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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
ML307	BS	Environmental Management and Sustainability	60	20	20	0	0	4	0	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

The student will have ability to:

1. To create awareness towards various environmental problems.
2. To create awareness among students towards issues of sustainable development.
3. To expose students towards environment friendly practices of organizations.
4. To sensitize students to act responsibly towards environment

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes

The students will be able to

1. The course will give students an overview of various environmental concerns and practical challenges in environmental management and sustainability.
2. Emphasis is given to make students practice environment friendly behavior in day-to-day activities.

COURSE CONTENT

Unit I: Introduction to Environment Pollution and Control 10HRS

1. Pollution and its types (Air, Water, and Soil): Causes, Effects and Control measures
2. Municipal Solid Waste: Definition, Composition, Effects
3. Electronic Waste: Definition, Composition, Effects
4. Plastic Pollution: Causes, Effects and Control Measures

Unit II: Climate Change and Environmental Challenges

1. Global Warming and Green House Effect
2. Depletion of the Ozone Layer
3. Acid Rain
4. Nuclear Hazards

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Unit III: Environmental Management and Sustainable Development **9HRS**

1. Environmental Management and Sustainable Development: An overview
2. Sustainable Development Goals (17 SDGs)
3. Significance of Sustainable Development
4. Environment Friendly Practices At Workplace and Home (Three Rs' of Waste Management,
   Water Conservation, Energy Conservation)

Unit 1V: Environmental Acts **8HRS**

1. The Water (Prevention and Control of Pollution) Act, 1974: Objectives, Definition of Pollution under this act, Powers and Functlons of Boards
2. The Air (Prevention and Control of Pollution) Act, 1981:Objectives, Definition of Pollution under this act, Powers and Functions of Böards
3. The Environment (Protection) Act, 1986: Objectives, Definition of important terms used in this Act, Details about the act.
4. Environmental Impact Assessment: Concept and Benefits

Unit V:Role of Individuals, Corporate and Society **7HRS**

1. Environmental Values
2. Positlve and Adverse Impact of Technological Developments on Society and Environment
3. Role of an individual/ Corporate/ Society in environmental conservation
4. Case Studies: The Bhopal Gas Tragedy, New Delhi's Air Pollution, Arsenic Pollution in Ground Water (West Bengal), Narmada Valley Project, Cauvery Water Dispute,Fukushima Daiichi Disaster (Japan), Ozone Hole over Antarctica, Ganga Pollution, Deterioration of Taj Mahal. Uttarakhand flash floods.

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ML307	BS	Environmental Management and Sustainability	60	20	20	0	0	4	0	0	4

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*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Text Books:

1. Rogers, P.P., Jalal, K.F. , Boyd, I.A.(Latest Edition) . An Introduction to Sustainable Development. Earthscan.

References:

1. Kalam, A.P.J. (Latest Edition) .*Target 3 Billon: Innovative Solutions Towards Sustainable Development.* Penguin Books
2. Kaushik , A. and Kaushik (Latest Edition).Perspectives in Environmeniaf Studies. New Delhi: New Age International Publishers.
3. Dhameja, S.K. (Latest Edition). Environmental Studies. S.K. Kataria and Sons.New Delhi
4. Bharucha,E. (Latest Edition). Environmental Studies for Undergraduate Courses. New
5. Delhi: University Grants Commission.
6. Wright, R. T. (Latest Edition). Environmental Science: towards a sustainable future .New Delhi: PHL Learning Private Ltd.
7. Rajagopalan, R. (Latest Edition). Environmental Studies. New York: Oxford University Press.

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Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS401N	DCC	Data Base Management Systems	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

The student will have ability :

1. To differentiate among the various database system according to their function.
2. To understand the process to develop database model and database design.
3. To understand managing a database using Structured Query Language.
4. To expand an understanding of necessary DBMS concepts such as: Database Transactions, Database Security, Integrity, Concurrency.
5. To understand and build a straightforward database system and show competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Construct conceptual data models by identifying the entities and relationships.
2. Evaluate the normality of a logical data model, and correct any anomalies.
3. Develop physical data models for relational database management systems.
4. Implement relational databases using a RDBMS
5. Work as a valuable member of a database design and implementation team.

