

JHARKHAND UNIVERSITY OF TECHNOLOGY
Jharkhand, Ranchi



Syllabus for

BACHELOR OF COMPUTER APPLICATION
(B.C.A) Programme

Second Semester

Subject Code	Course Type	Subject Name	Load Allocation			Marks distribution		Total Marks	Credit
			L	T	P	Internal Marks	External Marks		
2CR01	Core	Database Management System	4	0	0	30	70	100	4
2CR02	Core	Data Structures	4	0	0	30	70	100	4
2CR03	Core	Computer Networks	4	0	0	30	70	100	4
2CR04	Core	Math- II	4	0	0	30	70	100	4
2AE01	Ability Enhancement	Environmental Science	2	0	0	30	70	100	2
2CR01-L	Computer Lab-1	DBMS Lab	0	0	2	25	25	50	2
2CR02-L	Computer Lab-2	Data Structure Lab	0	0	2	25	25	50	2
Semester Total			18	0	4	200	400	600	22

SEMESTER-II
Course Code: 2CR01
Course Name: Database Management System

Detailed contents	Contact hours
<p>Unit-I</p> <p>Introduction of DBMS, Data Modeling for a Database, Three level Architecture of DBMS, Components of a DBMS. Introduction to Data Models, Hierarchical, Network and Relational Model, Comparison of Network, Hierarchical and Relational Model, Entity Relationship Model.</p>	10 Hours
<p>Unit-II</p> <p>Relational Database, Relational Algebra and Calculus, SQL Fundamentals, DDL, DML, DCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers.</p>	12 Hours
<p>Unit-III</p> <p>Introduction to Normalization, First, Second, Third Normal Forms, Dependency Preservation, Boyce-Codd Normal Form, Multi-valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth NormalForm, Domain-key normal form (DKNF).</p>	12 Hours
<p>Unit-IV</p> <p>Database Recovery, Concurrency Management, Database Security, Integrityand Control. Structure of a Distributed Database, Design of Distributed Databases.</p>	10 Hours

Text Books:

1. "An Introduction to Database System", Bipin C. Desai, Galgotia Publications PvtLtd-New Delhi, Revised Edition, (2012).
2. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Tata McGraw Hill, 6th Edition, (2013).

Reference Books:

1. "SQL, PL/SQL The Programming Language of Oracle", Ivan Bayross, BPBPublications, 4th Revised Edition (2009)
 2. "An Introduction to Database Systems", C. J. Date, A. Kannan, S. Swamynathan, 8thEdition, Pearson Education, (2006).
 3. Database Management Systems, Raghu Ramakrishnan, McGraw-Hill, Third Edition, 2014.
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Course Code: 2CR02
Course Name: Data Structures

<p>Unit-I Introduction to Data Structures: Algorithms and Flowcharts, Basics Analysis on Algorithm, Complexity of Algorithm, Introduction and Definition of Data Structure, Classification of Data, Arrays, Various types of Data Structure, Static and Dynamic Memory Allocation, Function, Recursion.</p> <p>Arrays, Pointers and Strings: Introduction to Arrays, Definition, One Dimensional Array and Multi-Dimensional Arrays, Pointer, Pointer to Structure, various Programs for Array and Pointer. Strings. Introduction to Strings, Definition, Library Functions of Strings.</p>	10 Hours
<p>Unit-II Stacks and Queue Introduction to Stack, Definition, Stack Implementation, Operations of Stack, Applications of Stack and Multiple Stacks. Implementation of Multiple Stack Queues, Introduction to Queue, Definition, Queue Implementation, Operations of Queue, Circular Queue, De-queue and Priority Queue.</p>	8 Hours
<p>Unit-III Linked Lists and Trees Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List.</p> <p>Trees Introduction to Tree, Tree Terminology Binary Tree, Binary Search Tree, Strictly Binary Tree, Complete Binary Tree, Tree Traversal, Threaded Binary Tree, AVL Tree B Tree, B+ Tree.</p>	14 Hours
<p>Unit-IV Graphs and Searching Graphs: Introduction, Representation to Graphs, Graph Traversals ShortestPath Algorithms.</p> <p>Searching: Searching, Types of Searching,</p>	8 Hours
<p>Unit-V Sorting and Hashing</p> <p>Sorting: Searching, Types of Searching, Sorting, Types of sorting like quicksort, bubble sort, merge sort, selection sort.</p> <p>Hashing: Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing</p>	8 Hours

