

**DEPARTMENT OF COMPUTER
SCIENCE AND APPLICATIONS
SCHEME AND SYLLABUS OF
EXAMINATION FOR
Bachelor (Honours/Honours with Research)
of
Computer Science
Duration 4 Years (8 Semesters) w.e.f.
Academic Session 2023-24**

Semester–VI Scheme C									
Course Code	Course Title	Credit	L:T:P:CH	Internal Marks		External Marks		Total Marks	
				Th	Pr	Th	Pr	Min	Max
Major/Core Courses									
B23-CSE-601	Computer Graphics	4	3:0:1:5	20	10	50	20	40	100
B23-CSE-602	Object Oriented Modeling with UML	4	3:0:1:5	20	10	50	20	40	100
DSE-A4	Student need to opt any one of two								
B23-DSE-603	Advanced Web Development	4	3:0:1:5	20	10	50	20	40	100
B23-DSE-604	Data Science	4	3:0:1:5	20	10	50	20	40	100
DSE-A5	Student need to opt any one of two								
B23-DSE-605	Machine Learning	4	3:0:1:5	20	10	50	20	40	100
B23-DSE-606	Design and Analysis of Algorithms	4	3:0:1:5	20	10	50	20	40	100
Skill Enhancement Courses									
B23-SEC-607	Dot Net Framework and C#	4	3:0:1:5	20	10	50	20	40	100
Total		20		25					500

B23- CSE – 601 Computer Graphics

Maximum marks: 70
Time: 3 hours

External: 50
Internal: 20

Credit: 4

Course Objectives:

- 1. To understand techniques of computer graphics.*
- 2. To provide an overview of working principles of graphic devices.*
- 3. To provide the working scanning algorithms.*
- 4. To understand the applications of computer graphics.*
- 5. To provide detail of hidden surface removal techniques.*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.

Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT – I

Computer Graphics: Introduction, applications, Interactive computer graphics, Passive computer graphics.

Devices: Flat panel displays, Three dimensional viewing devices, Stereoscopic and virtual reality system, Joystick, Data glove, Digitizer, Image scanner, Touch panel, Light pen, Voice system.

Graphics Software: Co-ordinate representation, Graphics functions, Software standards, PHIGS workstation.

Drawing Geometry: Point, Line, DDA line drawing algorithm, Bresenham's line drawing algorithm, Properties of circle, Mid point circle drawing algorithm, Pixel addressing & Object geometry.

UNIT – II

Filled area primitive: Scan line polygon fill algorithm, Inside-Outside test, Boundary fill algorithm, Flood fill algorithm.

2-D Transformations: Translation, Rotation, Scaling, Shearing, Reflection Matrix representation & Homogenous coordinate, Composite transformation, General pivot point rotation, General fixed point scaling.

UNIT – III

2-D Viewing: View coordinate reference frame, window to viewport coordinate transformation, two dimensional viewing function, line clipping, Cohen-Sutherland line clipping algorithm, Midpoint Line Clipping Algorithm.

3-D Transformation : Translation, Rotation, Scaling, Matrix representation & Homogenous coordinate, Composite transformation, General pivot point rotation, General fixed point scaling. Parallel and Perspective Projection.

UNIT – IV

GUI & Interactive Input: Interactive Picture construction techniques, Basic positioning method, Constraints, Grids, Gravity Fields, Rubber band method, Dragging, Painting and Drawing, Virtual reality environment.

Visible Surface Detection: Classification of visible surface detection algorithm, Depth buffer method, A-Buffer method, Scan line method, Depth sorting method.

Suggested Readings:

1. Donald Hearn, M. Pauline Baker , “*Computer Graphics C Version*”, Pearson, 2nd Edition.
 2. Newman and Sproull, “*Principals of Interactive Computer Graphics*”, Tata Mc Graw Hill, 2nd Edition.
 3. P.K. Bhatia, “*Computer Graphics*”, I.K. International Publisher, 3rd Edition.
 4. Zhigang Xiang, “*Computer Graphics*”, Tata Mc Graw Hill, 2006.
- Foley James, “*Computer Graphics Principles and Practice*”, Pearson Education, 3rd Edition.

