



Shri Vaishnav Vidyapeeth Vishwavidyalaya

B.Tech.(CSE-Big Data Analytics/Cloud and Mobile Computing/Artificial Intelligence-IBM)

Choice Based Credit System (CBCS) 2019-20

SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
ML301	UG	Environment and Energy Studies	3	0	0	3	60	20	20	0	0

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 students will be able to:

1. To understand sources of information required for addressing environmental challenges.
2. To identify a suite of contemporary tools and techniques in environmental informatics.
3. To apply literacy, numeracy and critical thinking skills to environmental problem-solving.

Course Outcomes:

The students should be able to:

1. Apply the principles of ecology and environmental issues that apply to air, land and water issues on a global scale.
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community.

Syllabus:

UNIT I

Environmental Pollution and Control Technologies: Environmental Pollution & Control: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and industrial pollution, Ambient air quality standards. Water pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid Waste management composition and characteristics of e - Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, Secondary and Tertiary.

UNIT II

Natural Resources: Classification of Resources: Living and Non - Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problem, Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable energy source, case studies.

UNIT III

Ecosystems: Definition, Scope and Importance ecosystem. Classification, Structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Energy flow in the



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ecosystem, Biogeochemical cycles, Bioaccumulation, ecosystem value, devices and carrying capacity, Field visits.

UNIT IV

Biodiversity and its Conservation: Introduction - Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a megadiversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man/wildlife conflicts; Conservation of biodiversity: In-situ and Ex-situ conservation. National biodiversity act.

UNIT V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP).

Text Books:

1. Agarwal, K.C.,(latest edition).**Environmental Biology**, Bikaner :Nidi Pub. Ltd.
2. Brunner R.C.(latest edition) **Hazardous Waste Incineration**, McGraw Hill Inc.
3. Clank R.S. ,(latest edition. **Marine Pollution**, Clarendon Press Oxford (TB).
4. De A.K(latest edition) **Environmental Chemistry**, Wiley Western Ltd.
5. ErachBharucha(2005).**Environmental Studies for Undergraduate Courses** by for University Grants Commission.

Reference Books:

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



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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIT502	UG	Computer Networks	3	1	2	5	60	20	20	30	20

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 should be made to:

1. Understanding the fundamental concepts of computer networking.
2. Creating students interest in the basic taxonomy and terminology of the computer networking area.
3. Applying advanced networking concepts for student knowledge.
4. Creating the student for entry Advanced courses in computer networking.

Course Outcomes:

Upon completion of the subject, students will be able to:

1. Understanding basic computer network technology.
2. Understanding and explain Data Communications System and its components.
3. Evaluating the different types of network topologies and protocols.
4. Remembering the layers of the OSI model and TCP/IP.
5. Evaluating the different types of network devices and their functions within a network.

Syllabus:

UNIT I

Computer Network: Definitions, Goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISO-OSI Reference Model: Principle, Model, TCP/IP model overview, Descriptions of various layers and its comparison with TCP/IP. Network standardization.

UNIT II

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB.

UNIT III

MAC Sublayer: Overview of MAC Layer, MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), CSMA/CA, CSMA/CD Ethernet, token bus, token ring, (IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11 wireless Communication.



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UNIT IV

Network Layer: Need, Services Provided, Design issues, Routing and congestion in network layer, wired & wireless routing protocol examples, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multi cast Routing. IP protocol, IP Addresses, subnetting, Comparative study of IPv4 & IPv6, Mobile IP.

UNIT V

Transport Layer: Overview, Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. **Session layer:** Overview, Authentication, Session layer protocol. **Presentation layer:** Overview, Data conversion, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler). **Application Layer:** Overview, WWW and HTTP, FTP, SSH.

Text Books:

1. Andrew S Tanenbaum, Computer Networks, 6th Edition, Pearson Education, 2016.
2. Behrouz A.Forouzan, TCP/IP-Protocol suite, 4th edition, McGraw-Hill, 2010.
3. William Stallings, Data and Computer Communication, 10th edition Pearson, 2014.
4. Comer, Internet working with TCP/IP Volume one, Addison-Wesley, 2015.
5. W. Richard Stevens, TCP/IP Illustrated, Volume 1, 2nd Edition Addison-Wesley Professional Computing Series.

Reference Books:

1. Kaveh Pahlavan, Prashant Krishnamurthy, Networking Fundamentals, Wiley Publication,2009.
2. Michael A. Gallo & William M. Hancock, Computer Communications & Networking Technologies, Cengagepearsen publications, 2001.
3. Dimitri Bertsekas, Robert Gallager, Data Networks, PHI Publication, Second Edition, 1992.
4. Uyles Black, Computer Networks, PHI Publication, Second Edition, 1993.

