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 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:
Upon completion of the subject, 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.

SYLLABUS
UNIT I   10 HOURS
Introduction to Environment Pollution and Control:
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   HOURS
Climate Change and Environmental Challenges:
1. Global Warming and Green House Effect
2. Depletion of the Ozone Layer
3. Acid Rain
4. Nuclear Hazards

UNIT III   9 HOURS
Environmental Management and Sustainable Development:
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)

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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.

UNIT IV   8 HOURS
Environmental Acts:
1. The Water (Prevention and Control of Pollution) Act, 1974: Objectives, Definition of Pollution under this act, Powers and Functions of Boards
2. The Air (Prevention and Control of Pollution) Act, 1981:Objectives, Definition of Pollution under this act, Powers and Functions of Boards
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   7 HOURS
Role of Individuals, Corporate and Society:
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 TajMahal. Uttarakhand flash floods.

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

REFERENCE:
1. Kaushik A. and Kaushik, *Perspectives in Environmental Studies*, New Delhi: New Age International Publishers.
2. Dhameja, S.K., *Environmental Studies,* S.K. Kataria and Sons, New Delhi
3. Bharucha E., *Environmental Studies for Undergraduate Courses*, New
4. Delhi: University Grants Commission.
5. Wright R.T., *Environmental Science: towards a sustainable future,* New Delhi: PHL Learning Private Ltd.
6. Rajagopalan R., *Environmental Studies*, New York: Oxford University Press.

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 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:
Upon completion of the subject, 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   10 HOURS
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   9 HOURS
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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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.

UNIT III   8 HOURS
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   7 HOURS
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   8 HOURS
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.

TEXTBOOKS:
1.   Henry F. Korth and Silberschatz Abraham, *Database System Concepts*, Mc.GrawHill, 6th Ed., 2015.
2.   Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems,* McGraw- Hill Education, 2003.

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

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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*				
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.

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, and the patient record. The application should also be able to search the patient's 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*				
BTCS302N	DCC	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.

COURSE OBJECTIVES:
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:
Upon completion of the subject, 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   10 HOURS
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   9 HOURS
Greedy Method: General Method, fractional Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Tree - Prim's and Kruskal's algorithm, Single Source Shortest Paths.

UNIT III   8 HOURS
Dynamic Programming: General Method, Optimal Binary Search Trees, O/1 Knapsack, multistage graph, Traveling Salesperson Problem, All Pairs Shortest Paths.

UNIT IV   7 HOURS
Backtracking: General Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycles, sum of Subsets.
Branch and Bound: General Method, O/1 Knapsack Problem, Traveling Salesperson Problem.

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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*				
BTCS302N	DCC	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.

UNIT V   8 HOURS
NP Hard and NP Complete Problems: Basic Concepts, Cook's Theorem, NP Hard Graph and NP Scheduling Problems, Some Simplified NP Hard Problems.

TEXTBOOKS:
1. Ellis Horowitz and Sartaj Sahni, *Fundamental of Computer Algorithms*, 2nd Edition, Galgotia Publication, 2001.
2. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest, *Introduction to Algorithms*, 3rd Ed., MIT Press. 2009.

REFERENCE:
1. Donal E Knuth, *Fundamentals of Algorithms: The Art of Computer Programming*, Vol 1, 3rd Ed., Pearson Education, 1997.
2. Goodman, S.E. & Hedetnieni, *Introduction to Design and Analysis of Algorithm*, Tata McGraw Hill, 1977.
3. S. Dasgupta, C. H. Papadimitriou, and U. V. Vazirani, *Algorithms*, Tata McGraw Hill, 2006.
4. J.E Hopcroft, J.D Ullman, *Design and analysis of algorithms*, TMH Publication.

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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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*				
BTAIML402N	DSC	AI Fundamentals	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.

COURSE OBJECTIVES:
The student will have ability to:
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:
Upon completion of the subject, students will be able to:
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   8 HOURS
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   9 HOURS
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 Auto ML process, Identify regression machine learning scenarios, What is Azure Machine Learning?, What is Azure Machine Learning designer?, 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.

| 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*				
BTAIML402N	DSC	AI Fundamentals	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.

UNIT III   8 HOURS
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   8 HOURS
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   7 HOURS
Microsoft Azure AI Fundamentals: Explore decision support What is Anomaly Detector? How Anomaly Detector works, when to use Anomaly Detector.

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.
4. First Edition (Azure Certifications Journey Book 3) by Abhishek Chaudhary

REFERENCE:
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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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*				
BTAIML402N	DSC	AI Fundamentals	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.

LIST OF PRACTICALS
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

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*				
BTIT411	SEC	Advanced 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 OBJECTIVES:
The student will have ability to:
1. Understand to develop java desktop applications.
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:
Upon completion of the subject, 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.

SYLLABUS
UNIT I   10 HOURS
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   6 HOURS
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   8 HOURS
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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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*				
BTIT411	SEC	Advanced 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.

UNIT IV   6 HOURS
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   8 HOURS
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 Ed., McGraw Hill, 2017
2. Bert Bates, Kathy Sierra, *Headfirst Java*, 2nd Ed., O' Reilly, 2005

REFERENCE:
1. Harvey. M. Dietel, *Advanced Java 2 Platform, How to program*, 2nd Ed., Prentice Hall.
2.

LIST OF PRACTICALS
1. A program for creating text box, check box, radio button, list, submit button.
2. A program to execute select query using JDBC.
3. A program to update customer information.
4. A simple servlet that just generates plain text.
5. A program to display cookie id.
6. A program for session tracking.
7. Write a program showing Database connectivity.

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