organization**

Course Code: CSE2105

Credit: 3.00

Contact Hours: 3 Hours/Week

Pre-Requisites: Nil

Total Marks: 100

Mark Distribution:

Semester Final Exam:	72 Marks	**Class Test:**	20 Marks	**Class Attendance:**	08 Marks

11.1 Rationale:

To be a computer engineer one needs to know architectural design, organizational design and computer family and also to learn the performance factors.

11.2 Objectives:

1. To learn the distinguished features of computer architecture, organization and family.
2. To learn about RISC and CISC.
3. To know activities and architecture of DMA, cache, and memory mapping.
4. To learn the parallel computer architecture and performance (High performance computer).

11.3 Learning Outcomes		11.4 Course Content	11.5 Teaching Strategy/ Learning Experience	11.6 Assessment Strategy
a.	Describe hardware and software	Introduction to Computer Hardware and Software	Lecture	Short Question Quiz
b.	Analyze the relationship between hardware and software			
a.	Explain stored computer concept	Von Neumann SISD organization. RISC and CISC Machines	Lecture Exercise Assignment	Short Question Quiz
b.	Explain the distinguish features of RISC and CISC			
a.	Describe of peripherals	Computer peripherals, Interrupts	Lecture	Short Question Quiz
b.	Analyze the interrupts			
a.	Define DMA	DMA, Memory Organization, cache coherence, Cache coherence protocols, Cache memory, Memory system design.	Lecture Assignment	Short Answer Analytical Answer Quiz Group Exercise
b.	Describe of memory organization and design			
c.	Describe the cache memory system			
a.	Describe parallel computer	Parallelism in multiprocessors and Multicomputer; Pipelined processor design: pipelining, super-pipelines, advanced pipelines, static and dynamic scheduling, Concurrent processors, Vector processors	Lecture Exercise Assignment	Short Answer Analytical Answer Quiz Group Exercise
b.	Distinguish between parallel and serial computer			
c.	Explain pipeline processor			

d.	Analyze the relation among different parallel computers	and multiprocessors, Array processors		
a.	Explain multicomputers	Compute-intensive processors and Multicomputers	Lecture	Short Answer Analytical Answer
b.	Analyze the efficiency of multicomputers			
a.	Explain vectorization and hypercube systems	Automatic Vectorization, Hypercube systems and Key application, Data flow computation	Lecture	Short Answer
b.	Analyze data flow and control flow computer			

Recommended Books And Periodicals

	Authors	Book Name
1.	J. P. Hayes	Computer Architecture and Organization
2.	M. Mano	Computer System Architecture
3.	Stone	Introduction to computer Architecture
4.	M. E. Sloan	Computer Hardware and Organization

Course No: 25 Course Title: Numerical Analysis

Course Code: CSE 2107 **Pre-Requisites: Nil**
Credit: 3.00 **Total Marks: 100**
Contact Hours: 3 Hours/Week
Mark Distribution:

Semester Final Exam: 72 Marks **Class Test:** 20 Marks **Class Attendance:** 08 Marks

11.1 Rationale:

The goal of the course is to provide the students with a strong background on numerical approximation strategies and a basic knowledge on the theory that supports numerical algorithms.

11.2 Objectives:

1. Use numerical methods for solving a problem
2. Locate and use good mathematical software,
3. Get the accuracy you need from the computer,
4. Assess the reliability of the numerical results, and
5. Determine the effect of round off error or loss of significance.

11.3 Course Learning Outcomes (CLO)

1. Recall the algebraic and transcendental equations
2. Illustrate the Eigenvalue and Eigen matrix
3. Identify the roots using algorithms
4. Devise the matrix calculation algorithms
5. Examine the integration problems
6. Demonstrate the differential equations

11.4	11.5	11.6	11.7

Learning Outcomes		Course Content	Teaching Strategy/ Learning Experience	Assessment Strategy
a.	Explain the Solution of algebraic and transcendental equations	**Numerical Solution of Algebraic & Transcendental Equations:** Bisection, False Position, Newton-Raphson, and Secant Method.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Compute the solution of Simultaneous Linear Non-Homogeneous Algebraic Equations	**Simultaneous Linear Non-Homogeneous Algebraic Equations:** Gauss Elimination, Gauss Jordan, Gauss Jacobi, and Gauss Sidel Method.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Calculate Eigen Values and Eigen Vectors	**Eigen Values and Eigen Vectors:** Introduction and concept ofeigen value and eigen vector, Estimation of the size of Eigen values.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Discuss different Interpolation method	**Interpolation:** Newton Forward, Newton Backward, Gauss's Forward, Gauss's Backward, Stirling Interpolation, Bessel's Interpolation, and Laplace-Everett's Interpolation Formula, Maxima-Minima of Tabulated Function.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Compute Numerical Differentiation	**Numerical Differentiation:** Newton's Forward and Newton's Backward Difference Formula to Compute the Derivatives, Difference Formula to Compute the Derivatives, Maxima-Minima of Tabulated Function.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Compute Integration	**Numerical Integration:** Newton-Cotes, Trapezoidal, Simpson's One-Third, Simpson's Three-Eight Formula to Compute Integration. Numerical Double Integration.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Explain the solution of ordinary differential equations	**Numerical Solution of Ordinary Differential Equations:** Taylor Series, Taylor Series Method for Simultaneous First-Order and Second-Order Differential Equations, Picard's Method of Successive approximation. Euler's, Modified Euler's, and Improved Euler's Method. Runge-Kutta Methods for Simultaneous First order, Second order,	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution

		Third order, and Fourth order Differential Equations. Predictor-Corrector Method.		