List of Practical:

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 command and Network configuration commands.
5. Examine network IP.
6. Write a program to implement various types of error correcting techniques.
7. Write a program to implement various types of farming methods.
8. Implement & simulate various types of routing algorithm.
9. Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks.
10. Simulate STOP AND WAIT Protocols on NS-2.
11. Simulate various Routing Protocol on NS-2.
12. Simulate various Network Topologies on NS-2.
13. Configuring routers, bridges and switches and gateway on NS-2.



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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS502	UG	Operating Systems	2	1	2	4	60	20	20	30	20

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 fundamentals of Operating Systems.
2. To study the mechanisms of Operating System to handle processes and threads and their communication.
3. To gain knowledge of process management concepts that includes architecture, Mutual exclusion algorithms, deadlock detection and recovery algorithms.
4. To learn the mechanisms involved in memory management in Operating System.
5. To know the components and management aspects of disc scheduling.

Course Outcomes:

Upon completion of the subject, students will be able to:

1. To describe the detail structure of Operating System.
2. To design and Implement Process management Techniques in Operating System.
3. To calculate CPU Scheduling criteria.
4. To understand The Memory Management of Operating System.
5. To elaborate Disc Scheduling.

Syllabus:

UNIT I

Introduction to Operating System: Introduction and Need of operating system, Layered Architecture/Logical Structure of Operating system, Type of OS(Multiprogramming , Time Sharing, Real Time ,Networked, Distributed, Clustered, Hand Held), Operating system as Resource Manager and Virtual Machine, OS Services, BIOS, System Calls/Monitor Calls, Firmware- BIOS, Boot Strap Loader. Threads- processes versus threads, threading, concepts, models, kernel & user level threads, thread usage, benefits, multithreading models.

UNIT II

Process Management: Process Model, Creation, Termination, States & Transitions, Hierarchy, Context Switching, Process Implementation, Process Control Block, Basic System calls- Linux & Windows. Basic concepts, classification, CPU and I/O bound, CPU scheduler- short, medium, long-term, dispatcher, scheduling:- preemptive and non-preemptive, Static and Dynamic Priority Criteria/Goals/Performance Metrics, scheduling algorithms- FCFS, SJFS, shortest remaining time, Round robin, Priority scheduling, multilevel queue scheduling, multilevel feedback queue



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SEMESTER IV

scheduling

UNIT III

Interprocess Communication: Introduction to Message Passing, Race Condition, Critical Section Problem, Peterson's Solution, Semaphore, Classical Problems of Synchronization
Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem, Sleeping Barber Problem etc. **Deadlock-** System model, Resource types, Deadlock Problem, Deadlock Characterization, Methods for Deadlock Handling, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock Detection, Recovery from Deadlock.

UNIT IV

Memory Management: concepts, functions, logical and physical address space, address binding, degree of multiprogramming, swapping, static & dynamic loading- creating a load module, loading, static & dynamic linking, shared libraries, memory allocation schemes- first fit, next fit, best fit, worst fit and quick fit. Free space management- bitmap, link list/free list.

Virtual Memory- concept, virtual address space, paging scheme, pure segmentation and segmentation with paging scheme hardware support and implementation details, memory fragmentation, demand paging, working set model, page fault frequency, thrashing, page replacement algorithms- optimal, FIFO,LRU; Belady's anomaly; TLB (translation look aside buffer).

UNIT V

File Management: Concepts, Naming, Attributes, Operations, Types, Structure, File Organization & Access (Sequential, Direct, Index Sequential) Methods, Memory Mapped Files, Directory Structures One Level, Two Level, Hierarchical/Tree, Acyclic Graph, General Graph, File System Mounting, File Sharing, Path Name, Directory Operations, Overview Of File System in Linux & Windows.

Input/output Subsystems- Concepts, Functions/Goals, Input/Output devices- Block And Character, Spooling, Disk Structure & Operation, Disk Attachment, Disk Storage Capacity, Disk Scheduling Algorithm- FCFS, SSTF, Scan Scheduling, C-Scan Schedule.

Text books:

1. Abraham Silberschatz, "Operating system concepts", 10th Edition, John Wiley & Sons. INC, 2018
2. Andrew S.Tannenbaum, "Modern operating system", 4th Edition, Pearson Education, 2014
3. Dhananjay M. Dhamdhere, "Operating Systems:A concept Based Approach", 3rd Edition TMH, 2017,
4. SibsankarHaldar, Alex AlagarsamyAravind, "Operating System", 8th Edition, Pearson Education India,, 2010

Reference Books:

1. Achyut S Godbole, "Operating System", 3rd TMH, 2017.
2. William Stallings, "operating system" 8th, Pearson Education, ,2014.
3. Vijay Shukla, "Operating System", 3rd, Kataria&Sons ,2013.
4. Singhal&Shivratri, "Advanced Concept in Operating Systems", 1st · TataMc-Graw Hill Education, edition 2017.