SYLLABUS:

UNIT I **10HRS**

Introduction: Concept & Overview of DBMS, Three Schema Architecture of DBMS, Database Approach v/s Traditional File Accessing Approach, Advantages of Database Systems, Data Models, Schema and Instances, Data Independence, Data Base Language and Interfaces, Functions of DBA and Designer, Database Users.

Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity- Relationship Diagram, Weak Entity Sets and Extended E-R features. ER Diagram to Relational Table conversion.

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BTCS401N	DCC	Data Base Management Systems	60	20	20	30	20	3	0	2	4

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UNIT II **9HRS**

Relational Model: Structure of Relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Joins and its type. Integrity Constraints. Referential Integrity, Intension and Extension.

UNIT III **8HRS**

SQL and PL/SQL: SQL commands, Set operations, Aggregate Functions, Null Values, Domain Constraints, Assertions, Views, Nested Sub Queries, Stored Procedures and Triggers, Database Security, Application development using PLSQL.

Relational Database Design: Functional Dependency, Database Anomalies, Normalization and its forms, Multi-Valued Dependencies, 4NF, Join Dependency, 5NF.

UNIT IV **7HRS**

Transaction and Concurrency Control: Physical Data Structures, Query Optimization, Transaction Model properties, State Serializability, Concurrency control protocols, Multiple Granularities, Granularity of Data Item. Multi version schemes, Database Recovery Methods, Recovery in Multi-Database System and Database Backup and Recovery from Catastrophic Failure

UNIT V **8HRS**

File Organization and Index Structure: File & Record Concept, Placing file records on Disk, Types of Records, Types of Single-Level Index, Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree . Mongo DB, NoSQL types, Features and tools.

UNIT-V **8HRS**

File Organization and Index Structure: File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree . Mongo DB, No SQL types, Features and tools.

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BTCS401N	DCC	Data Base Management Systems	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Text Books:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.GrawHill, 6th Edition,2015.

References:

1. Raghu Ramakrishnan and Johannes Gehrke "Database Management Systems" McGraw- Hill Education, 2003.
2. Kahate, Atul "Introduction to Database Management Systems" Pearson Education India, 2006.
3. C J Date, "An Introduction to Database System", Pearson Educations, 8th Edition, 2004
4. Ivan Bayross, "SQL, PL/SQL - The Programming Language of Oracle", BPB Publications 4th Revised Edition, 2010.
5. Elmasri, Navathe, "Fundamentals of Database Systems", Pearson Educations 7th Edition, 2016.
6. SeemaKedar, Database Management System, Technical Publications, 2009.
7. Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.

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BTCS401N	DCC	Data Base Management Systems	60	20	20	30	20	3	0	2	4

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;
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Suggested list of Practicals:-

1. Design a Database and create required tables. For e.g. Bank, College Database.
2. Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.
3. Write a SQL statement for table and record handling like implementing INSERT statement, using SELECT and INSERT together, DELETE, UPDATE, TRUNCATE statements and DROP, ALTER statements.
4. Write the queries for Retrieving Data from a Database Using the WHERE clause, using Logical Operators in the WHERE clause , Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING Clause, Using Aggregate Functions and Combining Tables Using JOINS.
5. Write the query for implementing the following functions: MAX (), MIN (), AVG (), COUNT ().
6. Write the query to implement the concept of Integrity constrains.
7. Write the query to create the views.
8. Perform the queries for triggers.
9. Perform the following operation for demonstrating the insertion , updating and deletion using the referential integrity constraints.
10. Write the query for creating the users and their role. Using GRANT and REVOKE operations.
11. Develop a small application for a patient admitted in a hospital which has capability of inserting, deleting, updating, the patient record. The application should also be able to search the patients record by its id.

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			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTIT301N	DCC	Computer Networks	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

The student will have ability to:
1. Understand the general overview of the concepts and fundamentals of computer networks.
2. Understand the various components required to build different networks.
3. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.
The students will be able to
1. Understanding basic computer network technology.
2. Understand the functions of each layer in the OSI and TCP/IP reference model.
3. Obtain the skills of subnetting and routing mechanisms
4. Familiarity with the essential protocols of computer networks, and how they can be applied in network design and implementation.

Syllabus:

UNIT I **9HRS**

Introduction :Importance of Computer Networks, Classifications & Types. Layered Architecture: Protocol hierarchy, Interfaces and Services, Connection Oriented &Connection less Services, ISO- OSI Reference Model, TCP/IP model overview, comparison of TCP/IP and ISO-OSI reference model.