B23- CSE – 602 Object Oriented Modeling with UML

Maximum marks: 70
Time: 3 hours

External: 50
Internal: 20
Credit: 4

Course Objectives:

1. *To understand the basics of modeling and its components.*
2. *To provide the detail of state model and it's working.*
3. *To understand the steps followed for system design.*
4. *To understand various interaction models with reference to UML design.*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.

Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Introduction: Object-Orientation, Object Oriented Methodology, Modeling,
Class Modeling: Object, Class, Value & Attributes, Operation & Method, Link & Association, Association Classes, Qualified association, Multiplicity, Association end name, Ordering, Bag & Sequences, Generalization & Inheritance, Uses of Generalization.

UNIT-II

Advance Class Modeling: Advanced Object & Class Concepts, N-Array association, Aggregation, Abstract Class, Multiple Inheritance, Metadata.
State Modeling: Events, States, Transition & Conditions, State Diagram, State Diagram Behavior.
Advanced State Modeling: Nested State Diagram, Nested States, Signal Generalization, Concurrency.

UNIT-III

System Design: Overview, Estimating Performance, Making a reuse plan, Breaking a system into subsystems, Identifying Concurrency, Allocation of subsystem, Management of data storage, Handling global resources, Choosing a software control strategy, Handling boundary conditions, Setting trade-off priorities.

UNIT-IV

Interaction Modeling:

Use Case Models: Actors, Use case, Use case diagram, Guidelines for use case diagram.

Sequence Model: Scenarios, Sequence Diagrams, Guidelines for Sequence model.

Activity Model: Activities, Branches, Initiation & Termination, Concurrent Activities, Executable Activity Diagram, Guidelines for Activity diagram.

Case Study: Working of ATM with reference to implementation of basic structure, advanced structure, and functionality.

Suggested Readings:

1. Michael Blaha, James Rumbaugh, *“Object Oriented Modeling and Design with UML”*, Pearson Education, 2011.

2. Michael R Blaha, James R Rumbaugh, "*Object Oriented Modeling and Design with UML, UML2*", Pearson, 2007.
3. Daminni Grover, "*Object Oriented Analysis and Design with UML*", I. K International Publishing House, 1st edition, 2012.
4. Martin Fowler, "*UML Distilled*", Pearson Education Inc., 2018.
5. Mike O'Docherty, "*Object Oriented Analysis And Design Understanding System Development with UML 2.0*", Wiley Dreamtech, 2005.

B23- DSE – 603 Advanced Web Development

Maximum marks: 70

Time: 3 hours

External: 50

Internal: 20

Credit: 4

Course Objectives:

1. *To provide the understanding of core features and applications of Angular JS.*
2. *To give an idea of Directives and built-in Filters.*
3. *To understand modules, scopes and Services of Angular JS.*
4. *To provide an overview of Node.JS modules and Node Package Manager.*
5. *To understand the concept of Event handling and database connectivity in Node.js*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks.

Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

AngularJS - Overview: Need of Angular JS, Applications of Angular JS, Core features, MVC Architecture

Directives: ng-app, ng-init, ng-model, ng-bind, ng-repeat, Directive Lifecycle, Binding Controls to Data, Matching Directives, Angular Expressions

Built in Filters, Using Angular JS Filters. Role of Controller, Controllers and Modules, Nested Controllers, Using Filters in Controllers

UNIT-II

Introduction to Angular JS Modules, Working with Angular forms, Model Binding Forms, Updating Models with a twist.

Scope, Scope Lifecycle, Scope Inheritance, Scope and Controllers, Rootscope, Scope Broadcasting.

Dependency Injection, Creating Services, Factory Service and Provider.

UNIT-III

Introduction to Node.js, REPL Terminal, Node.js Modules, Module Types, Core Modules, Local Modules, Module Experts

Node Packet Manager (NPM), Installing Packages Locally, Adding dependency in Packages, Installing Packages Globally, Updating packages. Creating Web Server, Handling http requests, sending requests.

Buffers, Streams, Files, reading, writing, updating files, synchronous and asynchronous.

UNIT-IV

Events in Node JS, significance of the events, writing own events, Event Emitter class, inhering events.

