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Semester-IV (2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING&EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM 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 Objectives:

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:

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.

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

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Unit II: Climate Change and Environmental Challenges **9HRS**

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

Unit III: Environmental Management and Sustainable Development **8HRS**

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 IV: Environmental Acts **7HRS**

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

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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 **8HRS**

1. Environmental Values
2. Positive 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

TEXTBOOKS:

1. Rogers, P.P., Jalal, K.F., Boyd, I.A.(Latest Edition) . An Introduction to Sustainable Development. Earthscan
2. Kalam, A.P.J. (Latest Edition). Target 3 Billon: Innovative Solutions Towards Sustainable Development. Penguin Books

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3. Kaushik, A. and Kaushik (Latest Edition). Perspectives in Environmeniaf Studies. New Delhi: New Age International Publishers.
4. Dhameja, S.K. (Latest Edition). Environmental Studies. S.K. Kataria and Sons.New Delhi
5. Bharucha,E. (Latest Edition). Environmental Studies for Undergraduate Courses. New 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.

REFERENCES:

1. R. Rajagopalan(2006).Environmental Studies. Oxford University Press.
2. M. AnjiReddy(2006).Textbook of Environmental Sciences and Technology. BS Publication.
3. Richard T. Wright (2008).Enviromental Science: towards a sustainable future PHL Learning Private Ltd. New Delhi.
4. Gilbert M. Masters and Wendell P. Ela.(2008).Environmental Engineering and science. PHI Learning Pvt Ltd.

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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.

5. Daniel B. Botkin& Edwards A. Keller (2008). Environmental Science Wiley INDIA edition.
6. AnubhaKaushik(2009).EnviromentalStudies. New age international publishers.

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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.

Course Objectives:

The student will have ability to:

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:

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.

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

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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.

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.

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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.

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Textbooks:

1. Henry F. Korth and Silberschatz Abraham, "Database System Concepts", Mc.GrawHill, 6th Edition,2015.
2. Elmasri, Navathe, "Fundamentals of Database Systems", Pearson Educations 7th Edition, 2016.
3. SeemaKedar, Database Management System, Technical Publications, 2009.
4. Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.

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.

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List of Practical:

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.

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

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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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BTAIML402N	DCC	AI Fundamentals	60	20	20	30	20	3	0	2	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.

Course Objectives:

1. To enable students to understand and explain the fundamental concepts of artificial intelligence, including machine learning, anomaly detection, computer vision, natural language processing, knowledge mining, and responsible AI.
2. To equip students with the knowledge and skills to use Microsoft Azure AI tools, such as Azure Machine Learning Studio, Azure Automated Machine Learning, and Azure Machine Learning Designer, to solve real-world problems through machine learning.
3. To provide hands-on experience to students in applying computer vision techniques, including image analysis, classification, object detection, face analysis, and receipt analysis, using Azure AI services.
4. To familiarize students with decision support systems and their practical applications through the exploration of Anomaly Detectors and their implementation in detecting anomalies in various contexts.

Course Outcomes:

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

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BTAIML402N	DCC	AI Fundamentals	60	20	20	30	20	3	0	2	4

1. Describe Artificial Intelligence workloads and considerations.
2. Describe the fundamental principles of machine learning on Azure.
3. Describe features of computer vision workloads on Azure.
4. Describe features of Natural Language Processing (NLP) workloads on Azure.
5. Discover the services available on Azure to detect anomalies in the time-series or real-time data.