UNIT II **9HRS**

Data Link Layer &MAC Sublayer:Need, Services Provided, Design issues, Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA, CSMA/CA, CSMA/CD.

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			THEORY			PRACTICAL					
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BTIT301N	DCC	Computer Networks	60	20	20	30	20	3	0	2	4

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UNIT III **9HRS**

Network Layer:Need, Services Provided, Design Issues, Routing Algorithms and types of Routing Algorithm, IPv4, IPv6, Classful and classless Addressing, Subnetting, Supernetting.

UNIT IV **10HRS**

Transport Layer: Need, Design Issues, Multiplexing and Demultiplexing, transport layer services, UDP,UDP Header Format, Principles of reliable data transfer, TCP,Connection Management, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management, SCTP.

UNIT V **8HRS**

Session layer: Overview, Authentication, Session layer protocols, Presentation layer: Overview, Data conversion, Encryption and Decryption, Presentation layer protocols (LPP, Telnet, X.25 packet Assembler/Disassembler), Application Layer: Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, FTP.

Text Books:

Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.

References:

1.BehrouzA.Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
2.William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
3. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
4. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

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BTIT301N	DCC	Computer Networks	60	20	20	30	20	3	0	2	4

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Suggested list of Practicals:-

1. Demonstrate Different Types of Network Equipment's.
2. Color coding standard of CAT 5, 6, 7 and crimping of cable in RJ-45.
3. LAN installations and Configurations.
4. Experiment with basic Network configuration commands.
5. Write a program for error detection and correction technique.
6. Write a program for framing.
7. Write a program for routing algorithm.
8. Socket Programming.
9. Study about different network simulators.
10. Establish and simulate peer to peer network using packet tracer.
11. Simulate LAN using hub and switch and discuss pros and cons of hub.
12. Router configuration using packet tracer.

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BTCS302N	DCC89	Analysis & Design of Algorithms	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

The student will have ability to:
1. To learn the algorithm analysis techniques.
2. To critically analyze the efficiency of alternative algorithmic solutions for the same problem
3. To understand the limitation of algorithm power.
4. To understand different algorithm design techniques.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The students will be able to

1. Define the basic concepts of algorithms and analyze the performance of algorithms.
2. Explain different standard algorithm design techniques, namely, divide & conquer, greedy, dynamic programming, backtracking and branch & bound.
3. Demonstrate standard algorithms for fundamental problems in Computer Science.
4. Design algorithms for a given problem using standard algorithm design techniques.
5. Analyze and compare the efficiency of various algorithms of a given problem.
6. Identify the limitations of algorithms in problem solving.
7. To identify the types of problem, formulate, analyze and compare the efficiency of algorithms.

Syllabus:

UNIT I **10HRS**

Algorithms Designing: Algorithms, Analyzing Algorithms, Asymptotic Notations, Heap Sort, Sorting and Searching Algorithms and their Analysis in terms of Space and Time Complexity.
Divide and Conquer:
General Method, Binary Search, Merge Sort, Quick Sort, Selection Sort, Strassen's Matrix Multiplication Algorithms.

UNIT II **9HRS**

Greedy Method: General Method, fractional Knapsack Problem, Job Sequencing with

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BTCS302N	DCC89	Analysis & Design of Algorithms	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Deadlines, Minimum-Cost Spanning Tree - Prim's and Kruskal's algorithm, Single Source Shortest Paths.

UNIT III **8HRS**

Dynamic Programming: General Method, Optimal Binary Search Trees, O/1 Knapsack, multistage graph, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV **7HRS**

Backtracking: General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, Sum of Subsets. Branch and Bound: GeneralMethod, O/1 Knapsack Problem, Traveling Salesperson Problem.

UNIT V **8HRS**

NP Hard and NP Complete Problems: Basic Concepts, Cook's Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

Text Books:

1. Ellis Horowitz and SartajSahni, "Fundamental of Computer Algorithms", 2nd Edition, Galgotia Publication, 2001.

References:

1. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest "Introduction to Algorithms",3rd Edition, MIT Press. 2009.
2. Donal E Knuth, "Fundamentals of Algorithms: The Art of Computer Programming" Vol l,3rd Edition, Pearson Educatio, 1997.
3. Goodman, S.E. &Hedetnieni,"Introduction to Design and Analysis of Algorithm", Tata McGraw Hill, 1977.
4. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani,"Algorithms",Tata McGraw Hill, 2006.
5. J.E Hopcroft, J.D Ullman, "Design and analysis of algorithms" TMH Publication.

