JHARKHAND UNIVERSITY OF TECHNOLOGY
Jharkhand, Ranchi

Syllabus for

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

Course Structure

First Semester

Subject Code	Course Type	Subject Name	Load Allocation			Marks distribution		Total Marks	Credit
			L	T	P	Internal Marks	External Marks		
1CR01	Core	Mathematics-I	4	0	0	30	70	100	4
1CR02	Core	Fundamentals of Computer and IT	4	0	0	30	70	100	4
1CR03	Core	Problem Solving using C/C++	4	0	0	30	70	100	4
1CR04	Core	Digital Electronics	4	0	0	30	70	100	4
1AE01	Ability Enhancement	English	3	0	0	30	70	100	3
1CR01-L	Computer Lab-1	Programming Lab C/C++	0	0	2	25	25	50	2
1AE01-L	Ability Enhancement Lab	Language Lab	0	0	2	25	25	50	2
Semester Total			19	0	4	200	400	600	23

Course Code: 1CR01
Course Name: Mathematics-I

Detailed contents	Contact hours
Unit-I Set Introduction, Objectives, Representation of Sets (Roster Method, Set Builder Method), Types of Sets (Null Set, Singleton Set, Finite Set, Infinite Set, Equal Set, Equivalent Set, Disjoint Set, Subset, Proper Subset, Power Set, Universal Set) and Operation with Sets (Union of Set, Intersection of Set, Difference of Set, Symmetric Difference of Set) Universal Sets, Complement of a Set.	12 hours
Unit-II Logic Statement, Connectives, Basic Logic Operations (Conjunction, Disjunction, Negation) Logical Equivalence/Equivalent Statements, Tautologies and Contradictions.	10 hours
Unit -III Matrices Introduction, Types of Matrix (Row Matrix, Column Matrix, Rectangular Matrix, Square Matrix, Diagonal Matrix, Scalar Matrix, Unit Matrix, Null Matrix, Comparable Matrix, Equal Matrix), Scalar Multiplication, Negative of Matrix, Addition of Matrix, Difference of two Matrix, Multiplication of Matrices, Transpose of a Matrix.	12 hours
Unit-IV Progressions Introduction, Arithmetic Progression, Sum of Finite number of quantities in A.P, Arithmetic Means, Geometric Progression, Geometric Mean.	10 hours

Text Books:

1. Discrete Mathematics and Its Applications by Kenneth H. Rosen, Mc Graw Hill, 6thEdition.
2. College Mathematics, Schaum's Series, TMH.

Reference Books:

1. Elementary Mathematics, Dr. RD Sharma
2. Comprehensive Mathematics, Parmanand Gupta
3. Elements of Mathematics, ML Bhargava

Course Code: 1CR02
Course Name: Fundamentals of Computer and IT

Detailed Contents	Contact hours
Unit-I **Human Computer Interface** Concepts of Hardware and Software; Data and Information. **Functional Units of Computer System:** CPU, registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors. **Devices:** Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter. **Memory:** Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks. **Data Representation:** Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversions and Binary Arithmetic (Addition/ Subtraction/ Multiplication) Applications of IT.	12
Unit-II **Concept of Computing, Types of Languages:** Machine, assembly and Highlevel Language; Operating system as user interface, utility programs. **Word processing:** Editing features, formatting features, saving, printing, table handling, page settings, spell-checking, macros, mail-merge, equation editors.	10
Unit-III **Spreadsheet:** Workbook, worksheets, data types, operators, cell formats, freeze panes, editing features, formatting features, creating formulas, using formulas, cell references, replication, sorting, filtering, functions, Charts & Graphs. **Presentation Graphics Software:** Templates, views, formatting slide, slides with graphs, animation, using special features, presenting slide shows.	10
Unit-IV **Electronic Payment System:** Secure Electronic Transaction, Types of Payment System: Digital Cash, Electronic Cheque, Smart Card, Credit/Debit Card E-Money, Bit Coins and Crypto currency, Electronic Fund Transfer (EFT), Unified Payment Interface (UPI), Immediate Payment System (IMPS), Digital Signature and Certification Authority. Introduction to Bluetooth, Cloud Computing, Big Data, Data Mining, MobileComputing and Embedded Systems and Internet of Things (IoT)	12

Text Books:

1. Introduction to Information Technology, ITL Education Solutions limited, PearsonEducation
2. Computer Fundamentals, A. Goel, 2010, Pearson Education.
3. Fundamentals of Computers, P. K.Sinha & P. Sinha, 2007, BPB Publishers.