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List of Practical:

1. Implement and update the BIOS settings of your PC.
2. If there are 5 printers are connected in a system each process to print will take different time to complete, and CPU will give a fixed time to each process after that deadline next process will enter in CPU. If a problem not completed in a given slot then that process will be re-enter as per the FCFS, on rotation basis? Apply the scheduling on this?
3. Implement Non Preemptive Priority CPU Scheduling.
4. Implement Non Preemptive Shortest Job first CPU Scheduling.
5. If there are 5 different resources like 3 printer,2 scanner are connected to a system each taking different time to complete the task. Which scheduling is best and gives best performance of CPU?
6. Implement the scheduling for that where CPU give chance to complete those process first which comes first?
7. Implement Round-Robin CPU scheduling.
8. Write a program to implement Semaphore.
9. Find the solution for the situation where 5 faculties are sitting in a round table. There are 4 ball pens are placed on this table. At a time only one pen can be picked by one faculty to writing work. What will happen if all picked the pen for writing simultaneously?
10. Find the solution for dentist checkup clinic where only one chair and one dentist is available for treatment. And having n chairs to waiting for patient.
 - If there is no patient, then the doctor sleeps in his own chair.
 - When a patient arrives, he has to wake up the doctor.
 - If there are many patients and the doctor is doing treatment of him, then the remaining patients either wait if there are empty chairs in the waiting room or they leave if no chairs are empty.
11. Write a program for Memory Management Algorithms e.g. First Fit, Best Fit, Worst Fit.
12. Demonstrate Virtual memory Techniques like, LRU, FIFO etc.
13. Implement Shortest Seek Time First Disk Scheduling Algorithm.
14. Implement Scan Scheduling Disk Scheduling Algorithm.
15. Implement Circular Scan Disk Scheduling Algorithm.
16. Implement Look Disk Scheduling Algorithm.



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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCSI405	UG	Database Management Systems	3	1	2	5	60	20	20	30	20

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 Objective:

The student will have ability to:

1. Understand the different issues involved in the design and implementation of a database system.
2. To learn the physical and logical database design, database modeling, relational, hierarchical, and network models.
3. Understand and use data manipulation language to query, update, and manage a database.
4. Design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
5. To intend 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. Evaluate business information problem and find the requirements of a problem in terms of data.
2. Understand the uses the database schema and need for normalization.
3. Design the database schema with the use of appropriate data types for storage of data in database.
4. Use different types of physical implementation of database
5. Use database for concurrent use.
6. Backup data from database.

Syllabus

UNIT I

Introduction: Concept & Overview of DBMS, Purpose of Database Systems, Architecture of DBMS, Data Models and its type, Schema and Instances, Data Independence, DBA and its function.

Entity-Relationship Model: Entities, Attributes and its types, Mapping Cardinalities, Keys, Entity Relationship Diagram, Weak entity set and Strong entity set and Extended E-R features (Generalization , Specialization, Aggregation) ,ER Diagram to Relational Table conversion.



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UNIT-II

Relational Model: Structure of Relational Databases, Relation , Characteristics of Relations, Domains, Tuples , Relational schema and instance, Relational Algebra, Relational Algebra Operations (select, project, join and its type, union, intersection, set difference, Cartesian product, rename, division), Extended Relational Algebra Operations (Generalized Projection , Aggregate Functions , Outer Join),

Relational Calculus: types of relational calculus, tuple and domain oriented relational calculus, and its operation.

UNIT-III

Integrity Constraints: Null Values, Domain Constraints, Entity Integrity Constraints Referential Integrity Constraints, Key constraints, Triggers.

Relational Database Design: Functional Dependency, Inference rule, Different Anomalies in designing a Database. Normalization , Decomposition, Normal Forms (1NF, 2NF, 3NF, Boyce-Codd Normal Form, Normalization using Multi-Valued Dependencies, 4NF, Join Dependency, 5NF), Canonical cover.

UNIT IV

Query Optimization: Introduction, steps of optimization, various algorithms to implement select, project and join operations of relational algebra, optimization methods: heuristic based, cost estimation based.

Transaction Processing, Concurrency Control and Recovery Management: Transaction Model properties, State Serializability, Lock base protocols, Two Phase Locking, Time Stamping Protocols for Concurrency Control, and Validation Based Protocol, Multiple Granularities, Granularity of Data Item. Multi version schemes, Recovery with Concurrent Transaction, Recovery technique based on Deferred Update and Immediate Update, Shadow Paging, Recovery in Multi Database System and Database Backup and Recovery from Catastrophic Failure.

UNIT V

Index structures: Types of index (primary, secondary, clustering, partitioning, unique and non index), use and Purpose of index, searching via an index.