Syllabus:

UNIT I **10HRS**

Microsoft Azure AI Fundamentals: Get started with artificial intelligence

Introduction to AI, Understand machine learning, Understand anomaly detection, Understand computer vision, Understand natural language processing, Understand knowledge mining, Challenges and risks with AI, Understand Responsible AI

UNIT II **9HRS**

Microsoft Azure AI Fundamentals: Explore visual tools for machine learning

What is machine learning?, What is Azure Machine Learning studio?, What is Azure Automated Machine Learning?, Understand the AutoML process, Identify regression machine learning scenarios, What is Azure Machine Learning?, What is Azure Machine Learning designer?,

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BTAIML402N	DCC	AI Fundamentals	60	20	20	30	20	3	0	2	4

Understand steps for regression, Identify classification machine learning scenarios, What is Azure Machine Learning?, What is Azure Machine Learning designer?, Understand steps for classification, Identify clustering machine learning scenarios, What is Azure Machine Learning?, What is Azure Machine Learning designer, Understand steps for clustering

UNIT III **8HRS**

Microsoft Azure AI Fundamentals: Explore computer vision

Get started with image analysis on Azure, Understand classification, Get started with image classification on Azure, What is object detection?, Get started with object detection on Azure, Get started with Face analysis on Azure, Get started with the Read API on Azure, Get started with receipt analysis on Azure

UNIT IV **7HRS**

Microsoft Azure AI Fundamentals: Explore natural language processing

Explore text mining and text analysis with the Language service's Natural Language Processing (NLP) features. Recognize and synthesize speech by using Azure Cognitive Services. Translate Speech and Text. Create a language model with Conversational Language Understanding

UNIT V **8HRS**

Microsoft Azure AI Fundamentals: Explore decision support

What is Anomaly Detector?, How Anomaly Detector works, When to use Anomaly Detector

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BTAIML402N	DCC	AI Fundamentals	60	20	20	30	20	3	0	2	4

Textbooks:

1. Exam Ref AI-900 Microsoft Azure AI by Julian Sharp
2. Microsoft Azure AI Fundamentals Certification Exam Preparation Guide - (AI-900): Microsoft AI-900 Certification Exam Guide by Raman Publications, R. Raman
3. Microsoft Azure AI Fundamentals AI-900 Over 100 Practice Questions: Exam AI-900 First Edition (Azure Certifications Journey Book 3)by Abhishek Chaudhary

References:

1. https://learn.microsoft.com/en-us/certifications/exams/ai-900/
2. https://learn.microsoft.com/en-us/training/paths/explore-fundamentals-of-decision-support/
3. https://learn.microsoft.com/en-us/training/paths/explore-fundamentals-of-knowledge-mining/
4. https://learn.microsoft.com/en-us/training/paths/get-started-with-artificial-intelligence-on-azure/
5. https://learn.microsoft.com/en-us/training/paths/create-no-code-predictive-models-azure-machine-learning/
6. https://learn.microsoft.com/en-us/training/paths/explore-computer-vision-microsoft-azure/

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List of Practical:

1. Explore Cognitive Services
2. Explore Automated Machine Learning in Azure ML
3. Explore regression with Azure Machine Learning Designer
4. Explore classification with Azure Machine Learning Designer
5. Explore clustering with Azure Machine Learning Designer
6. Explore Computer Vision
7. Explore image classification
8. Explore object detection
9. Explore face recognition
10. Explore optical character recognition
11. Explore form recognition
12. Explore text analytics
13. Explore speech
14. Explore translation
15. Explore language understanding
16. Explore question answering
17. Explore knowledge mining

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BTCS403N	**SEC**	**Fundamentals of Design Thinking**	**60**	**20**	**20**	**30**	**20**	**1**	**0**	**2**	**2**

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Course Objectives:

The student will have ability to:

1. To learn the concepts of Business Process Management.
2. To emphasizing the concepts of reuse, ease of maintenance, and high-quality development strategies.
3. To create a simple case and a business process definition (BPD) from business requirements.