Reference Books:

1. “Introduction to Computers”, Peter Norton
2. Computers Today, D. H. Sanders, McGraw Hill.
3. “Computers”, Larry long & Nancy long, Twelfth edition, Prentice Hall.

Course Code: 1CR03
Course Name: Problem Solving using C

Detailed Contents	Contact hours
Unit-I **Logic Development:** Data Representation, Flowcharts, Problem Analysis, Decision Trees/Tables, Pseudo code and algorithms. Fundamentals: Character set, Identifiers and Key Words, Data types, Constants, Variables, Expressions, Statements, Symbolic Constants. **Operations and Expressions:** Arithmetic operators, Unary operators, Relational Operators, Logical Operators, Assignment and Conditional Operators, Library functions.	11 Hours
Unit-II **Data Input and Output:** formatted & unformatted input output. **Control Statements:** While, Do–while and For statements, Nested loops,If–else, Switch, Break – Continue statements.	10 Hours
Unit-III **Functions**: Brief overview, defining, accessing functions, passing arguments to function, specifying argument data types, function prototypes, recursion. **Arrays**: Defining, processing arrays, passing arrays to a function, multi–dimensional arrays. **Strings**: String declaration, string functions and string manipulation Program Structure Storage Class: Automatic, external and static variables.	11 Hours
Unit-IV **Structures & Unions:** Defining and processing a structure, user defined data types, structures and pointers, passing structures to functions, unions.	06 Hours
Unit-V **Pointers:** Understanding Pointers, Accessing the Address of a Variable, Declaration and Initialization of Pointer Variables, Accessing a Variable through its Pointer, Pointers and Arrays **File Handling:** File Operations, Processing a Data File	06 Hours

Text Books:

1. Programming in ANSI C, E. Balagurusami, Fourth Edition, Tata McGraw Hill.
2. Programming in C, Third Edition, Stephen G Kochan, Pearson.
3. The C Programming Language, Kernighan & Richie, Second Edition, PHIPublication.

Reference Books:

1. Object Oriented Programming, Lafore R, Third Edition, Galgotia Publications
2. Let us C, Yashvant P Kanetkar, Seventh Edition, BPB Publications, New Delhi.
3. Programming in C, Byron S. Gottfried, Second Edition, McGraw Hills.
4. Problem Solving and Programming in C, R.S. Salaria, Second Edition

Course Code: 1CR04
Course Name: Digital Electronics

Detailed Contents	Contact hours
Unit-I Introduction to network theorems and AC fundamentals: Ohm's law: Statement, explanation. Kirchhoff's law: Statement & explanation of KCL and KVL. Mesh/loop analysis (up to 2 loops) and node voltage method, Numerical problems. Delta/star and star/Delta transformation: No derivation for Interco version equations, introduction of network, port of network (one port network, two port network), unilateral network, bilateral network, linear network. Need for application of network theorems. (DC Circuits only). Superposition theorem: statement, (only with TWO voltage sources) steps to apply the theorem explanation by considering a simple resistive network and problems. The venin's theorem: Statement, (Only with ONE voltage source) Steps to apply the theorem, explanation by considering a simple resistive networking and problems. Norton's theorem: Statement, (Only with ONE voltage source) steps to apply the theorem, explanation by considering a simple resistive network and problems. Maximum power transfer theorem: Statement, explanation of theorem by considering a simple resisting network, expression for maximum power deliver (P L (max) =Vth2/4Rth) (no derivation), graph of Vs Pl, numerical problems and applications. Reciprocity theorem, Statement, explanation using resistive network with dc source and numerical problems. AC Fundamentals: Representation of ac sine wave, instantaneous value, peak value, peak to peak value, average value, r.m.s value cycle, time period, frequency. (No derivations, only mention the expressions) Representation of non sinusoidal waves.	12 Hours
Unit-II Semiconductor Devices: Introduction, atomic structure, energy level, energy band diagram in solids, classification of conductors, insulators and semiconductors. Semiconductor, properties, crystal structure of semiconductor, types – intrinsic and extrinsic semiconductor. Intrinsic semiconductor: Crystal structure (Ge & Si), thermal generated charges (electron and holes) carriers the effect temp on their motion. Extrinsic semiconductor: Doping, donor acceptor impurities, c-type, p-type semiconductor, majority and minority carriers, their currents, concept of immobile ions. Semiconductor devices : PN junction diode, formation of pn junction layer, potential barrier, energy level diagram of pn junction, Biasing of pn junction, behavior of pn junction under forward and reverse biasing, break down in pn junction, avalanche and zener break down. Diode characteristics; V-I characteristic, forward and reverse bias, diode parameters, bulk resistance, knee voltage, static and dynamic resistance, PIV. Application of diode; As a rectifier, as logic gate, as a switch, etc. Rectifier, types, Half wave Full wave. Half wave rectifier: Circuit, working, wave forms and expression for ripple factor and efficiency (no derivation),	12 Hours