Course Code: 2CR03
Course Name: Computer Networks

Detailed Contents	Contact hours
<p>Unit-I</p> <p>Data communications concepts: Digital and analog transmissions- Modem, parallel and serial transmission, synchronous and a synchronous communication. Modes of communication: Simplex, half duplex, full duplex.</p> <p>Types of Networks: LAN, MAN, WAN</p> <p>Network Topologies: Bus, Star, Ring, Mesh, Tree, Hybrid</p> <p>Communication Channels: Wired transmissions: Telephone lines, leased lines, switch line, coaxial cables-base band, broadband, optical fiber transmission.</p> <p>Communication Switching Techniques: Circuit Switching, Message Switching, Packet Switching.</p>	12 Hours
<p>Unit-II</p> <p>Network Reference Models: OSI Reference Model, TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Models.</p> <p>Transmission impairments – Attenuation, Distortion, Noise. Multiplexing Frequency division, Time division, Wavelength division.</p> <p>Data Link Layer Design Issues: Services provided to the Network Layer, Framing, Error Control (error detection and correction code), Flow Control, Data Link Layer in the Internet (SLIP, PPP)</p>	10 Hours
<p>Unit-III</p> <p>MAC sub layer: CSMA/CD/CA, IEEE standards (IEEE802.3 Ethernet, Gigabit Ethernet, IEEE 802.4 Token Bus, IEEE 802.5 Token Ring)</p> <p>Network Layer: Design Issues, Routing Algorithms: Optimality Principle, Shortest Path Routing, Congestion Control Policies, Leaky bucket and token bucket algorithm, Concept of Internetworking.</p>	12 Hours
<p>Unit-IV</p> <p>Transport Layer: Design issues, Elements of transport protocols – Addressing, Connection establishment and release, Flow control and buffering, Introduction to TCP/UDP protocols.</p>	10 Hours
<p>Unit-V</p> <p>Session, Presentation and Application Layers: Session Layer – Design issues, remote procedure call. Presentation Layer – Design issues, Data compression techniques, Cryptography. Application Layer – Distributed application (client/server, peer to peer, cloud etc.), World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), HTTP as an application layer protocol.</p>	10 Hours

Text Books:

1. Computer Networks, Tanenbaum, Andrew, Fifth Edition, PHI.
2. Data Communication and Networking, Behrouz A. Forouzan, Fourth Edition.
3. Computer Today, S.K. Basandra, First Edition, Galgotia.

Reference Books:

1. Data Communication System, Black, Ulysse, Third Edition, PHI.
 2. Data and Computer Communications, Stalling, Ninth Edition, PHI.
 3. James F. Kurose and Keith W. Ross, "ComputerNetworking", Pearson Education.
 4. Douglas E. Comer, "Internetworking with TCP/IP", Volume-I, Prentice Hall, India.
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Course Code: 2CR04
Course Name: Mathematics-II