Recommended Books And Periodicals

	Authors	Book Name
1.	Canale, P. Raymon and Chapra, C. Steven	Numerical Methods for Engineers
2.	J.F. Steffensen	Interpolation
3.	Santosh Gupta	Numerical Methods for
4.	Richard Hamming	Numerical Methods for Scientists and Engineers

Course No: 26 Course Title: Numerical Analysis Lab

Course Code: CSE 2108 **Pre-Requisites: Nil**
Credit: 1.00 **Total Marks: 100**
Contact Hours: 2 Hours/Week
Mark Distribution:

Lab Final Exam: 60 Marks **Viva:** 30 Marks **Class Attendance:** 10 Marks

11.1 Rationale:

Numerical methods, based upon sound computational mathematics, are the basic algorithms underpinning computer predictions in modern systems science. Such methods include techniques for simple optimization, interpolation from the known to the unknown, linear algebra underlying systems of equations, ordinary differential equations to simulate systems, and stochastic simulation under random influences. The objective of the lab work is to familiarize students with implementation of numerical methods using Python Programming Language.

11.2 Objectives:

1. Using Python to code, including design of codes
2. Engineering computations
3. Error analysis and relations to methods used
4. Organization of computations
5. Understanding the implications of approximations

11.3 Course Learning Outcomes (CLO)

1. Implement algebraic and transcendental equations
2. Experiment the Eigenvalue and Eigen matrix
3. Implement the roots using algorithms
4. Implement the matrix calculation algorithms
5. Experiment the integration problems
6. Experiment the differential equations

11.4		11.5	11.6	11.7
Learning Outcomes		Course Content	Teaching Strategy/ Learning Experience	Assessment Strategy
a.	Implementation of different algorithms of Numerical	**Numerical Solution of Algebraic and Transcendental**	Lecture, Discussion,	Assignment, Home Work,

	Solution of Algebraic and Transcendental Equations using computer programming language	**Equations:** Bisection, False Position, Newton-Raphson, and Secant Method.	Case studies	Quiz, Problem-Solution
a.	Implementation of different algorithms of Simultaneous Linear Non-Homogeneous Algebraic Equationsusing computer programming language	**Simultaneous Linear Non-Homogeneous Algebraic Equations:** Gauss Elimination, Gauss Jordan, Gauss Jacobi, and Gauss Sidel Method.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Implementation of different algorithms Eigen Values and Eigen Vectors using computer programming language	**Eigen Values and Eigen Vectors:** Introduction and concept of eigen value and eigen vector, Estimation of the size of Eigen values.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Implementation of different algorithms of Interpolation using computer programming language	**Interpolation:** Newton Forward, Newton Backward, Gauss's Forward, Gauss's Backward, Stirling Interpolation, Bessel's Interpolation, and Laplace-Everett's Interpolation Formula, Maxima-Minima of Tabulated Function.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Implementation of different algorithms of NumericalDifferentiationusing computer programming language	**Numerical Differentiation:** Newton's Forward and Newton's Backward Difference Formula to Compute the Derivatives, Difference Formula to Compute the Derivatives, Maxima-Minima of Tabulated Function.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Implementation of different algorithms Numerical Integration using computer programming language	**Numerical Integration:** Newton-Cotes, Trapezoidal, Simpson's One-Third, Simpson's Three-Eight Formula to Compute Integration. Numerical Double Integration.	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution
a.	Implementation of different algorithms of Numerical Solution of Ordinary Differential Equations using computer programming language	**Numerical Solution of Ordinary Differential Equations:** Taylor Series, Taylor Series Method for Simultaneous First-Order and Second-Order Differential Equations, Picard's Method of Successive approximation. Euler's, Modified Euler's, and Improved Euler's	Lecture, Discussion, Case studies	Assignment, Home Work, Quiz, Problem-Solution

		Method. Runge-Kutta Methods for Simultaneous First order, Second order, Third order, and Fourth order Differential Equations. Predictor-Corrector Method.		

Recommended Books And Periodicals

	Authors	Book Name
1.	Canale, P. Raymon and Chapra, C. Steven	Numerical Methods for Engineers
2.	J.F. Steffensen	Interpolation
3.	Santosh Gupta	Numerical Methods for
4.	Richard Hamming	Numerical Methods for Scientists and Engineers

Course No: 27 Course Title: Software Development Project Laboratory-1

Course Code: CSE 2110 **Pre-Requisites: Nil**

Credit: 3.00

Contact Hours: 2 Hours/Week **Total Marks: 100**

Mark Distribution:

Lab Final Exam: 60 Marks **Viva:** 30 Marks **Class Attendance:** 10 Marks

11.1 Rationale:

Computer Engineers should be competent in Application software through Object oriented language. This C#.net /ASP.net/Java Programming Knowledge is valuable to both beginners and advanced developers that already have experience in developing applications software.