Course Outcomes:

The students will be able to:

1. To implement business process management (BPM).
2. List and describe the phases in the BPM lifecycle Procedure.
3. Explore process modeling and creating applications.
4. Understand what came before Design Thinking
5. Learn how design thinking is introduced in an organization
6. Learn how it built upon previous approaches

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			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTCS403N	SEC	Fundamentals of Design Thinking	60	20	20	30	20	1	0	2	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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7. Understand the whole overview of the whole approach to design thinking
8. Understand the principles, loop, and keys

Syllabus:

UNIT I **10HRS**

INTRODUCTION TO BUSINESS PROCESS &AS-IS BUSINESS PROCESS

Define business process management (BPM), List and describe the phases in the BPM lifecycle procedure, Define process modelling., Describe how to use IBM Business Process Manager to accomplish process modelling goals, Explain how to create and modify process applications in the Process Centre, Create a process application, Explain case management, Describe the purpose and function of Blue works Live, Create a business process definition (BPD) from the process and nested process tasks and responsible.

UNIT II **9HRS**

MODELING PROCESS

List and describe gateways as they are used in Process Designer, List and describe intermediate event types in Process Designer, model a business process escalation path with an attached timer intermediate event, Describe the Playback 0 validation goals and requirements, validate that a process model meets Playback 0 goals and Requirements.

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			THEORY			PRACTICAL		L	T	P	CREDITS
			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTCS403N	SEC	Fundamentals of Design Thinking	60	20	20	30	20	1	0	2	2

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

ENTERPRISE DESIGN THINKING

Understand what came before Design Thinking, identify who did what to bring it about, learn how it built upon previous approaches, get an overview of the whole approach to design thinking, Understand the principles, loop, and keys, determine what is most important.

UNIT IV **7HRS**

ENTERPRISE DESIGN THINKING –7 KEY HABITS, THE LOOP, USER RESEARCH

Learn 7 key habits of effective thinker's design, avoid common anti-patterns, optimize for success with these habits, Understand the importance of iteration, learn how to observe, reflect, & make, get ready to drill down & do tomorrow, Understand the importance of user research, appreciate empathy through listening, Learn key methods of user research.

UNIT V **8HRS**

ENTERPRISE DESIGN THINKING – MAKE, USER FEEDBACK: -

Understand how Make fits into the Loop, learn how to leverage Observe information, Learn Ideation, Storyboarding, & Prototyping, understand user feedback and the Loop, Learn the different types of user feedback, learn how to carry out getting feedback.

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			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTCS403N	**SEC**	**Fundamentals of Design Thinking**	**60**	**20**	**20**	**30**	**20**	**1**	**0**	**2**	**2**

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.

Textbooks:

1. Kathryn Christopher, Design Thinking in Engineering, Kendall/Hunt Publishing Co ,U.S. 2019.
2. David West and Rebecca Rinker Design Thinking: The Key to Enterprise Agility, Innovation, and Sustainability Author's Press International , 2017.

References:

1. Design Thinking for Dummies 1st Edition, Writing is designing: Words and the User.
2. Experience, The Design Thinking Toolbox: A Guide to Mastering the Most Popular and Valuable, Innovation Methods, 1st Edition, Design Thinking in Play: An Action Guide for Educators
3. Roger L. Martin Design of Business: Why Design Thinking is the Next Competitive Advantage, Harvard Business Review Press (26 October 2009)

List of Practical:

1. Design your first discovery map in blueworks live study of process life cycle.
2. Designing process model in blueworks live.

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BTCS403N	**SEC**	**Fundamentals of Design Thinking**	**60**	**20**	**20**	**30**	**20**	**1**	**0**	**2**	**2**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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3. Explore adding and viewing process details in blueworks live
4. Design enterprise thinking - listening.
5. Design enterprise thinking - hmw
6. Design enterprise thinking - user research
7. Design enterprise thinking – reflect
8. Design enterprise thinking – ideation
9. Design enterprise thinking – storyboarding
10. Design enterprise thinking - crafting hills
11. Design enterprise thinking – prototyping.

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			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTDSE411N	**DSE**	**Principles of Distributed Systems**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**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.

Course Objectives:

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:

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.

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			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTDSE411N	**DSE**	**Principles of Distributed Systems**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**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.

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.