Detailed Contents	Contact hours
<p>Unit-I</p> <p>SETS & RELATIONS Definition -Operation on sets, Principal of Inclusion and Exclusion, Difference and symmetric difference of sets, Cartesian products and results related to Cartesian products. Relations- Types of relations, Equivalence relations.</p>	14 Hours
<p>Unit-II</p> <p>CO-ORDINATE GEOMETRY: Concept of limits, fundamental theorems on Limits (without proof), 3Dimensional geometry:-co-ordinates of points in space, results of points in space and lines in space, Equation of straight lines in space- vector form, Cartesian form.</p>	14 Hours
<p>Unit-III</p> <p>PROBABILITY: Introduction, Sample, Space and events, Conditional Probability, Independent events, Addition and Multiplication theorem on probability, Random variables, Mathematical Expectation, Theorems on Expectations, Variance of a variable in terms of Expectations.</p>	14 Hours
<p>UNIT IV</p> <p>TRIGONOMETRY : Trigonometric or Circular Functions, Conditional Identities involving the angles of a triangle, Trigonometric equations, Graphs of trigonometric functions.</p>	14 Hours
<p>UNIT V</p> <p>FUNCTIONS: Types of Functions-one to one, onto, into and inverse functions, composition of functions-inverse of composition of functions, Logarithmic and exponential functions, Factorial Functions, Fibonacci sequence.</p>	13 Hours

Text Books:

1. Elements of Discrete Mathematics- C. L L IU
2. Discrete Mathematics- a)Sem your Lipschutz, Marc Lipson ,b) Vinay Kumar.

Reference Books:

- 1.Fundamentals of Statistics- S.C.Gupta
 - 2.Business Mathematics- Thukral J.K
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Course Code: 2AE01
Course Name: Environmental Science

Detailed Contents	Contact hours
<p>Unit-I</p> <p>Introduction to Environmental Studies Multidisciplinary nature of Environmental Studies: Scope & Importance Need for Public Awareness</p>	4 Hours
<p>Unit-II</p> <p>Ecosystems Concept of an Ecosystem: Structure & functions of an ecosystem (Producers, Consumers & Decomposers) Energy Flow in an ecosystem: Food Chain, Food web and Ecological Pyramids Characteristic features, structure & functions of following Ecosystems:</p> <ul style="list-style-type: none"> • Forest Ecosystem • Aquatic Ecosystem (Ponds, Lakes, River & Ocean) 	11 Hours
<p>Unit-III</p> <p>Natural Resources Renewable & Non-renewable resources Forest Resources: Their uses, functions & values (Biodiversity conservation, role in climate change, medicines) & threats (Overexploitation, Deforestation, Timber extraction, Agriculture Pressure), Forest Conservation Act Water Resources: Their uses (Agriculture, Domestic & Industrial), functions & values, Over exploitation and Pollution of Ground & Surface water resources (Case study of Punjab), Water Conservation, Rainwater Harvesting, Land Resources: Land as a resource; Land degradation, soil erosion and desertification Energy Resources: Renewable & non-renewable energy resources, use of alternate energy resources (Solar, Wind, Biomass, Thermal), Urban problems related to Energy</p>	14 Hours
<p>UNIT IV</p> <p>Biodiversity & its conservation Types of Biodiversity: Species, Genetic & Ecosystem India as a mega biodiversity nation, Biodiversity hot spots and bio geographic regions of India Examples of Endangered & Endemic species of India, Red data book</p>	10 Hours
<p>UNIT V</p> <p>Environmental Pollution & Social Issues Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution Nuclear hazards and accidents & Health risks Global Climate Change: Global warming, Ozone depletion, Acid rain, Melting of Glaciers & Ice caps, Rising sea levels Environmental disasters: Earthquakes, Floods, Cyclones, Landslides</p>	10 Hours
<p>UNIT VI</p> <p>Field Work Visit to a National Park, Biosphere Reserve, Wildlife Sanctuary Documentation & preparation of a Biodiversity (flora & fauna) register of campus/river/forest Visit to a local polluted site: Urban/Rural/Industrial/Agricultural Identification & Photography of resident or migratory birds, insects (butterflies) Public hearing on environmental issues in a village</p>	8 Hours

Text Books:

1. Bharucha, E. Text Book for Environmental Studies. University Grants Commission, New Delhi.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.