advantages & disadvantages. Bridge wave rectifier: Circuit, working, wave forms and expressions for ripple factor and efficiently (no derivation), advantages & disadvantages. Logic families: Scale of integration, Digital IC's, classifications, DTL, TTL, ECL, MOS, CMOS, Mention of features: speed of operation, powerdissipation, propagation delay, fan-in, fan-out.	
Unit-III Number Systems: Introduction to number systems – positional and non-positional, Base /Radix. Decimal number system-Definition, digits, radix/base, Binary number system – Bit Byte, Conversions: Binary to Decimal and Decimal to Binary. Octal number system Conversion from Octal to Decimal to Octal, Octal to Binary and binary to Octal. Hexadecimal number system –Conversion : Decimal to Hex, Hex to decimal, Hex to Binary, Binary to Hex, Octal to Hex, Hex to Octal, Binary, arithmetic – binary addition, subtraction, multiplicationand division (only Integer part). 1's and 2's compliment: 2's complement subtraction. Binary code: BCD numbers, 8421 code, 2421 code- examples and applications. Gray code – Conversions-Gray to binary and Binary to Gray, application of gray code (Mention only). Excess-3 code – self complimenting property and applications. Definition and nature of ASCII code. Introduction to error detection and correction code, parity check. Boolean algebra:-Laws and theorems. AND, OR, NOT Laws, Commutative law, associative law, distributive law, Duality theorem. Demorgan's theorems-Statements, proof using truth tables; Simplification of Boolean expressions using Boolean laws. Definition of product term, sum term, minterm, maxterm, SOP, standard POS and Standard POS. Conversion of Boolean expression to Standard SOP and Standard POS forms. Karnaugh maps-Definition of Karnaugh map, K- map for 2, 3 and 4 variables. Conversion of truth tables into k-map grouping of cells, redundant groups and don't care conditions Karnaugh map technique to solve 3 variable and 4 variable expressions. Simplification of 3 and 4 variable Boolean expression using K-maps (SOP only)	12 Hours
Unit-IV Logic Gates: AND Gate: Definition, symbol truth table, timing diagram, Pin diagram of IC 7408. OR Gate: Definition, symbol, truth table, timing diagram of IC 7432. NOT Gate: Definition symbol, truth table, timing diagram, Pin diagram of IC 7404. NAND Gate: Definition, symbol, truth table, Pin diagram of IC 7400, NOR Gate: Definition, symbol, truth table, timing diagram, Pin diagram of IC 7402. Exclusive OR Gate: Definition, symbol, truth table, timing diagram. Combinational logic circuits: Definition, applications. Half Adder: Symbol, Logic circuits using XOR and basic gates, Truth table, Full Adder: Symbol, Logic circuits using XOR and basic gates, Truth table, Half Subtractor: Symbol, Logic circuits using XOR and basic gates, Truth table. Full Subtractor: Symbol, Logic circuits using XOR and basic gates, Truth table. Adder –Subtractor; Logic circuit, Pin diagram IC 7483, IC 7486. Parallel Adder: 4 –bit parallel binary adder, BCD adder, IC 7483 NAND –NOR implementation of Adders.	12 Hours
Unit - V Sequential Circuits: Importance of clock in digital circuit and introduction to flip flop. Flip –flop-difference between latch and flip-flop. Qualitative study of level and edge triggering. RS latch /unlocked, symbol and truth table. RS flip- flop using NAND gate, symbol, truth table and timing diagram. D flip –flop – Symbol, truth table, Realization of JK flip –flop using NAND gates, working, and timing diagram. Race around condition, present and clear inputs, pin diagram of IC 74112. T flip flop-Logic symbol,	12 Hours