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

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.			TEACHING&EVALUATION SCHEME								
			THEORY			PRACTICAL					
COURSE CODE	CATEGORY	COURSE NAME	ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*	L	T	P	CREDITS
BTDSE411N	DSE	Principles of Distributed Systems	60	20	20	0	0	3	0	0	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.

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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.			TEACHING&EVALUATION SCHEME								
			THEORY			PRACTICAL					
COURSE CODE	CATEGORY	COURSE NAME	ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*	L	T	P	CREDITS
BTDSE411N	DSE	Principles of Distributed Systems	60	20	20	0	0	3	0	0	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.

Textbooks:

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.

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BTDSE412N	**DSE**	**Information Storage and Management**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**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.

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 Introduction: Digital data and its types, Information storage, Key characteristics of data center, Evolution of computing platforms. Introduction to storage technology: Data Proliferation,

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			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTDSE412N	**DSE**	**Information Storage and Management**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**3**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
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evolution of various storage technologies, Overview of storage infrastructure components, Information life Cycle Management, Data categorization.

UNIT II

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

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

UNIT IV

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.

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BTDSE412N	**DSE**	**Information Storage and Management**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**3**

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

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.

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			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTDSE413N	**DSE**	**Wireless networks**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**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.

Course Objectives:

The student will have ability to:

1. Understand the fundamental of wireless communication system.
2. Describes wireless channel effects.
3. Able how to model different wireless communication scenarios.
4. An ability to explain multiple access techniques for Wireless Communication.
5. Evaluate the performance of various schemes for wireless communications.
6. Analyze fundamental concept of cellular radio concepts.
7. Apply various wireless communication network systems, standards, and applications.

Course Outcomes:

The students will be able to:

1. Demonstrates wireless communication systems design and working.
2. Determine various advanced techniques for wireless communications.
3. Develop models to understand various characteristics of wireless communications.
4. Analyze design architectures for different Wireless Systems.
5. Evaluates the emerging trends in Wireless communication.
6. Able to Apply concepts of radio communications
7. Understands the applications of wireless communications tools.

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BTDSE413N	**DSE**	**Wireless networks**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**3**

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

UNIT I **10HRS**

Introduction to Wireless Communication System: Evolution of mobile communications, Types of Wireless communication System, Comparison of Common wireless system, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL), Wireless Local Area network (WLAN),

UNIT II **9HRS**

The Cellular Concept- Cellular system, Hexagonal geometry cell and concept of frequency reuse Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, Umbrella Cell Concept, Cell sectorization, Repeaters, Micro cell zone concept, Channel antenna system

UNIT III 8**HRS**

Mobile Radio Propagation Model, Small Scale Fading and diversity: Large scale path loss:- Free Space Propagation loss equation, Reflection, Ray ground reflection model, Diffraction, Scattering, Link budget design, Indoor and outdoor propagation models, Small scale multipath propagation, Impulse model for multipath channel, Delay spread, Feher‟s delay spread.

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BTDSE413N	**DSE**	**Wireless networks**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**3**

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

Mobile Network And Transport Layers :Mobile IP , Dynamic Host Configuration Protocol, Mobile Ad Hoc Routing Protocols, Multicast routing, TCP over Wireless Networks , Indirect TCP , Snooping TCP, Mobile TCP .Wireless Systems: GSM system architecture, Protocols, Authentication and security in GSM, GSM speech coding, GPRS system architecture.

UNIT V **8HRS**

Introduction to Wi-Fi, WiMAX, Zig-Bee Networks, Software Defined Radio, UWB Radio, Wireless Adhoc Network and Mobile Portability, Security issues and challenges in a Wireless network. Application Layer :WAP Model, Mobile Location based services ,WAP Gateway ,WAP protocols wireless bearers for WAP , WML ,WMLScripts

Textbooks:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education,
2. William Stallings, “Wireless Communications and Networks”, Pearson Education.