Reference Books:

1. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
 2. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
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Course Code: 2CR01-L

Course Name: Database Management Systems Laboratory

List of Experiments :	
1.	Used of CREATE, ALTER, RENAME and DROP statement in the database tables (relations)
2.	Used of INSERT INTO, DELETE and UPDATE statement in the database tables (relations)
3.	Use of simple select statement.
4.	Use of select query on two relations
5.	Use of nesting of queries.
6.	Use of aggregate functions.
7.	Use of substring comparison.
8.	Use of order by statement.
9.	<p>Consider the following schema for a Library Database: BOOK (<i>Book_id, Title, Publisher_Name, Pub_Year</i>) BOOK_AUTHORS (<i>Book_id, Author_Name</i>) PUBLISHER (<i>Name, Address, Phone</i>) BOOK_COPIES (<i>Book_id, Branch_id, No-of_Copies</i>) BOOK_LENDING (<i>Book_id, Branch_id, Card_No, Date_Out, Due_Date</i>) LIBRARY_BRANCH (<i>Branch_id, Branch_Name, Address</i>)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none">1. Retrieve details of all books in the library_id, title, name of publisher, authors, number of copies in each branch, etc.2. Get the particulars of borrowers who have borrowed more than 3 books between Jan2018 to Jun 20183. Delete a book in BOOK table. Update the contents of other tables to reflect this datamanipulation operation.4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.5. Create a view of all books and its number of copies that are currently available in the Library.
10.	<p>Consider the following schema for Order Database: SALESMAN (<i>Salesman_id, Name, City, Commission</i>) CUSTOMER (<i>Customer_id, Cust_Name, City, Grade, Salesman_id</i>) ORDERS (<i>Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id</i>)</p> <p>Write SQL queries to</p> <ol style="list-style-type: none">1. Count the customers with grades above Amritsar's average.2. Find the name and numbers of all salesmen who had more than one customer.3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)4. Create a view that finds the salesman who has the customer with the highest order of a day.5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.
11.	Write a PL/SQL code to add two numbers and display the result. Read the numbers

	during run time.
12.	Write a PL/SQL code to find sum of first 10 natural numbers using while and for loop.
13.	Write a program to create a trigger which will convert the name of a student to upper case before inserting or updating the name column of student table.
14.	Write a PL/SQL block to count the number of rows affected by an update statement using SQL%ROWCOUNT
15.	Write a PL/SQL block to increase the salary of all doctors by 1000.

Course Code: 2CR02-L
Course Name: Data Structures Laboratory

Instructions: Programs may be developed in C/C++

List of assignments:

1	Program for using Dynamic Functions (malloc(), calloc(), realloc() and free()) functions.
2	Program to insert, delete and traverse an element from an array
3	Program to merge one dimensional arrays
4	Program for addition and subtraction of two matrices.
5	Program for implementing multiplication of two matrices
6	Implement linear search using one and two dimensional array.
7	Program for implementing selection sort.
8	Program for implementing insertion sort.
9	Program for implementing quick sort.
10	Program for implementing merge sort.
11	Program to calculate length of the string using user defined function.
12	Program to concatenate and compare two strings using user defined function.
13	Program for using the concept of pointer to string.
14	Program to reverse a sentence by recursion.
15	Program to delete all repeated words in string.
16	Program to find the number of vowels, consonants, digits and white space in a string.
17	Program to find the length of the longest repeating sequence in a string.
18	Program to find highest and lowest frequency character in a string.
19	Program for implementing Stack using array.
20	Program for implementing Stack using pointer.
21	Program for implementing multiple stack.
22	Program for converting infix to postfix form.
23	Program for implementing Queue using array.
24	Program for dynamic implementation of queue.
25	Program for implementing circular queue.
26	Program for implementing dequeue.
27	Program for implementing priority queue.
28	Program for implementing Singly Linked list.
29	Program for implementing Doubly Linked list.
30	Program for implementing Binary Search Tree.
31	Program for Breadth First Search (BFS) for graph traversal.
32	Program for Depth First Search (DFS) for graph traversal.