11.2 Objectives:

1. Create and populate Windows Forms.

11.3		11.4	11.5	11.6
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	To Apply OOP Knowledge	**C#.NET Language Basics** Data Types, Type Conversion,Boxing & Unboxing, Conditional Statements, Looping, Methods in C#, Properties, Arrays, Indexers, Structures, Enumerations	Group Assignment, Panel Discussion, Problem based Learning	Matching Type, Peer-Rating
a.	To Apply OOP Knowledge	**Memory Management:** Garbage Collector, Stack and Heap, System. GC Class.	Problem Based Learning, Project, Inquiry –based Learning	Practical Exam, Matching Type
a.	To Apply OOP Knowledge	**OOP Concepts:** Encapsulation, Inheritance,Polymorphism,Class and Object Constructors, Dynamic types, Optional parameters,Names &optional arguments,Covariant generic type parameters, Destructors,MethodoverloadingMethod overriding,Early binding, Late	Group Assignment,Panel Discussion	Observation

		Binding,Abstract Classes, Abstract Methods,Interfaces, Multiple Inheritance,Genericclasses,Static classes, Static constructors, Object initialize		
a.	To Apply OOP Knowledge	**Exception Handling:** System Defined Exceptions, Custom Exceptions, Try, Catch, Finally, Throwing exceptions	Group Assignment,Panel Discussion	Observation
a.	To Apply OOP Knowledge	**Delegate:** Function Pointers, Multi cast delegates,FileHandlingSystem. IO namespace, File stream,Stream Reader, Stream writer, File info, Directory info, Drive Info	Problem-based Learning, Demonstration, Project /Assignment	Group Exercise, Observation, Inventories
a.	To Apply .NET Knowledge	**Developing Microsoft.NET Applications for Windows (Visual C#.NET)** □Creating a Form □Adding Controls to a Form □Creating an Inherited Form □Organizing Controls on a Form □Creating MDI Application **Working with Controls** □Creating an Event Handler fora Control □Using Windows Forms Controls □Using Dialog Boxes □Application □Adding Controls at Run Time □Creating Menus □Validating User Input **Using Data in Windows Forms Applications** □Adding ADO.NET □Objects to and □Configuring ADO.NET □Objects in a Windows □Forms Application □Accessing and Modifying Data by Using DataSets □Binding Data to Controls □Overview of XML Web □Services □Persisting Data	Problem-based Learning, Demonstration, Project /Assignment	Group Exercise, Observation, Inventories
a.	To Apply .NET Knowledge	**Developing Microsoft.NET Applications for Windows (Visual C#.NET)** □Printing and Reporting in Windows Forms □Applications Lessons □Printing From a □Windows Forms Application □Using the Print Preview, Page Setup, and □Print Dialogs □Constructing Print Document Content by Using GDI+ □Creating Reports by Using Crystal Reports □Deploying Windows Forms Applications • .NET Assemblies	Problem-based Learning, Demonstration, Project /Assignment	Group Exercise, Observation, Inventories
a.	To Apply Database Knowledge	**Introduction to LINQ and ADO.NET Entity Framework.** LINQ expressions Using via extension methods, Filtering, Sorting,	Problem-based Learning, Demonstration, Project	Group Exercise, Observation, Inventories

		Aggregation, Skip and Take operators, Joins, Query, Lambda expressions. **Data Projection** Single result value, Existing types, Anonymous types,Grouping	/Assignment	
a.	To Apply ASP.NET Knowledge	**ASP.NET INTRODUCTION** Difference Between ASP and ASP.NET ,Architecture Inline Technique & Code-Behind Technique,Code Render Blocks Server Controls ,Page Basics, Page lifecycle, Post back Request View State, Directives **PROGRAMMING WITH SERVER CONTROLS** Web Server Controls Basic Web Controls, List Controls, Data Controls,Adv Controls, User Controls, Master Page and Content Page. **Validation Controls** Understanding Validation Client or Server Site Validation Required Filed Validator Rang Validator, Regular Expression Validator, Compare Validator, Custom Validator Validator Summary. **CONTENT** **Developing Microsoft.NET Applications for Web (ASP.NET using C#.NET)** **STATE MANAGEMENT WITH ASP.NET** Context, View State,Cookie State Session State, Session Tracking Application Object, Session and Application Events **ADO.NET AND ASP.NET** Working with Data Controls, GridView, -Inserting, Updating, Deleting,-Sorting in Data Grid -Paging in Data Grid, DataSourceControls,Dataset,Details View FormView,DataList,Repeater Control, Crystal Reports **ADO.NET PROGRAMMING** Architecture, DataReaders and DataSets, Command Object Transaction Programming Procedure Execution Data Adapter and Data Set, Data Tables, Data Relation,Data Views Updating Dataset	Problem-based Learning, Demonstration, Project /Assignment	Group Exercise, Observation, Inventories
a.	Project	Project, Review & Exam	Problem-based Learning, Demonstration, Project /Assignment	Group Exercise, Observation, Inventories

Recommended Books And Periodicals

Authors	Book Name
1.	W3school.com
2.	On line tutorial

Course No: 28 Course Title: Business Studies for Engineers

Course Code: BUS 2101
Credit: 2.00
Contact Hours: 2 Hours/Week
Pre-Requisites: Nil
Total Marks: 100

Mark Distribution:

Semester Final Exam: 72 Marks **Class Test:** 20 Marks **Class Attendance:** 08 Marks

11.1 Rationale:

An introduction to the business and management aspects of the engineering profession, project management, prioritization of resource allocation, intellectual property protection, management of technical projects, and product/production management.