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BTDSE413N	**DSE**	**Wireless networks**	**60**	**20**	**20**	**0**	**0**	**3**	**0**	**0**	**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.

References:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", First Edition, Pearson Education,
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer,
3. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
4. Wireless digital communication, KamiloFeher, PH.
5. William D Stanley : Network Analysis with Applications, Pearson Education.
6. Roy Choudhary D: Network and systems, New Age Publication.
7. Wireless Communication, Theodore S. Rappaport, Prentice hall

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BTIT407N	**DCC**	**Advanced Java Programming**	**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 Objectives:

The student will have ability to:

1. Understand HTML Tags.
2. Understand Database connectivity and sql queries in java.
3. Design and develop Web applications using servlet and JSP.
4. Understand how to work with JavaBeans.
5. Designing applications using pre-built frameworks.

Course Outcomes:

The students will be able to:

1. learn to access database through Java programs, using Java Data Base Connectivity (JDBC)
2. Design new applications using object-oriented methodologies.
3. Create dynamic web pages, using Servlets and JSP.
4. Make a reusable software component, using Java Bean.
5. Design Data base connectivity program for simple problems.

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			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTIT407N	DCC	Advanced Java Programming	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.

Syllabus:

UNIT I **10HRS**

Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features Using Swing Components, Java Utilities (java.util Package)
Event-Driven Programming in Java, Event- Handling Process, Event Handling Mechanism, The Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling.

UNIT-II **6HRS**

Servlets: Basics of Web, MVC in Server-side Programming, Servlet API, Servlet Interface, Generic Servlet, HTTP Servlet, Servlet Life Cycle, Working with Apache Tomcat Server, Steps to create a servlet in Tomcat, Deployment descriptor. Servlet Request: Various Servlet Request methods for form data and HTTP header data.

UNIT-III **8HRS**

Session Tracking: Purpose and need of Session Tracing. Approaches to session tracking: Cookies, Hidden Form Field, URL Rewriting, Session tracking with JAVA servlet API.

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Choice Based Credit System (CBCS) in Light of NEP-2020
B.Tech.(CSE- Artificial Intelligence and Machine Learning - Microsoft)
Semester-IV (2021-2025)

COURSE CODE	CATEGORY	COURSE NAME	TEACHING&EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			ENDSEM University Exam	Two Term Exam	Teachers Assessment*	ENDSEM University Exam	Teachers Assessment*				
BTIT407N	DCC	Advanced Java Programming	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-IV **6HRS**

Database Connectivity and Servlet Collaboration: Database drivers, JDBC, API for Querying with database, API for updating the database. Servlet collaboration: Methods of Request Dispatcher interface: forward, Include. Send redirect.

UNIT-V **8HRS**

Java Server Pages: Basic of JSP: Life Cycle of JSP, JSP API. Scripting Elements: - Scrip let Tag, expression tag, declaration tag. 9 Implicit Object: out, request, response, config, application, session, page context, page, and Exception. Directives: - page directive, include directive, taglib; Exception Handling, Action Elements, JSTL, Custom tags.

Textbooks:

1. Herbert Schildt, "J2EE The Complete Reference Java", Ninth Edition, McGraw Hill, 2017

References:

1. Bert Bates, Kathy Sierra, "Headfirst Java", 2nd Edition, O' Reilly, 2005
2. Advanced Java 2 Plateform, How to program, 2nd edition, Harvey.M.Dietel, Prentice Hall.