JK flip flop as a T flip –flop truth table and timing diagram. Master slave flip flop; Logic circuit, truth table and timing diagram, advantage of M/S flip-flop, pin diagram of IC 7473 IC 7476. Registers: Definition, types of registers-Serial in serial out, serial in parallel out, Parallel in serial out, Parallel in parallel our shift register (Block diagram representation for each), truth table, timing diagram and speed comparison.	

Text Books:

1) Thomas L.Floyd ,''Digital Fundamentals", Peason Education Inc, New Delhi, 2003

Reference Books:

1) Morris Mano, "Digital Design", 5Th Edition, Prentice Hall, 2013
2) R.P.Jain, "Modern Digital Electronics", 3rd Edition, Tata Mc Graw Hill, 2003.
3) Bignell and Donovan, "Digital Electronics", 5th Edition, Thomson Publication, 2007

Course Code: 1AE01
Course Name: English

Detailed Contents	Contact hours
Unit1- 1 (Introduction) Theory of Communication, Types and modes of Communication	10 Hours
Unit-II (Language of Communication) Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication	10 Hours
Unit-III (Reading and Understanding) Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation	11 Hours
Unit-IV (Writing Skills) Documenting, Report Writing, Making notes, Letter writing	12 Hours
Unit - V Translation(from Hindi to English and vice-versa) **Precis writing /Paraphrasing** Literary/Knowledge TextsPaper writing skills	11 Hours

Text Books:

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.

Reference Books:

1. *Language through Literature* (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul,Dr Brati Biswas
2. *On Writing Well*. William Zinsser. Harper Resource Book. 2001
3. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

Course Code: 1CR01-L
Course Name: Programming Lab C/C++

Instructions: Develop all programs in C programming language.

Assignments:

1.	WRITE A PROGRAM to display your name. Write another program to print messagewith inputted name.
2.	WRITE A PROGRAM to add two numbers.
3.	WRITE A PROGRAM to find the square of a given number.
4.	WRITE A PROGRAM to calculate the average of three real numbers.
5.	Write a program to Find ASCII Value of a Character
6.	WRITE A PROGRAM to Find the Size of int, float, double and char
7.	WRITE A PROGRAM to Compute Quotient and Remainder
8.	WRITE A PROGRAM to accept the values of two variables.
9.	WRITE A PROGRAM to find the simple interest, inputs are amount, period in years and rate of interest.
10.	Basic salary of an employee is input through the keyboard. The DA is 25% of the basic salary while the HRA is 15% of the basic salary. Provident Fund is deducted at the rateof 10% of the gross salary(BS+DA+HRA). WRITE A PROGRAM to calculate the net salary
11.	WRITE A PROGRAM to find area of a circle using PI as constant
15.	WRITE A PROGRAM to find the larger of two numbers.
16.	WRITE A PROGRAM to find greater of three numbers using Nested If.
17.	WRITE A PROGRAM to find whether the given number is even or odd.
18.	WRITE A PROGRAM to Generate Multiplication Table Using for loop
19.	WRITE A PROGRAM to Generate Multiplication Table Using while loop
20.	WRITE A PROGRAM to Make a Simple Calculator Using switch...case
21.	WRITE A PROGRAM to find whether the given number is a prime number.
22.	WRITE A PROGRAM using function to find the largest of three numbers
23.	WRITE A PROGRAM using function to print first 20 numbers and its squares.
24.	WRITE A PROGRAM to find the factorial of a given number.
25.	WRITE A PROGRAM to print the sum of two matrices
	WRITE A PROGRAM to Find the Length of a String

26.	
27.	WRITE A PROGRAM to Copy String using strcpy()
28.	WRITE A PROGRAM to compare a string
29.	WRITE A PROGRAM to reverse a string
30.	WRITE A PROGRAM to reverse a string
31.	WRITE A PROGRAM to multiply two numbers using pointers.
32.	WRITE A PROGRAM to display address of variable using pointers
33.	WRITE A PROGRAM to show the memory occupied by Structure and Union
34.	WRITE A PROGRAM to create Student I-Card using a Structure
35.	WRITE A PROGRAM to read data from a file from a file
36.	WRITE A PROGRAM to save Employee details in a file using File Handling