SQL: DDL, DML, DQL (column function and grouping, union, multiple queries, union all, sub-query using IN, NOT IN, HAVING, GROUP BY CLAUSE), DCL (grant, revoke), TCL (Commit, roll back, save point, set Transaction)

Distributed database: Planning for distributed database, management-centralized and decentralized Back-up and recovery.

Text books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, Mc.GrawHill, 6th Edition,2015.
2. C J Date, “An Introduction to Database System”, Pearson Educations, 8th Edition, 2004.
3. Elmasri, Navathe, “Fundamentals of Database Systems”, Pearson Educations 7th Edition, 2016.
4. SeemaKedar, Database Management System, Technical Publications, 2009.
5. 5.Rajiv Chopra,Database Management System (DBMS) A Practical Approach. Kindle Edition, S Chand (December 1, 2010), 2017.



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Reference Books:

1. IBM Career Education- database management system.
2. Abraham Silberschatz and S Sudarshan “Database System Concepts” 6th Edition McGraw-Hill Education – Europe 2013.
3. Raghu Ramakrishnan and Johannes Gehrke “Database Management Systems” McGrawHill Education, 2003.
4. Kahate, Atul “Introduction to Database Management Systems” Pearson Education India, 2006.

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. Display name, hire date of all employees using cursors.
10. Display details of first 5 highly paid employees using cursors.
11. Write a database trigger which fires if you try to insert, update, or delete after 7'o' clock.
12. Write a data base trigger, which acts just like primary key and does not allow duplicate values.
13. Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.
14. Write the query for creating the users and their role. Using GRANT and REVOKE operations



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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBMB401	UG	Business Intelligence	3	1	2	5	60	20	20	30	20

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 Objective:

The student will have ability to:

1. Gain the depth knowledge of data which helps the industry to take better decision
2. Understand how business analysis Software works to analyze the data.
3. Learn how business Intelligence can be applied.
4. Create reports, dashboards, stories and cross reports and accessing them accordingly.
5. Visualize the data in many forms and ways.

Course Outcomes:

1. The importance of analytics and how its transforming the world today
2. Understand how analytics provided a solution to industries using real case studies
3. Explain what is analytics, the various types of analytics, and how to apply it
4. Understand how a business analysis software works, and its architecture
5. Describe a reporting application, its interface, and the different report types
6. Create different types of advanced reports
7. Understand Active Reports and how to create them

SYLLABUS

UNIT-I Analytics Overview: The history of analytics and how it has changed today ,Understanding how to analyze unstructured data ,Understanding how analytics is making the world smarter ,Understanding where the future of analytics lies, Explaining why successful enterprises need business analytics ,Understanding how business analytics can help turn data into insight ,Understanding how predictive analytics is transforming all types of organizations ,Explaining how analytics supports retail companies ,Understanding how analytics can reduce crime rates and accidents ,Explaining the use of analytics in law enforcement and insurance companies ,Understanding how analytics can affect the future of education, Understanding the importance of business analytics ,Comprehend how big data and analytics can help in understanding consumer/customer behavior ,Explaining how analytics can help manage assets ,Understanding how analytics can help combat fraud ,Explaining how analytics can help us to understand social sentiments.

UNIT-II Business Intelligence and Analytics: Explaining what is analytics, Defining various types of analytics, Demonstrating how to apply analytics, Describing business intelligence, Demonstrating how to apply business intelligence.



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UNIT–III Create list reports, Crosstab reports & Present data graphically: Learning how to access content, use reports, and create dashboards ,Learning how personalize the IBM Cognos Analytics portal, Group, format, and sort list reports ,Describing the various options for aggregating data ,Creating a multi-fact query ,Creating a report with repeated data, Creating filters to narrow the focus of reports ,Examining detail filters and summary filters ,Determining when to apply filters on aggregate data, Formatting and sort crosstab reports ,Creating complex crosstab reports using drag and drop functionality ,Creating crosstab reports using unrelated data items, Creating charts containing peer and nested columns ,Presenting data using different chart type options ,Adding context to charts ,Creating and reuse custom chart palettes ,Introduction to visualization ,Presenting key data in a single dashboard report, Identifying various prompt types ,Using parameters and prompts to focus data ,Searching for prompt types ,Navigating between pages, Creating calculations based on the data in the data source ,Adding run-time information to the reports ,Creating expressions using functions, Enhancing report design with report objects ,Reusing objects within the same report ,Sharing layout components among separate reports ,Discussing report templates ,Choosing options to handle reports with no available data, Creating multi-lingual reports ,Highlighting exceptional data ,Showing and hide data ,Conditionally render objects in reports ,Conditionally format one crosstab measure based on another, Knowing how to let users navigate from a specific report to a target report ,Passing parameter values to filter the data in drill-through targets, Navigating through multiple reports, Force page breaks in reports ,Modifying existing report structures ,Applying horizontal formatting ,Specifying print options for PDF reports ,Formatting data and report objects