11.2 Objectives:

In this course, student will work in groups to learn about strategy, marketing, finance, project management and people management and will practice writing concise persuasive analyses and action plans and verbally defending their ideas. After completing this course, student will be prepared to be a working professional like engineer, manager, entrepreneur or other professional over the years.

11.3 Learning Outcomes		11.4 Course Content	11.5 Teaching Strategy/ Learning Experience	11.6 Assessment Strategy
a.	Explain accounting principles	Basic accounting principles, Cash book, Trial Balance, Balance Sheet, Bank Reconciliation statement	Lecture, Assignment, Demonstration	Assignment, Short Answer, Essay
b.	Apply cash book, trial balance, balance sheet, reconciliation statement			
a.	Define and explain cost accounts	Cost Accounts and objectives; Elements of a costs; Direct cost, Overhead allocation.	Lecture, Assignment, Demonstration	Assignment, Short Answer, Essay
b.	Apply direct cost and overhead allocation			
a.	Prepare a cost sheet	Preparation of a cost sheet, Computation of breakeven point. Standard Costing. job order costing, Process costing, Cost Variance.	Lecture, Assignment, Demonstration	Assignment, Short Answer, Essay
b.	Compute breakeven point			
c.	Define, explain and compare different costing.			
a.	Define and explain administration, management, organization, authority, responsibility and scientific management.	Administration, Management and organization. Authority and responsibility. Scientific management. Organization structure, organization chart. Span of control. Selection and recruitment of employees; training and its types, promotion, wage system and incentive; job-evaluation and merit rating. Plant	Lecture, Assignment, Demonstration	Assignment, Short Answer, Essay
b.	Compare different types of training.			

c.	Evaluate and rate jobs	layout, layout of physical facilities. Transportation and storage. Material handling, Maintenance, Maintenance policy. Production control in intermittent and continuous manufacturing industry, functions of production control. Purchasing procedures: Inventory- need and methods of control, Factors affecting inventory building-up. Economic lot size and reorder point.		
d.	Define and explain material handling, maintenance, production control.			
e.	Analyze purchasing procedures			
f.	Identify factors affecting inventory build-up, economic lot size and reorder point.			
a.	Define and explain law of contract	Law of contract: Elements of a valid contract, consideration, parties component to contract. Sale of goods, hire and purchase. Negotiable instrument Act. Patent right and validity. Industrial laws in Bangladesh: factories Act, Industrial Relation Ordinance, Workmen's compensation act.	Lecture, Assignment, Demonstration	Assignment, Short Answer, Essay
b.	Compare laws and acts			

Recommended Books And Periodicals

	Authors	Book Name
1.	Pyle and White	"Principle of Accounting"
2.	Pyle and Larson	"Principle of Accounting"
3.	Herold Koontz	"Management"
4.	W. H. Newman	"Administrative Action"
5.	Terry &Frankin	"Principle of Management"
6.	W. J. Stevenson	"Management Science"

Course No: 29 Course Title: Design and Analysis of Algorithms

Course Code: CSE 2201 **Total marks: 100**
Credit: 3.00 **Pre-Requisites: Nil**
Contact Hours: 3 Hours/Week **Total Marks: 100**

Mark Distribution:

Semester Final Exam: 72 Marks **Class Test:** 20 Marks **Class Attendance:** 08 Marks

11.1 Rationale:

A student, after successfully passing this course will be able to understand the fundamental data structures and Abstract Data Types, the main sorting and searching algorithms and recursion, analyze the time and space complexity of a given algorithm, stacks and queues, process the linked list and tree structures, and the graph terminology and perform basic graph operations.

11.2 Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.
6. Analyze the asymptotic performance of algorithms.

11.3		11.4	11.5	11.6
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	Define complexity	Computationalcomplexity	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Distinguish among different types of problem			
a.	Discuss parameterized complexity	Parameterized complexity	Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Define optimization problem	Algorithms for combinatorial optimization	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Discuss different optimization algorithm			
c.	Apply optimization algorithm to solve real life problem			
a.	Define heuristic algorithm	Practical computing and heuristics	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply it in practical problem			
a.	Define Approximation algorithm	Approximation algorithms	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Learn different approximation algorithm			
c.	Apply approximation algorithm to solve problem			
a.	Define Linear programming	Linear Programming based approximation algorithms	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Learn LP based algorithm			
a.	Discuss different randomized algorithm	Randomized algorithms	Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Learn experimental algorithm	Experimental algorithmic	Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Apply algorithm in different filed	Algorithms in state-of-the-art fields like Bioinformatics, Grid Computing, VLSI design	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Create new idea to solve problem			