Express framework to create web applications: Configuring Routes, Working with Express. How to serve Static HTML pages to the browser, and serving other file formats and restricting certain files.

Database Connectivity: MySQL Database, Creating Connection, Creating database and tables, Insert, Select, Delete, Update records.

Suggested Readings:

1. Ruebbelke L., "*Angular JS in Action*", Manning Publications, 2015.

2. Sandro Pasquali, Kevin Faaborg, "*Mastering Node.js*", Packt Publishing Limited, 2017
3. Dhruvi Shah, "*Node .Js*", BPB Publications, 1st edition, 2018.
4. Seshadri S., Green B., "*Angular JS Up and Running*", O'Reilly, 2014.
5. Jim R. Wilson, "*Node.js the Right Way*", O'Reilly, 2013.
6. Alex Young, Bradley Meck, Mike Cantelon, Tim Oxley, Marc Harter, T.J. Holowaychuk, Nathan Rajlich , "*Node.js in Action*", Dreamtech Press; 2nd edition, 2017.

B23- DSE – 604 Data Science

Maximum marks: 70
Time: 3 hours

External: 50
Internal: 20
Credit: 4

Course Objectives:

1. To understand and formulate data driven questions.
2. Clean and preprocess data efficiently.
3. Conduct exploratory analysis and statistical inference.
4. Visualize findings effectively.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

Unit – I

Data acquisition, cleaning, and aggregation, Exploratory data analysis and visualization, Feature engineering, Model creation and validation
Numerical Data, Summary Statistics, From Population to Sampled Data, Different Types of Biases, Random Number Generation and their applications.

Unit – II

Probability, Expectation and Probability Distribution.
Introduction to Statistical Inference., Association and Dependence, Association and Causation, Conditional Probability and Bayes Rule, Simpsons Paradox, Confounding, Introduction to Linear Regression, Special Regression Models

Unit – III

Bayesian inference: combining models and data in a forecasting problem, Bayesian hierarchical modeling for studying public opinion, Bayesian modeling for Big Data
Goals of statistical graphics and data visualization, Graphs of Data, Graphs of Fitted Models, Graphs to Check Fitted Models, What makes a good graph?, Principles of graphics

Unit – IV

Introduction, Classification, Linear Classification, Ensemble Classifiers, Model Selection, Cross Validation, Holdout, Probabilistic modelling, Topic modelling, Probabilistic Inference, Application: prediction of preterm birth, Data description and preparation, Relationship between machine learning and statistics

Reference Books:

1. Jain V K, "*Data Science and Analytics*", Khanna Book Publishing House, 2021.
2. Bruce P. & Bruce A., "*Practical Statistics for Data Scientists*", O'Reilly, 2017
3. Tamhane, C.Ajit & Dorothy D, "*Statistics and Data Analysis: From Elementary to Intermediate*", PHI, 1999
4. Dirk P. Kroese "*Data Science and Machine Learning*", CRC, 2019

B23- DSE – 605 Machine Learning

Maximum marks: 70
Time: 3 hours

External: 50
Internal: 20
Credit: 4

Course Objectives:

1. To learn the concept and importance of Machine Learning.
2. To develop a solid understanding of core algorithms and models used in Machine Learning, their selection and evaluation.
3. To learn strengths and weaknesses of various Software Engineering Techniques used in industrial applications.

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

Unit – I

What Is Machine Learning?, How Do We Define Learning?, How Do We Evaluate Our Networks?, How Do We Learn Our Network?, What are datasets and how to handle them?, Feature sets, Dataset division: test, train and validation sets, cross validation. Applications of Machine Learning, processes involved in Machine Learning

Unit – II

Introduction to Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Real life examples of Machine Learning. Classification and Regression: K-Nearest Neighbor, Linear Regression, Logistic Regression, Support Vector Machine (SVM), Evaluation Measures: SSE, MME, R2, confusion matrix, precision, recall, F-Score, ROC-Curve.

Unit – III

Introduction to clustering, Types of Clustering: Hierarchical, Agglomerative Clustering and Divisive clustering; Partitional Clustering - K-means clustering.