UNIT–IV IBM Cognos Analytics: Describing IBM Cognos Analytics and its position within an analytics solution ,Describing IBM Cognos Analytics components ,Describing IBM Cognos Analytics at a high level ,Describing IBM Cognos Analytics security at a high level ,Explaining how to extend IBM Cognos Analytics Building query models and connect them to the report layout ,Editing an SQL statement to author custom queries ,Adding filters and prompts to a report using the query model, Creating reports by merging query results ,Creating reports by joining queries ,Combining data containers based on relationships from different queries ,Filtering reports on session parameter values ,Navigating a briefing book using a table of contents ,Creating dynamic headers and titles that reflect report data ,Navigating to specific locations in reports ,Creating a customer invoice report ,Controlling report displays using prompts ,Specifying conditional formatting values using prompts ,Specifying conditional rendering of objects based on prompt selection ,Creating sorted and filtered reports based on prompt selection, Creating a report that displays summarized data before detailed data ,Highlighting alternate rows in a list report ,Creating a report using an external data file ,Using single data items to summarize report information, Examining the report specification structure ,Modifying a report specification ,Adding custom toolbox objects and custom template options, Distributing reports using bursting ,Creating burst keys ,Identifying report recipients and data items using burst tables ,Distributing reports using email and the Business Analysis Solution Connection ,Creating tooltips that clarify report data ,Sending emails using links in a report, Describing Active Reports, and their value ,Saving Active Reports

UNIT–V Focus reports using prompts and Extend reports using calculations: Creating Active Reports as prompt pages, Converting existing reports to Active Reports , Explaining security considerations in Active Reports ,Debugging Active Report behavior, Describing active report connections ,Filtering and selecting active report controls, Modifying the interactive



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behavior of report controls ,Identifying active report controls and variables, Using variables to control multiple controls independently ,Controlling multiple controls from a single variable ,Authoring and optimizing active Reports for mobile consumption, Describing characteristics of traditional charts in Active Reports, Controlling data display using decks and data decks ,Using decks and data decks to display traditional charts, Optimizing decks for performance ,Describing characteristics of RAVE visualizations

TEXT BOOKS:

1. IBM Cognos Business Intelligence 10: The Official Guide
2. IBM Cognos 10 Report Studio Cookbook, Second Edition
3. IBM Cognos 10 Report Studio: Practical Examples

REFERENCES:

1. IBM Material for Business intelligence

LIST OF EXPERIMENTS:

1. Examine list reports ,Group data ,Include list headers and footers ,Format list columns , Enhance a list report, Understand fact/measure data ,Understand aggregate data, Understand difference in aggregation ,Explore data aggregation ,Use shared dimensions to create multi-fact queries ,Create a multi-fact query in a list report ,Add repeated information to reports Create a mailing list report ,Focus reports using filters ,Create filters ,Filter your data with advanced detail filters , Apply filters to a report, Determine when to apply a filter with aggregation , Apply a detail filter on fact data in a report ,Filter your data with summary filters ,Apply a summary filter to a report Using Rational Rose do the following for a given source code. Apply pre-defined source filters , Create a report focused on top performing product types and product lines.
2. Create a Crosstab report ,Add measures to Crosstab reports ,Data sources for Crosstabs ,Create a simple Crosstab report ,Create complex Crosstab reports ,Create Crosstab nodes and Crosstab node members ,Create complex Crosstab reports ,Format Crosstab reports ,Add unrelated items to Crosstabs edges ,Sort and format a Crosstab report ,Present unrelated items in a Crosstab using a discontinuous Crosstab.
3. Create a Visualization report ,Different chart options ,Create charts containing peer and nested items, Create and reuse custom chart palettes ,Add data-driven baselines and markers to charts, Create and format a chart report ,Compare values and highlight proportions using gauge charts and pie charts, Create a gauge report and a pie chart report



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- ,Display items on separate axes , Show the same data graphically and numerically
,Customize charts ,RAVE , Display RAVE visualizations , Create a dashboard report.
4. Examine parameters and prompts ,Create a parameter item on the report, Build a prompt page, Add a prompt item to a report ,Create a prompt by adding a parameter.
 5. Identify prompt type, Add a value prompt to a report ,Add pages to a report ,Add a Select & search prompt to a report ,Create a cascading prompt, Create a cascading prompt, Focus a report using value prompts.



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SEMESTER IV

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBM402	UG	Cyber Physical System Using IoT	3	1	2	5	60	20	20	30	20

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:

This course will help the students in:

1. Understand the evolution and impact of IoT in the world today.
2. Explore IoT by industry domains: automotive, connected homes, manufacture, energy & utilities, transportation, healthcare, aerospace.
3. Explore end-to-end case studies for every key IoT industry and identify common patterns.