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BTCS302N	DCC89	Analysis & Design of Algorithms	60	20	20	30	20	3	0	2	4

Legends: **L -** Lecture; **T -** Tutorial/Teacher Guided Student Activity; **P** – Practical; **C -** Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Suggested list of Practicals:-

1.Write a program for Iterative and Recursive Binary Search.
2.Write a program for Merge Sort.
3.Write a program for Quick Sort.
4.Write a program for Strassen's Matrix Multiplication
5.Write a program for minimum spanning trees using Kruskal's algorithm.
6.Write a program for minimum spanning trees using Prim's algorithm.
7.Write a program for single sources shortest path algorithm.
8.Write a program for Floyd-Warshal algorithm.
9.Write a program for traveling salesman problem.
10.Write a program for Hamiltonian cycle problem.

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BTDSE421M	DSE	Computer Graphics and Multimedia	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

The student will have ability to:
1. Understood basic concepts of computer graphics.
2.Extract the various computer graphics hardware and display technologies.
3.Evaluate various algorithms for scan conversion and filling of basic objects and their comparativeanalysis.
4.Acquire knowledge about drawing basic shapes such as lines, circle, ellipse, polygon.
5.Remembering knowledge about two- and three-dimensional transformations.
6.Analyze the line and polygon clipping algorithms of the basic shapes.
7.Understood the various Multimedia Operation and file formats.
2.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills, and attitudes.
The students will be able to
1. Apply basic concepts of computer graphics.
2.Able to perform processing of basic shapes by various processing algorithms /techniques.
3.Design two and three-dimensional graphics.
4.Analyze all the types of clipping algorithms for line and polygon.
5.Apply the acquire knowledge about Visible Surface Detection methods, Illumination Models and Surface Rendering.
6. Able to perform various types of color model implication.
7.Acquire knowledge to apply advanced techniques such as fractals, introduction to open GL and Multimedia Systems.

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTDSE421M	DSE	Computer Graphics and Multimedia	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Syllabus:

UNIT I **9HRS**

Introduction to Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, CRT color monitors,Beam Penetration CRT, The Shadow - Mask CRT, DVST, Graphics input devices, Graphics software and standards.

UNIT II **10HRS**

Points and Lines,DDA line drawing algorithm, Bresenham's drawing algorithm, Mid-point Circle drawing algorithm, Mid-point circle drawing algorithm, Mid-point Ellipse drawing algorithm, Parametric Cubic Curves: - Bezier and B-Spline curves, Filled Area Primitives: -Scan line polygon fill algorithm, Pattern fill algorithm Inside-Outside Tests, Boundary fill algorithms, Flood fill algorithms

UNIT III **10HRS**

2D transformation: Translation, Rotation, Scaling, Shearing, Reflection. Inverse Transformation, Homogenous coordinate system, Matrices Transformation, Composite Transformation.
3D transformations: translation, rotation, scaling. Parallel & Perspective Projection, Types of Parallel & Perspective Projection.Composite transformations Projections, Back Surface detection method Depth Buffer method Scan line method BSP tree method, Area Subdivision method.

UNIT IV **8HRS**

Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping, Cohen Sutherland, Midpoint Line clipping algorithms, Polygon Clipping: Sutherland –Hodgeman, Weiler-Atherton algorithms.
Basic Illumination Model, Diffuse reflection, Specular reflection, Phong Shading Gourand shading, ray tracing, color models like RGB, YIQ, CMY, HSV.

UNIT V **9HRS**

Multimedia System: An Introduction, Multimedia hardware, Multimedia System Architecture. Data & File Format standards.i.e RTF, TIFF, MIDI, JPEG, DIB, MPEG, Audio: digital audio, MIDI, processing sound, sampling, compression. Video: Avi, 3GP, MOV, MPEG, compression standards, compression through spatial and temporal redundancy. Multimedia Authoring.

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BTDSE421M	DSE	Computer Graphics and Multimedia	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Textbooks:

1. John F. Hughes, Andries Van Dam, Morgan McGuire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", , 3rd Edition, Addison- Wesley Professional,2013.