Recommended Books and Periodicals

	Authors	Book Name
1.	Thomas H. Cormen	Introduction to Algorithms
2.	Ellis Horowitz &Sartaj	Fundamentals of Computer Algorithms

Course No: 30 Course Title: Design and Analysis of Algorithms Lab

Course Code: CSE 2202 **Pre-Requisites: Nil**

Credit: 1.5

Contact Hours: 3 Hours/Week **Total Marks: 100**

Mark Distribution:

Lab Final Exam:	60 Marks	**Viva:**	30 Marks	**Class Attendance:**	10 Marks

11.1 Rationale:

A student, after successfully passing this course will be able to understand the fundamental data structures and Abstract Data Types, the main sorting and searching algorithms and recursion, analyze the time and space complexity of a given algorithm, stacks and queues, process the linked list and tree structures, and the graph terminology and perform basic graph operations.

11.2 Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

11.3		**11.4**	**11.5**	**11.6**
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	Define complexity	Computational complexity	Lecture, Exercise	Assignment, Quiz,Short Question.
b.	Distinguish among different types of problem			
a.	Discuss parameterized complexity	Parameterized complexity	Lecture, Exercise	Assignment, Quiz,Short Question.
a.	Define optimization problem	Algorithms for combinatorial optimization	Lecture, Exercise	Assignment, Quiz,Short Question.
b.	Discuss different optimization algorithm			
c.	Apply optimization algorithm to solve real life problem			
a.	Define heuristic algorithm	Practical computing and heuristics	Lecture, Exercise	Assignment, Quiz,Short Question.
b.	Apply it in practical problem			
a.	Define Approximation algorithm	Approximation algorithms	Lecture, Exercise	Assignment, Quiz,Short Question.
b.	Learn different approximation algorithm			
c.	Apply approximation algorithm to solve problem			
a.	Define Linear programming	LP based approximation algorithms	Lecture,Exercise	Assignment, Quiz,Short Question.
b.	Learn LP based algorithm			
a.	Discuss different randomized algorithm	Randomized algorithms	Lecture,Exercise	Assignment, Quiz,Short Question.

a.	Learn experimental algorithm	Experimental algorithmic	Lecture,Exercise	Assignment, Quiz,Short Question.
a.	Apply algorithm in different filed	Algorithms in state-of-the-art fields like Bioinformatics, Grid Computing, VLSI design	Lecture, Exercise	Assignment, Quiz,Short Question.
a.	Create new idea to solve problem			

Recommended Books And Periodicals

	Authors	Book Name
1.	Thomas H. Cormen	Introduction to Algorithms
2.	Ellis Horowitz	Fundamentals of Computer Algorithms

Course No: 31 Course Title: Database Management System

Course Code: CSE2203 **Pre-Requisites: Nil**

Credit: 3.00

Contact Hours: 3 Hours/Week **Total Marks: 100**

Mark Distribution:

Semester Final Exam: 72 Marks **Class Test:** 20 Marks **Class Attendance:** 08 Marks

11.1 Rationale:

A computer engineer needs to know the fundamentals of database architecture, database management systems, and database systems, principles and methodologies of database design, and techniques for database application development.

11.2 Objectives:

1. An understanding of the needs for and uses of database management systems in business;
2. An understanding of the context, phases and techniques for designing and building database information systems in business;
3. An understanding of the components of a computerized database information system (application)
4. An ability to correctly use the techniques, components and tools of a typical database management system -- such as Access 2000 or Oracle 8i -- to build a comprehensive database information system (application);
5. An ability to design a correct, new database information system for a business functional area and implement the design in either Access 2000 or Oracle 8i;
6. An introductory understanding of some advanced topics in database management, e.g., object-relational databases and design, distributed databases, database administration (security, backup and restore, tuning) and data warehousing.

11.3		11.4	11.5	11.6
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	Define Database	Database Concepts: Files and Databases, Database Management systems, Data models	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Explain advantage of Database over file system			
c.	Describe different data model			

a.	Explain Relational Data model	Relational Data Model: Relations, Domains, Attributes and Tuple	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Apply RDM in DB design			
c.	Describe different types of attribute			
a.	Evaluate anomalies in DB design	Anomalies, Functional Dependency, First, Second and third normal forms, Boyce-Codd Normal form	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Identify different normal form			
c.	Apply normalization in DB design			
d.	Convert one normal form to another normal			
		Relational Calculus Based Languages: SQL, Relational algebra and Set operations.	Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Explain decomposition and synthesis algorithm	Relational Database Design: Relational design criteria, Lossless decomposition, decomposition algorithms, synthesis algorithms.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Define lossless decomposition			
a.	Define OODD	Advance Database Concepts: Fourth and fifth normal forms, Object-oriented databases.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Describe advantage of OODD			
c.	Differentiate fourth and fifth normal form			
a.	Define entity	Entity-Relationship (ER) approach: The ER model and its constructs, ER modeling in logical database design.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Relationship, relationship set.			
c.	Apply E-R approach to DB design			
a.	Explain transformation of ER model to SQL	Transformation of the ER model to SQL	Lecture, Exercise	Assignment, Quiz, Short Question.
a.	Architecture of DDBMS	Distributed database design.	Lecture, Exercise	Assignment, Quiz, Short Question.
b.	Advantage of DDBMS			
c.	Explain pitfalls of DDBMS			
a.	Evaluation of relational queries	Optimization and evaluation of relational queries: conjunctive query optimization, optimization of queries involving union and difference operators, algorithms for performing joins.	Lecture, Exercise	Assignment, Quiz, Short Question.