Unit – IV

Dimensionality reduction techniques: PCA, LDA, ICA. Introduction to Deep Learning, Gaussian Mixture Models, Natural Language Processing, Computer Vision.

Reference Books:

- 1) Jeeva Rose, *Introduction to Machine Learning*, Khanna Book Publishing Co., 2020
- 2) Chopra Rajiv, *Machine Learning*, Khanna Book Publishing Co., 2021
- 3) Ethem A., *Machine Learning: The New AI*, MIT Press, 2016

B23- DSE – 606 Design and Analysis of Algorithms

Maximum marks: 70

Time: 3 hours

External: 50

Internal: 20

Credit: 4

Course Objectives:

- 1. To understand the concept of Algorithm Design.*
- 2. To know about various Sorting techniques.*
- 3. To get familiar with Dynamic Programming and Greedy algorithms.*
- 4. To understand NP-complete problems and String matching.*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

Introduction: Analyzing algorithms, Designing algorithms, asymptotic notation, Standard notations and common functions, the substitution method, the recursion tree method, the master method.

Sorting: Heaps- maintaining the heap property, building a heap, The heapsort algorithm, description of quick sort, performance of quicksort, Analysis of quicksort, Lower bounds for sorting-Counting sort, Radix sort, Bucket sort.

UNIT-II

Dynamic Programming: Assembly-line scheduling, Matrix chain multiplication elements of dynamic programming, longest common subsequence, optimal binary search trees.

Greedy algorithms: An activity selection problem, Elements of greedy strategy, Huffman codes, a task scheduling problem.

UNIT-III

Graph algorithms: Representation of graphs, Breadth first search, Depth first search, Topological sort, strongly connected components, Growing a minimum spanning tree Kruskal and Prims algorithms, Single source shortest paths in directed acyclic graphs-The Bellman-Ford Algorithm, Dijkstra's Algorithm. All pairs shortest paths and matrix multiplication- The Floyd-Warshall algorithm, Johnson's algorithm for sparse matrices.

UNIT-IV

NP-completeness: Polynomial time and its verification-NP-completeness-reducibility proofs and NP-complete problems- The vertex cover problem, The travelling salesman's problem, The set cover problem-Randomization and linear programming, The subset-sum problem.

String Matching: the naïve string matching algorithm, the Rabin Karp algorithm, string matching with finite automata, the Knuth-Morris-Pratt algorithm.

Suggested Readings:

1. Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest & Clifford Stein , "*Introduction to Algorithms*", MIT Press, 3rd Edition, 2009.
2. Aho, Hopcroft and Ullman , "*The Design and Analysis of Computer Algorithms*", Pearson Education, 2nd Edition.
3. Michel T. Goodrich & Roberto Tamassia, "*Algorithm Design and Applications*", Wiley, 1st Edition, 2014.

B23- SEC – 607 DOT NET Framework and C#

Maximum marks: 70
Time: 3 hours

External: 50
Internal: 20
Credit: 4

Course Objectives:

1. *To understand .Net Framework and base classes*
2. *To know the basics of C# language.*
3. *To understand .Net Assemblies and Attribute.*
4. *To provide information about ASP.Net and ADO.Net*

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of total 5 parts (objective type/short-answer type questions) covering the entire syllabus and will carry 10 marks. In addition to the compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus and each question will carry 10 marks. Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting One question from each Unit.

UNIT-I

The .Net framework: Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.

UNIT-II

C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

UNIT-III

C# Using Libraries: Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.
.Net Assemblies and Attribute: .Net Assemblies features and structure, private and share assemblies, Built-In attribute and custom attribute. Introduction about generic.

UNIT-IV

Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

Suggested Readings:

1. Fergal Grimes,"*Microsoft .Net for Programmers*", Manning Publications, 2002.
2. E. Balagurusamy,"*Programming with C#*", Tata McGrawHill, 3rd Edition.
3. Karli Watson, Chrisian Nagel, Jacob Hammer Pedersen, Jon D. Reid, Morgan Skinner, Eric White,"*Beginning Visual C#*", Wrox, 2008
4. Mark Michaelis, "*Essential C# 3.0: For .NET Framework 3.5*", Pearson Education, 2nd Edition.