References:

1. Computer Graphics, C Version, 2e Paperback – 2002
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. David F Rogers, "Procedural elements for Computer Graphics", Tata McGraw Hill, Second Edition.
5. Foley, VanDam, Feiner and Hughes, "Computer Graphics Principles & Practice in C", Second edition, Pearson Education.
6. David Hillmaa, "Multimedia Technology & Applications, Delmar, 1998.
7. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007.

Suggested list of Practicals:-

1. Implement DDA Line Drawing algorithm .
2. Implement Bresenham's line drawing algorithm.
3. Implement Mid-Point circle drawing algorithm.
4. Implement Mid-Point ellipse drawing algorithm.
5. Implement cubic Bezier curve.
6. Implement a menu-driven program for 2D transformations.
7. Implement Line clipping algorithm using Cohen-Sutherland
8. Implement Polygon Clipping using Sutherland Hodgeman.
9. Implement Scan line fill algorithm.
10. Study of Multimedia and Program for Flash.

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BTDSE422M	DSE	Principles of Distributed Systems	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Educational Objectives (CEOs):

The student will have ability to:

1. Observe the principles, architectures, algorithms and programming models used in distributed system.
2. Analyze state-of-the-art distributed system, such as Google File System.
3. Model and implement sample distributed system.
4. Summarize the functionality of Distributed System.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Understand architecture and communication systems in Distributed Systems.
2. Understand synchronization and various election algorithms in Distributed Systems.
3. Discuss different Distributed File System.
4. Evaluate Distributed Shared Memory.
5. Analyze various consistency and replication protocols and methods.
6. Understand various types of Distributed Systems.
7. Determine performance evaluation of various types of Distributed System.

Syllabus:

UNIT I **10HRS**

Characterization of Distributed System: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges.
System Models: Introduction, Architectural Models, Fundamental Models.

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BTDSE422M	DSE	Principles of Distributed Systems	60	20	20	30	20	2	0	2	3

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UNIT II **9HRS**

Time and Global States: Introduction, Clocks Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States, Distributed Debugging.
Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, Consensus and Related Problems.

UNIT III 8**HRS**

Inter Process Communication: Introduction, the API for the Internet Protocols, External Data Representation and Marshalling, Client-Server Communication
Distributed Computing Paradigms: Basic Message Passing Model – The Client Server, Message Passing, RPC basics, RPC implementation, RPC communication and issues, Remote Procedure Call Model – RPC in conventional languages and in Java - The Distributed Objects – The Collaborative Application

UNIT IV **7HRS**

Distributed File Systems: File system, DFS- definition, Characteristics, Goals, File Service Architecture.
Name Services: Introduction, Name Services and the Domain Name System, Directory Services, Case Study of the Global Name Services.
Distributed Shared Memory: Introduction, Design and Implementation Issues, Sequential Consistency, Release Consistency, , Other Consistency Models.

UNIT V **8HRS**

Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency Control.
Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery.

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BTDSE422M	DSE	Principles of Distributed Systems	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
*__Teacher Assessment__ shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Text Books:

1. Distributed Systems, Principles and Paradigms, Andrew S. Tanenbaum, Maarten Van Steen, 3rd Edition 2017, PHI.

References:

1. Distributed Systems, Concepts and Design, George Coulouris, J Dollimore and Tim Kindberg, Pearson Education, 5th Edition. 2017.
2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, hapman&Hall/CRC, Taylor & Fransis Group, 2014.
3. P. K. Sinha, *Distributed Operating Systems: Concepts and Design*, IEEE press 3rd Edition, 2009
4. M. Singhal and N. G. Shivaratri, *Advanced Concepts in Operating Systems*,, McGraw-Hill, 2011.

Suggested list of Practicals:-

1.Implement concurrent echo client-server application.
2.Implement concurrent day-time client-server application.
3.Incrementing a counter in shared memory.
4.Create CORBA based server-client application.
5.Configuring reliability and security options.Monitor SOAP request and response packets.
6.Analyze parts of it and compare them with the operations (java functions) headers
7.Design XML Schema and XML instance document .

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BTDSE423M	DSE	Information Storage and Management	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Course Objectives:

1. An ability to understand various storage architecture & technologies.
2. An ability to understand various technologies used to provide backup & recovery.
3. An ability to understand various techniques used to provide security.
4. Ability to identify information storage system requirements.
5. An ability to develop policy for information storage system.
6. An ability to develop policy for backup& recovery.