Recommended Books And Periodicals

	Authors	Book Name
1.	Korth and Silverchatz	Database System Concepts

2. O. William Principle of Database Systems

3. Jeffrey Ullman Relational Database Management System

Course No: 32 Course Title: Database Management System Lab

Course Code: CSE2204 **Pre-Requisites: Nil**

Credit: 1.50

Contact Hours: 2 Hours/Week **Total Marks: 100**

Mark Distribution:

Lab Final Exam: 60 Marks **Viva:** 30 Marks **Class Attendance:** 10 Marks

11.1 Rationale:

A computer engineer needs to know the fundamentals of database architecture, database management systems, and database systems, principles and methodologies of database design, and techniques for database application development.

11.2 Objectives:

1. An understanding of the needs for and uses of database management systems in business.
2. An understanding of the context, phases and techniques for designing and building database information systems in business.
3. An understanding of the components of a computerized database information system.
4. An ability to correctly use the techniques, components and tools of a typical database management system -- such as Access 2000 or Oracle 8i -- to build a comprehensive database information system (application).
5. An ability to design a correct, new database information system for a business functional area and implement the design in either Access 2000 or Oracle 8i.
6. An introductory understanding of some advanced topics in database management, e.g., object-relational databases and design, distributed databases, database administration (security, backup and restore, tuning) and data warehousing.

11.3		11.4	11.5	11.6
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	learn system configuration	Configure system for database programming	Exercise	Practice And Coding
a.	apply database basic function	Create Database, table ,learn data types	Exercise	Practice And Coding
a.	Demonstrate SQL	Learn SQL	Exercise	Practice And Coding
a.	Apply SQL to write database program	Apply SQL to retrieve, insert, update and delete data	Exercise	Practice And Coding
a.	Demonstrate advance SQL and apply it	Learn Advanced SQL	Exercise	Practice And Coding
a.	Design large database model with proper table organization	Learn normalization	Exercise	Practice And Coding
a.	Apply database triggering	Learn database triggering	Exercise	Practice And Coding
a.	Develop database design	Learn database design	Exercise	Practice And Coding

Recommended Books And Periodicals

	Authors	Book Name
1.	Korth and Silverchatz	Database System Concepts
2.	O. William	Principle of Database Systems
3.	Jeffrey Ullman	Relational Database Management System

Course No: 33 Course Title: Data Communication

Course Code: CSE-2205 **Pre-Requisites: Nil**
Credit: 3.00
Contact Hours: 3 Hours/Week **Total Marks: 100**

Mark Distribution:
Semester Final Exam: 72 Marks **Class Test:** 20 Marks **Class Attendance:** 08 Marks

11.1 Rationale:

A computer science engineer needs to know the communication model, different network layer, transmission medium and technique to fulfill his CSE degree.

11.2 Objectives:

1. Build an understanding of the fundamental concepts of Data communication.
2. Learn how computer network hardware and software operate
3. Investigate the fundamental issues driving network design
4. Learn about dominant network technologies

11.3		11.4	11.5	11.6
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	**Discuss** Communication model, task, network standards and organizations	**Introduction:** Data Communication, Fundamental characteristics, Components, Data representation, Data Flow, Network and its criteria, point-to-point and multipoint connection, different topologies, Network Models, Protocols and standards	Lecture	Essay Short Question
b.	Draw Protocol architecture			
c.	Discuss different protocol layer			
a.	**Discuss** Network Model, Tasks, ISO, OSI Model, TCP/IP Protocol	**Network Model:** different tasks in network model, peer-to-peer communication, characteristics and usage area of different layers in OSI model, fundamental properties of different layers of TCP/IP protocol, physical, logical and port address.	Lecture Tutorial	Essay Short Question
a.	**Define** Physical layer and media, Illustrate Analog and digital data and signal,	**Physical Layer:** Analog and digital data and signal, period, frequency, phase, wavelength, time and frequency domain,	Lecture Exercise	Short Question Assignment