Course Outcomes:

After the successful completion of this course students will be able to:

1. Understand technical aspects of IoT solutions: devices and networks, data, cloud, applications, blockchain, analytics and security.
2. Build cognitive IoT solutions, leveraging artificial intelligence and data science.
3. Understand industry practices to design and build agile IoT solutions, using the design thinking methodology.
4. Work in team's jointly exploring real-world IoT scenarios.
5. Prototype bespoke IoT solutions leveraging industry-proven concepts, technologies and methodologies

Syllabus:

UNIT I

IoT Global LANDSCAPE: What is the Internet of things, IoT global adoption, IoT common Patterns: sensor, data, analytics, IoT challenges: security and scalability, Resources.

UNIT II

IoT Application Domains: IoT Technology Domains, Connected Devices, Connected Vehicles, Smart Buildings, Smart Cities, Resources



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UNIT III

IoT Solution Anatomy – Device and Networks: IoT Solution Architecture, Physical Layer (Devices, Hardware, Sensors), Communication layer (IoT networks), Resources

Unit IV

IoT Solution Anatomy – IoT Data Platform: IoT Platform Layer, Data Analytics and applications Layer, Resources

Unit V:

Cognitive IoT Solutions: IoT Sensor Data and AI, Data Science on the Cloud, Resources

IoT Industry Case Studies: IoT Trends, IoT in Manufacturing, Global Logistics with IoT, Worker Safety, Industry Predictions, Resources

TEXT BOOKS:

1. Vijay Madiseti, ArshdeepBahga,” Internet of Things A Hands-On- Approach”,2014, ISBN:978 0996025515
2. Adrian McEwen, Hakim Cassimally “Designing the Internet of Things”, John Wiley & Sons (2013), ISBN - 9781118430620
3. IBM Skills Academy

REFERENCES:

1. Daniel Kellmerit, “The Silent Intelligence: The Internet of Things”. 2013, ISBN 0989973700
2. Massimo Banzi, “Getting Started with Arduino”, O'Reilly Media, Inc." (2011), ISBN-9781449309879
3. Richard Grimmett, “Raspberry Pi Robotics Essentials”, Packt Publishing Ltd (2015), ISBN-978178528564

LIST OF EXPERIMENTS:

1. Remote Sensor Data Visualization: Preface, Remote Sensors
2. IBM Cloud Account Creation and Device Setup: Preface, Obtain an IBM Cloud Account, Provision the Node-Red App, Register a new Device
3. Node-RED setup & Chart Data: Preface, Node-RED setup, Receive Environmental Sensor Data in Node-RED, Dashboard Charts – Plot Sensor Data
4. Store Data in Cloudant Storage & Chart Data: Preface, Import the Node-RED Cloudant storage flow, Chart Historical Sensor Data
5. Use IoT Sensor Data to track Zebras in Botswana with AI: Preface, Clone & Deploy, Create Services, Run the Application, Links
6. Analyze large Data Sets Collected from a Long-range IoT System: Preface, Create Services, and Run Watson Studio Notebook.



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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBMA401	UG	Data Visualization (with R) + Machine learning with R	3	1	2	5	60	20	20	30	20

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 Objective:

1. Describe R syntax, including assigning variables
2. Describe simple operations with one of R's most important data structures – vectors
3. Describe lists, matrix, arrays and data frames.
4. Describe conditional statements, functions, classes and debugging.
5. Describe important functions for character strings and dates in R.
6. Describe popular algorithms Classification, Regression, Clustering, and Dimensional Reduction.
7. Develop understanding of interpreting and identifying patterns and trends
8. Describe steps to create customized graphics and charts
9. Understanding Supervised vs Unsupervised Learning
10. Explore how Statistical Modeling relates to Machine Learning
11. Introduce Classification, Regression, Clustering, and Dimensional Reduction
12. Describe Train/Test Split, Root Mean Squared Error
13. Explore many algorithms and model like Random Forests

Course Outcomes:

After the successful completion of this course students will be able to:

1. Command over R programming for Data Science;
2. Describe the key components of the Machine Learning field and its relation and role in Computer Science;
3. Identify and describe Machine learning algorithms, including knowledge of useful packages;
4. Design and implement appropriate ML model solution techniques for such problems;
5. Analyze and understand the computational trade-offs involved in applying different data visualization techniques and features.
6. Communicate clearly and effectively using the technical language of the field correctly.