Course Outcomes:

On completion of the course students will be able to:

1. Describe & apply storage technologies.
2. Identify storage technologies that provide cost effective IT solution for medium to large scale businesses & data centers.
3. Manage Virtual Server & Storage between Remote locations.
4. Design analysis and manage clusters of resources

Syllabus:

Unit-I: **10HRS**

Introduction: Digital data and its types, Information storage, Key characteristics of data center, Evolution of computing platforms. Introduction to storage technology: Data Proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

Unit-II: **9HRS**

Storage System Architecture: Intelligent disk subsystems overview, Contrast of integrands modular array, Component Architecture of Intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.

.**Unit-III:** **8HRS**

Introduction to network storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison, Applications, Elements, Connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN

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BTDSE423M	DSE	Information Storage and Management	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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Unit-IV: **7HRS**

Hybrid storage solutions and virtualization: memory, network, server, storage & appliances. Data centre concepts & requirements, Backup and disaster recovery. Industry Management standards, standard framework applications, Key management metrics

Unit-V: **8HRS**

Information storage on clouds: concept of cloud, cloud computing, storage on cloud, Cloud benefits, Cloud computing evolution. Application & services on cloud, cloud service providers, cloud deployment models, Essential characteristics of cloud computing.

Text Books:

1. G.Somasundaram & Alok Shrivastava editors, ISM: Storing, Managing, and Protecting Digital Information; Wiley India

Reference Books:

1. Saurabh; Cloud Computing: Insight into New era Infrastructure; Wiley India.
2. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained: Basic and application of fiber channels, SAN, NAS, ISESI, INFINIBAND and FCOE, Wiley India.
3. Sosinsky, Cloud Computing Bible, Wiley India.

Suggested list of Practicals:-

1. Understand working of different storage devices .
2. Perform different steps for data backup and recovery.
3. Analyze of various techniques to provide security to data.
4. Understand different policies for information storage and management.
5. Demonstrate how to manage Virtual Server and Storage between remote locations.
6. Understand physical structure and components of hard disc.
7. Analyze how information storage on cloud is performed.

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			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTIT307N	SEC	Introduction to core JAVA	0	0	0	30	20	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

Course Educational Objectives (CEOs):

The student will have ability to:

1. Understand Java Environment for application development.
2. Understand Programing using Object Oriented Technology.
3. Develop computer program to solve specific problems with high performance.
4. Create debug and run java standalone applications.
5. Understand the concept of Exception handling and Multithreading.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Design new applications using object oriented methodologies.
2. Explore various system libraries.
3. Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
4. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes..
5. Design Data base connectivity program for simple problems.

Syllabus:

UNIT I **12HRS**

Introduction to Java: Java's magic, The Byte code, Java Development Kit (JDK), Java Buzzwords, Object oriented programming, Simple Java programs, Data types, variables and arrays, Operators, Control Statements**.**

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
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BTIT307N	SEC	Introduction to core JAVA	0	0	0	30	20	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
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UNIT II 8**HRS**

Classes, Inheritance, Packages and Interfaces: Classes: Classes fundamentals, Declaring objects, Constructors, this keyword, garbage collection. Inheritance: inheritance basics, using super, creating multi level hierarchy, method overriding. Packages, Access Protection, Importing Packages, Interfaces.

UNIT III **7HRS**

Exceptions handling and Multi-threading: Exception , Exceptions and Errors ,Types of Exception, Control Flow in Exceptions, Use of Try, Catch, Finally, Throw, Throws in Exception Handling, In-Built and User Defined Exceptions, Checked and Un Checked Exceptions.

UNIT IV **8HRS**

Understanding Threads, Needs of Multi-Threaded Programming, Thread Life Cycle, Thread Priorities ,Synchronizing Threads,

UNIT V **8HRS**

The Java Library: String Handling, Exploring Java.Lang, Java.Util – The Collection Framework, Exploring Java.IO.

Text Books:

1. E. Balagurusamy, “Programming with java A Primer”, Fourth Edition, Tata McGraw Hill, 2009

References:

2. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.