	transmission technique and its impairments, Data rate limit for both noisy and noiseless channel.	bandwidth, transmission of digital signal, attenuation, distortion, noise, SNR, Nyquist bit rate, Shannon's capacity performance parameters.		
a.	**Discuss** various Digital transmission techniques.	**Digital transmission:** Line coding techniques NRZ, RZ, Manchester, and differential Manchester encoding, AMI, Block coding, analog to digital conversion based on PCM, delta modulation, etc.	Lecture Exercise Assignment	Quiz Short Question Assignment
a.	**Discuss** various Analog transmission techniques.	**Analog transmission:** ASK, FSK, PSK, QPSK, QAM encodings, AM, PM,FM, etc.	Lecture Exercise Assignment	Essay Quiz Short Question Assignment
a.	**Discuss** and characterize different data transmission techniques.	**Data Transmission:** Synchronous and asynchronous data transmission techniques.	Lecture Exercise Assignment	Essay Quiz Short Question
a.	**Discuss** and characterize different multiplexingtechniques.	**Multiplexing:** FDM, international FDM carrier standards, synchronous TDM, international TDM carrier standards, statistical time division multiplexing	Lecture Exercise Assignment	Essay Quiz Short Question Assignment
a.	**Discuss** and characterize different spread spectrum techniques.	**Spread Spectrum:** Frequency hopping spread spectrum, direct sequence spread spectrum, code division multiple access.	Lecture	Short Question Essay
a.	**Discuss** and characterize different transmission medium.	**Transmission Medium:** Characteristics and applications of various types of guided medium.	Lecture Exercise Assignment	Quiz Short Question
a.	Explain Different wireless transmission technique.	**Wireless Transmission:** Characteristics and applications of wireless transmission-terrestrial and satellite microwave, radio waves, propagation mechanism, free space propagation, land propagation, path loss, slow fading, fast fading, delay spread, inter symbol interference, VSAT.	Lecture Exercise Assignment	Essay Quiz Short Question
b.	Compute path loss.			
c.	Distinguish slow and fast fading			
d.	Define inter symbol interference and VSAT			
a.	**Discuss and Explain** switching, different switching techniques and various switches	**Switching:** Switch, Taxonomy of switched network, Circuit switched network, three phases and efficiency and delay calculation, datagram network and its routing table, delay and efficiency calculation, virtual circuit network and its three phase, delay and efficiency calculation, structure of	Lecture	Essay Short Question

		space division switch, crossbar switch, multistage switch, banyan switch, batcher banyan switch.		
a.	**Discuss** error detection and correction methods, forward and backward detection, checksum	**Data Link Layer:** Error Detection and Correction; parity check, CRC, forward error correction technique, linear block code, hamming code, etc.	Lecture Exercise	Short Question Essay
a.	Examine data link layer design issues, Generalize error detection and correction, Describe elementary data link & sliding window protocols Deduce Protocol verification	**The data link layer:** data link layer design issues, error detection and correction, elementary data link protocols, sliding window protocols, protocol verification, example data link protocols	Lecture Discussion	Assignment Group Exercise Multiple Choice
a.	**Discuss** wireless channel, multiple access protocol, random access and controlled access protocol	**Multiple Access:** Random access, ALOHA, Pure ALOHA, CSMA, CSMA/CD, CSMA/CA, Controlled access, reservation, token passing, polling, poll function, Channelization protocols, FDMA, TDMA and CDMA technology	Lecture Exercise Assignment	Essay Quiz Short Question Assignment

Recommended Books And Periodicals

	Authors	Book Name
1.	William Stallings	Data and Computer Communication
2.	Hajkins	Data Communication
3.	Taub	Data Communication
4.	Behrouz A. Forouzan	Data Communications and networking.

Course No: **35** **Course Title:** **Mobile Application Development Lab**

Course Code: CSE 2210 **Pre-Requisites: Nil**

Credit: 3.00

Contact Hours: 2 Hours/Week **Total Marks: 100**

Mark Distribution:

Lab Final Exam: 60 Marks **Viva:** 30 Marks **Class Attendance:** 10 Marks

11.1 Rationale:

Computer Engineers should be competent in mobile app and game development. This development Knowledge is valuable to both beginners and advanced developers that already have experience in developing mobile apps.

11.2 Objectives:

1. Create and populate mobile applications and games.

11.3	11.4	11.5	11.6

Learning Outcomes		Course Content	Teaching Strategy/ Learning Experience	Assessment Strategy
a.	To Apply OOP Knowledge for Android and/or iOS app development	Getting started with Android and iOS	Group Assignment, Panel Discussion, Problem based Learning	Matching Type, Peer-Rating
b.	Create UI for Android and/or iOS app	Building simple User Interface	Problem Based Learning, Project, Inquiry –based Learning	Practical Exam, Matching Type
c.	To apply knowledge of handling files in Android and iOS	Handling files in Android and iOS	Group Assignment,Panel Discussion	Observation
d.	Create mid-level application in Android and/or iOS	Course Project	Group Assignment,Panel Discussion	Observation

Recommended Books And Periodicals

Authors	Book Name
1.	W3school.com
2.	On line tutorial

Course No: 36 Course Title: Probability and Statistics

Course Code: MATH 2201
Credit: 3.00
Contact Hours: 3 Hours/Week
Pre-Requisites: Nil
Total Marks: 100

Mark Distribution:

Semester Final Exam: 72 Marks **Class Test:** 20 Marks **Class Attendance:** 08 Marks

11.1 Rationale:

To be a computer Engineer one has to be expert at Probability distribution and Statistical methods.