SYLLABUS

Unit I: R Programming : Math, Variables, and Strings, Vectors and Factors, Vector operations, Data Structures-Arrays & Matrices, Lists, Data frames, R programming fundamentals- Conditions and loops, Functions in R, Objects and Classes, Debugging, Working with data in R-



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SEMESTER IV

Reading CSV and Excel Files, Reading text files, Writing and saving data objects to file in R, Strings and Dates in R-String operations in R, Regular Expressions, Dates in R

Unit II: Data Visualization with R: Basic Visualization Tools-Bar Charts, Histograms,Pie Charts, Basic Visualization Tools Continued-Scatter Plots,Line Plots and Regression, Specialized Visualization Tools-Word Clouds,Radar Charts, Waffle Charts,Box Plots, How to create Maps-Creating Maps in R, How to build interactive web pages- Introduction to Shiny,Creating and Customizing Shiny Apps, Additional Shiny Features

Unit III: Machine Learning vs Statistical Modeling & Supervised vs Unsupervised Learning: Machine Learning Languages, Types, and Examples ,Machine Learning vs Statistical Modelling,Supervised vs Unsupervised Learning ,Supervised Learning Classification ,Unsupervised Learning ,Supervised Learning I,K-Nearest Neighbors ,Decision Trees ,Random Forests, Reliability of Random Forests ,Advantages & Disadvantages of Decision Trees

Unit IV: Supervised Learning II, Dimensionality Reduction & Collaborative Filtering: Supervised Learning II, Regression Algorithms, Model Evaluation , Model Evaluation: Over fitting & Under fitting, Understanding Different Evaluation Models ,Dimensionality Reduction: Feature Extraction & Selection , Collaborative Filtering & Its Challenges

Unit V: Unsupervised Learning: K-Means Clustering plus Advantages & Disadvantages, Advantages & Disadvantages, Measuring the Distances Between Clusters - Single Linkage Clustering.

Text Books:

1. IBM Text Book
2. Cognitive computing with IBM Watson(by Rob High(Author),Tanmay Bakshi(Author),30 April 2019)-1st edition.

Reference Books:

1. R in a Nutshell: Second EditionPaperback– (23 Oct 2012) by Joseph Adler-2nd edition.
2. Applied Predictive ModelingHardcover– (27 Apr 2018)by Max Kuhn, Kjell Johnson- 1st edition.
3. An Introduction to Statistical Learning: with Applications in R (Springer Texts in Statistics)Hardcover– (29 Sep 2017) ,by Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani- 2nd Edition.

List of Practical:

1. Basic Syntaxes and how to install packages
2. R-statements with conditions.
3. Create Looping in multiple conditions.



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4. Creating pie and histogram with R package.
5. Maps
6. Creating dashboard and Shiny app
7. K-Nearest Neighborhood.
8. Linear and Multiple Regression algorithm
9. Logistic Regression
10. K-Means clustering algorithm



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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTCS307	UG	Advanced Java	0	0	2	1	0	0	0	30	20

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. Using Graphics, Animations and Multithreading for designing Simulation and Game based applications.
2. Design and develop GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
3. Design and develop Web applications.
4. Designing Enterprise based applications by encapsulating an application's business logic.
5. Designing applications using pre-built frameworks.

Course Outcomes:

1. Use various tools, and Validation techniques, use of different templates available in Intelligent IDEA, Implementation and testing strategies in real time applications.
2. Learn the Internet Programming, using Java Applets.
3. Create a full set of UI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using Abstract Windowing Toolkit (AWT) & Swings.
4. Learn to access database through Java programs, using Java Data Base Connectivity (JDBC).
5. Create dynamic web pages, using Servlets and JSP.

Syllabus:

UNIT I

Introduction of Java Programming:Java Networking :Network Basics and Socket overview, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, ServerSocket, InetAddress, URL, URL Connection.

UNIT II

JDBC Programming:JDBC Programming :The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQLException Class, The SQLWarning Class, The Statement Interface, PreparedStatement, CallableStatement The ResultSet Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management.

UNIT III

SEVELET & API:Servlet API and Overview : Servlet Model: Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor ServletContext and ServletConfig interface, Attributes in Servelt, Request Dispatcher interface The Filter API: Filter,



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SEMESTER IV

FilterChain, Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting .

UNIT IV

Java Server Pages:Java Server Pages : JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP Environment ,JSP Directives, JSP Action, JSP Implicit Objects JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking JSP Database Access, JSP Standard Tag Libraries, JSP Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing

UNIT V

Java Server Faces:Java Server Faces2.0 : Introduction to JSF, JSF request processing Life cycle, JSF Expression Language, JSF Standard Component, JSF Facelets Tag, JSF Converter Tag, JSF Validation Tag, JSF Event Handling and Database Access, JSF Libraries: PrimeFaces

Text Books:

1. Kathy walrath, Black Book Java server programming J2EE, 1st ed., Dream Tech Publishers, 2008.
2. James Keogh Complete Reference J2EE by Mcgraw publication 2016.
3. Subrahmanyam Allamaraju, Cedric Buest, Professional Java Server Programming by Wiley Publication 2011.
4. Matthew Scarpino, HanumantDeshmukh, JigneshMalavie SCWCD, Manning publication,2014.
5. Cay Horstmann and Gary Cornell Core Java, Volume II: Advanced Features Pearson Publication 2011.