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List of Practical:

1. A html program for creating text box, check box, radio button, list, submit button.
2. A html program for Student registration page.
3. WAP in Servlets to get and display value from an HTML page.
4. A program to execute select query using JDBC.
5. A program to update customer information.
6. A simple servlet that just generates plain text.
7. A program to display cookie id.
8. A program for session tracking.
9. Write a program showing Database connectivity.
10. Write a program showing Simple database Operation (CRUD).
11. WAP in JSP to get and display value from an HTML page
12. A program for display student result by JSP page

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BTIT408N	**SEC**	**Unix Programming Lab**	**0**	**0**	**0**	**0**	**50**	**0**	**0**	**2**	**1**

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Course Objectives:

The student will have ability to:

1. Provide introduction to UNIX Operating System and its File System.
2. Gain an understanding of important aspects related to the SHELL and the process
3. Develop the ability to formulate regular expressions and use them for pattern matching.
4. Provide a comprehensive introduction to SHELL programming, services, and utilities.
5. Develop the ability to perform different networking tasks.

Course Outcomes:

The students will be able to:

1. Describe the architecture and features of UNIX Operating System.
2. Distinguish UNIX Operating System from other Operating Systems.
3. Demonstrate UNIX commands for file handling and process control.
4. Show the working of vi editor in all its modes using various commands.
5. Write Regular expressions for pattern matching and apply them to various filters for a specific task.
6. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem.
7. Diagnose network using different networking utilities of UNIX.

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Syllabus:

UNIT I: **10HRS**

Introduction to UNIX - The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal and External Commands, Command Structure.

General purpose utilities: cal, date, echo, printf, bc, script, passwd, path, who, uname, tty, pwd, cd, mkdir, rmdir.

UNIT II: **9 HRS**

Handling Files - The File System,touch, cat, cp, rm, mv, more, file, ls, wc, pg, comm, gzip, tar, zip, df, du, The vi editor.

Security by file Permissions: chmod, umask .

Networking commands: ping, telnet, ftp, finger, arp, rlogin.

UNIT III: **8 HRS**

Shell Basics - Types of shells, Shell Functionality, Work Environment, writing script & executing basic script, debugging script, Making interactive scripts, Variables (default variables), Mathematical expressions. Conditional statements: If-else-elif, Test command, Logical operators - AND, OR, NOT, Case –esac. Loops: While, For, Until Break & continue.

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UNIT IV: **7HRS**

Command Line Arguments & Regular Expression - Command line arguments: Positional parameters, Set & shift, IFS. Functions & file manipulations: Processing file line by line, Functions. Regular Expression & Filters: Regular expression, grep, cut, paste, sort , head , tail , nl , pipe ,tr, tree , meta characters.

UNIT V: 8**HRS**

SED and AWK - SED: Scripts, Operation, Addresses, commands, Applications.
AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications awk.

TEXTBOOKS:

1. Sumitabha Das: “YOUR UNIX – The Ultimate Guide”, Tata McGraw Hill.

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REFERENCES:

1. Behrouz A. Forouzan, Richard F. Gilbery, "Unix and Shell Programming",Cengage Learning India.
2. Graham Glass, King Ables, "Unix for programmers and users", Pearson Education.
   N.B. Venkateswarlu, "Advanced Unix programming", B S Publications.
3. Yashavant Kanetkar, "Unix Shell programming", 1st Edition, BPB Publisher.
4. Stephen Prata "Advanced UNIX: A Programming's Guide", BPB Publications.
5. Maurice J. Bach "Design of UNIX O.S. ", PHI Learning.
6. Brian W. Kernighan & Robe Pike, "The UNIX Programming Environment", PHI Learning.

LIST OF EXPERIMENTS:

1. Perform installation of UNIX/LINUX operating system.
2. Study of UNIX general purpose utility commands.
3. Execution of various file/directory handling commands.
4. Working with the vi editor: Creating and editing a text file with the vi text editor using the standard vi editor commands.
5. Write a shell script for calculator (to perform basic arithmetic and logical calculations).

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6. Write a shell script that will take an input file and remove identical lines (or duplicate lines from the file).
7. Shell scripts to explore system variables such as PATH, HOME etc.
8. Execution of various system administrative commands.
9. Write awk script that uses all its features.
10. Write a shell script to display list of users currently logged in.
11. Write a shell script to delete all the temporary files.
12. Write shell script to perform different string operations of arrays.