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***Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.**

3. Introduction to Java programming, By Y.DanielLiang,Pearson Publication.
4. SouravSahay, Object Oriented Programming with C++ , Oxford University Press,2006
5. Herbert Schildt, “The Complete Reference Java”, Ninth Edition, McGraw Hill, 2014
6. Bert Bates, Kathy Sierra, “Head First Java”, 2nd Edition, O’ Reilly, 2005

Suggested list of Practical’s:-

1. Write a program to show concept of Class in Java.
2. Write a program showing Type Casting
3. Write a program showing Different type of inheritance
4. Write a program showing Different types of Polymorphism.
5. Write a program showing Encapsulation
6. Write a program showing Abstraction
7. Write a program showing interface.
8. Write a program showing abstract class.
9. Write a program showing inner class.
10. Write a Multithreaded program.
11. Write a program showing Checked and Unchecked Exception.

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CL110	DCC	Red Hat Openstack Administration I	0	0	0	0	100	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
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Course Objectives:

The student will have ability to:

1. P Launch instances to satisfy various use case examples.
2. Manage domains, projects, users, roles, and quota in a multitenant environment.
3. Manage networks, subnets, routers, and floating IP addresses.
4. Manage instance security with group rules and access keys.

Course Outcomes:

The students will be able to:

1. Design and implement on-demand projects, software-defined networks, and virtual Machine instances.
2. Deploy a proof-of-concept Openstack installation for practice, development, demonstration, and testing, back in your own home or business computing environment. 3. Manage software-defined networks such as subnets, routers, floating IP addresses, images, flavors,security groups/rules, and block and object storage.
4. Create and customize advanced VM instances as applications, customize on deploy, and createscalable stacks of multiple VM applications.

Syllabus:

UNIT I

Introduction to Red Hat OpenStack Platform: Describe OpenStack personas, launch an instance, and describe the OpenStack components and architecture.

Manage application projects in a multitenant cloud: Create and configure projects with secure user access and sufficient resources to support cloud user application deployment requirements.

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CL110	DCC	Red Hat Openstack Administration I	0	0	0	0	100	0	0	2	1

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UNIT II

Manage OpenStack networking : Describe how IP networks are implemented in OpenStack, including fundamental TCP/IP stack behavior, software-defined networking elements, and the common types of networks available to self-service cloud users.

Configure resources to launch a non-public instance: Configure the requisite resource types for launching a basic non-public instance, including vCPUs, memory, and a system disk image, and launch an instance of an application component that runs in a tenant network with no public access.

UNIT III

Configure virtual machine system disks: Identify the available choices for configuring, storing and selecting block-based virtual machine (VM) system disks, including the choice of ephemeral or persistent disks for specific use cases

Provide additional storage strategies: Identify the available choices for additional cloud storage techniques, including object-based storage, network file sharing, and volumes sourced from a file sharing service.

UNIT IV

Configure resources to launch an instance with public access: Identify and configure the additional resource types required to launch instances with public access for specific use cases, including networking and access security elements.
Automate customized cloud application launches: Configure and deploy a typical multi-tier cloud application stack, defined as an architected template of scalable VM instances, including per- instance launch customizations.

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CL110	DCC	Red Hat Openstack Administration I	0	0	0	0	100	0	0	2	1

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;
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UNIT V

Manage cloud application placement: Introduce over cloud layouts more complex than a single site, and explain the management resources to control the placement of launched instances, including segregation elements such as cells and availability zones, and placement attributes such as requisite compute node resources.

TEXT BOOKS:

1. Adolfo Vazquez, Chen Chang, Fiona Allen, Herve Quatremain,Morgan Weetman, Snehangshu Karmakar. Red Hat OpenStack Administration I: Core Operations for Cloud Operators, Edition 1, Red Hat Inc.

REFERENCES:-

1. Red Hat OpenStack Administration I: Core Operations for Cloud Operators, https://www.redhat.com/en/services/training/cl110-red-hat-openstackadministration-i
2. Red Hat OpenStack Administration I: Core Operations for Cloud Operators (CL110), https://www.redhat.com/en/blog/now-available-openstack-13-red-hatopenstack-administration-i-core-operations-cloud-operators-cl110

LIST OF PRACTICALS:

1. Introduction to the Lab
2. Introduction to Red Hat Openstack
3. Case Study: Manage application projects in a multitenant cloud
4. Case Study: Manage OpenStack networking
5. Configure virtual machine system disks
6. Case Study: Configure resources to launch a non-public instance
7. Configure resources to launch an instance with public access
8. Case Study: Automate customized cloud application launches
9. Case Study: Manage cloud application placement
10. Case Study: Additional Storage Strategies

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Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		