Reference Books:

1. Kito D. Mann, Java Server Faces in Action, Manning Publication 2016.
2. Maydene Fisher, Jon Ellis, Jonathan Bruce JDBC™ API Tutorial and Reference, Third Edition, Addison Wesley ,2018 .
3. CookBook, Anghel Leonard, GiulioZambon Beginning JSP, JSF and Tomcat, Apress.JSF2.0, PACKT publication 2016.
4. Bryan Basham, Kathy Sierra & Bert Bates Head First Servlets and JSP, Publisher: O'Reilly Media 2015.

List of Practical:

1. Create chat application using either TCP or UDP protocol.
2. Implement TCP Server for transferring files using Socket and ServerSocket
3. Implement any one sorting algorithm using TCP/UDP on Server application and Give Input On Client side and client should sorted output from server and display sorted on input side.
4. Implement Concurrent TCP Server programming in which more than one client can connect and communicate with Server for sending the string and server returns the reverse of string to each of client
5. Write RMI application where client supplies two numbers and server response by summing it. Provide your custom security policy for this application.
6. Implement Student information system using JDBC and RMI.



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7. Create Servlet file which contains following functions:
Connect 2. Create Database 3. Create Table 4. Insert Records into respective table 5. Update records of particular table of database 6. Delete Records from table. 7. Delete table and also database.
8. User can create a new database and also create new table under that database. Once database has been created then user can perform database operation by calling above functions. Use following Java Statement interface to implement program: Statement 2. Prepared statement 3. Callable statement.
9. Create Servlet file and study web descriptor file.
10. Create login form and perform state management using Cookies, Http Session and URL Rewriting.



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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTIBM403	UG	Application Development Using Python	0	0	2	1	0	0	0	0	50

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 understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications.
3. To define the structure and components of a Python program.

Course Outcomes:

Upon completion of the subject, students will be able to:

1. To use lists, tuples, and dictionaries in Python programs.
2. To identify Python object types.
3. To use indexing and slicing to access data in Python programs.
4. To write loops and decision statements in Python.
5. To write functions and pass arguments in Python.
6. To build and package Python modules for reusability.
7. To read and write files in Python.
8. To design object-oriented programs with Python classes.
9. To data handling and use cases diagrams
10. To use class inheritance in Python for reusability.
11. To use exception handling in Python applications for error handling

Syllabus:

UNIT-I

Introduction to Python

What is Python?, Advantages and disadvantages, Downloading and installing, Which version of Python Running Python Scripts and using the interpreter interactively.

UNIT-II

Using variables, String types: normal, raw and Unicode, String operators and expressions, Math operators and expressions, Writing to the screen, Reading from the keyboard and Indenting is significant.

UNIT-III

The if and elif statements, While Loops, Using List, Dictionaries, Using the for statement, Opening, reading and writing a text file, Using Pandas, the python data analysis library and data frames Grouping, aggregating and applying, merging and joining. Dealing with syntax errors,



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SEMESTER IV

Exceptions, Handling exceptions with try/except

UNIT-IV

RE Pattern Matching, Parsing Data, Introduction to Regression, Types of Regression, Use Cases, Exploratory data analysis, Correlation Matrix, Visualization using Matplotlib, Implementing linear regression

UNIT-V

Machine Learning – Algorithm, Algorithms – Random forest, Super vector Machine, Random Forest, Build your own model in python, Comparison between random forest and decision tree

TEXT BOOKS:

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.
3. Mark Lutz "Learning Python" O'Reilly Media; 5 edition.
4. David Beazley "Python Cookbook, Third edition" O'Reilly Media

REFERENCES:

1. Python Essential Reference, 4th Edition Addison-Wesley Professional.
2. Mark Lutz "Programming Python: Powerful Object-Oriented Programming "David Beazley "Python Cookbook" Third edition, O'Reilly Media

List of Practical:

1. Implement to use lists, tuples, and dictionaries in Python programs.
2. Implement to identify Python object types.
3. Implement to use indexing and slicing to access data in Python programs.
4. Implement structure and components of a Python program.
5. Implement to write loops and decision statements in Python.
6. Implement to write functions and pass arguments in Python.
7. Implement to build and package Python modules for reusability.
8. Implement to read and write files in Python.
9. Implement to design object-oriented programs with Python classes.
10. Implement data handling and use cases diagrams
11. Implement to use class inheritance in Python for reusability.
12. Implement to use exception handling in Python applications for error handling