11.2 Objectives:

1. To achieve knowledge for solving stochastic world problems.
2. To know about Statistics and application of Statistics

11.3		11.4	11.5	11.6
Learning Outcomes		**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**
a.	Explain probability distribution	**Probability:** Probability theory, discrete and continuous probability distributions, sampling theory and estimation, test of hypothesis, regression	Lecture Exercise	Assignment Essay Exercise Short Answer
b.	Sampling distribution			
c.	Test of hypothesis, Correlation, Regression			

d.	Find the relation between Correlation and Regression	and correlation analysis, analysis of variance, decision making using probabilities, decision trees, application of game theory		
e.	Write down the different measures of central tendency			
f.	Establish the relation between AM, GM, HM			
a.	Explain frequency distribution	**Statistics:** Introduction and introductory concepts, Variable and Frequency distribution. Central tendency & its measures, Dispersion & its measures, nature and shape of frequency distribution, Probability and Probability Theory, Regression and correlation, Sampling and sample survey, Test of hypothesis.	Lecture Exercise	Assignment Essay Exercise Short Answer
b.	Measuring Mean, Mode, Median values from frequency distribution			
c.	Standard Deviation techniques			
d.	Variable and attributes			
e.	Define Skewness and Kurtosis			
f.	Solve problems using different measures of central tendency			

Recommended Books And Periodicals

	Authors	Book Name
1.	Murray R. Spiegel	Statistics
2.	Ahmed and Bhuiya	Methods of Statistics
3.	Shil and Debnath	An Introduction to Theory of Statistics
4.	Md. Abu Yusuf	Mathematical Method and tensor Analysis

Course No: 37 **Course Title:** Business Psychology

Course Code: BUS 2201
Credit: 3.00
Contact Hours: 3 Hours/Week
Pre-Requisites: Nil
Total Marks: 100

Mark Distribution:

Semester Final Exam: 72 Marks **Class Test:** 20 Marks **Class Attendance:** 08 Marks

11.1 Rationale:

This is an undergraduate course in linear algebra for students of engineering, science, and mathematics. Linear algebra is the study of linear systems of equations, vector spaces, and linear transformations. Solving systems of linear equations is a basic tool of many mathematical procedures used for solving problems in science and engineering.

11.2 Objectives:

- Build an understanding of the fundamental concepts of Linear Algebra.
- Learn how to solve linear equations, performing matrix algebra, calculating determinants, and finding eigenvalues and eigenvectors
- Learn about the applications of linear algebra applications

11.3	11.4	11.5	11.6
Learning Outcomes	**Course Content**	**Teaching Strategy/ Learning Experience**	**Assessment Strategy**

Understanding fundamental of psychology Learning perspective of Psychology Defining importance of psychology in business	**Fundamentals:** Definition of Psychology, Subfields of Psychology, Major Perspectives of Psychology, Psychology in Business	Lecture	Essay Short Question
Understanding Job Analysis	**Job Analysis:** Job-oriented Approach, Person-oriented Approach, Purposes of Job Analysis, Methods of Job Analysis, Job Evaluation	Lecture Tutorial	Essay Short Question
Learning assessment methods for selection and placement	**Assessment Methods for Selection and Placement:** Psychological Tests: Ability Test, Personality Test, Intelligence Test, Vocational Interest Test	Lecture Exercise	Short Question Assignment
Defining training and development	**Training and Development:** Training Need Analysis, Training Designs, Training Methods, Evaluation of Training	Lecture Exercise	Quiz Short Question Assignment
Learning theories of employee motivation	**Theories of Employee Motivation:** Need Theories, Reinforcement Theory, Expectancy Theory, Goal Setting Theory	Lecture Exercise Assignment	Essay Quiz Short Question Assignment
Learning job attitude and emotion	**Job Attitude and Emotion:** Nature of Job Satisfaction, Assessment of Job Satisfaction, Antecedents of Job Satisfaction, Potential Effects of Job Satisfaction, Organizational Commitment, Emotion at work	Lecture Exercise Assignment	Essay Quiz Short Question
Learning Productive and Counterproductive Employee Behavior	**Productive and Counterproductive Employee Behavior:** Productive Behavior, Job Performance; Counterproductive Behavior, Withdrawal, Aggression, Mistreatment, Sabotage, and Theft	Lecture Exercise	Essay Quiz Short Question Assignment
Understanding Occupational Health Psychology	**Occupational Health Psychology:** Occupational Health and Safety, Work Schedules, Occupational Stress, Work-Family Conflict, Burnout, Hawthorne Studies;	Lecture	Short Question Essay
Understanding Leadership	**Leadership:** Approaches to the Understanding of	Lecture	Quiz Short Question

Learning Leader Behavior Approach	Leadership Trait Approach, Leader Behavior Approach, Contingency Theory, Path-Goal Theory, Leader-Member Exchange (LMX) Theory, Transformational Leadership Theory	Lecture	Essay Quiz Short Question
Understanding Organizational Development and Theory	**Organizational Development and Theory:** Organizational Development Employee Acceptance of Change, Management by Objectives, Survey Feedback, Team Building, T-Group	Lecture	Essay Short Question
Learning Effectiveness of Organizational Development	**Effectiveness of Organizational Development:** Organizational Theories, Bureaucracy, Theory X and Theory Y, Open System Theory, Socio-technical System Theory.	Lecture	Short Question Essay

Recommended Books And Periodicals

	Authors	Book Name
1.	Paul E. Spector	Industrial and Organizational Psychology

Course No: 38 **Course Title: Viva Voce**

Course Code: CSE 2200
Credit: 1.00
Contact Hours:
Pre-Requisites: Nil
Total Marks: 100

Mark Distribution:

Viva voce 100 Marks