Course Code: 1AE01-L
Course Name: Language Lab

Assignments:

1.	Listening Skills • The student should be able to listen to s text read aloud in normal speed with focus on intonation. • After listening the student can fill-in-blanks, choose a suitable title, make a summary, supply required information and be able to answer comprehension questions from the passage read aloud.
2.	Speaking Skill • Reading aloud of dialogues, texts, poems, speeches focusing on intonation. Self-introduction • Role plays on any two-situations. • Telephonic Conversations.
3.	Personality Development • Initiation • Physical Appearance • Audience Purpose
4.	Interpersonal Skills • Appropriate use of non-verbal skills in face to face communication [i.e. Viva –Voce, group –interviews, GDs and seminars.]
5.	Presenting in GD, Seminars and Conferences. • Leadership Quality • Time Management • Achieving the target

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Syllabus for

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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
Unit-I 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.	10 Hours
Unit-II Relational Database, Relational Algebra and Calculus, SQL Fundamentals, DDL, DML, DCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers.	12 Hours
Unit-III 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).	12 Hours
Unit-IV Database Recovery, Concurrency Management, Database Security, Integrityand Control. Structure of a Distributed Database, Design of Distributed Databases.	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.

Course Code: 2CR02
Course Name: Data Structures

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. **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.	10 Hours
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.	8 Hours
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. **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.	14 Hours
Unit-IV **Graphs and Searching** **Graphs:** Introduction, Representation to Graphs, Graph Traversals ShortestPath Algorithms. **Searching:** Searching, Types of Searching,	8 Hours
Unit-V **Sorting and Hashing** **Sorting:** Searching, Types of Searching, Sorting, Types ofsorting like quicksort, bubble sort, merge sort, selection sort. **Hashing:** Hash Function, Types of Hash Functions, Collision, Collision Resolution Technique (CRT), Perfect Hashing	8 Hours

Course Code: 2CR03
Course Name: Computer Networks

Detailed Contents	Contact hours
Unit-I **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. **Types of Networks:** LAN, MAN, WAN **Network Topologies:** Bus, Star, Ring, Mesh, Tree, Hybrid **Communication Channels: Wired transmissions:** Telephone lines, leased lines, switch line, coaxial cables-base band, broadband, optical fiber transmission. **Communication Switching Techniques**: Circuit Switching, Message Switching, Packet Switching.	12 Hours
Unit-II **Network Reference Models**: OSI Reference Model, TCP/IP Reference Model,Comparison of OSI and TCP/IP Reference Models. Transmission impairments – Attenuation, Distortion, Noise. Multiplexing Frequency division, Time division, Wavelength division. **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)	10 Hours
Unit-III **MAC sub layer:** CSMA/CD/CA, IEEE standards (IEEE802.3 Ethernet, Gigabit Ethernet, IEEE 802.4 Token Bus, IEEE 802.5 Token Ring) **Network Layer:** Design Issues, Routing Algorithms: Optimality Principle, Shortest Path Routing, Congestion Control Policies, Leaky bucket and token bucket algorithm, Concept of Internetworking.	12 Hours
Unit-IV **Transport Layer**: Design issues, Elements of transport protocols – Addressing, Connection establishment and release, Flow control and buffering,Introduction to TCP/UDP protocols.	10 Hours
Unit-V **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.	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, "Computer Networking", Pearson Education.
4. Douglas E. Comer, "Internetworking with TCP/IP", Volume-I, Prentice Hall, India.

Course Code: 2CR04
Course Name: Mathematics-II

Detailed Contents	Contact hours
Unit-I **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.	14 Hours
Unit-II **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.	14 Hours
Unit-III **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.	14 Hours
UNIT IV **TRIGONOMETRY :** Trigonometric or Circular Functions, Conditional Identities involving the angles of a triangle, Trigonometric equations, Graphs of trigonometric functions.	14 Hours
UNIT V **FUNCTIONS:** Types of Functions-one to one, onto, into and inverse functions, composition of functions-inverse of composition of functions, Logarithmic and exponentialfunctions, Factorial Functions, Fibonacci sequence.	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

Course Code: 2AE01
Course Name: Environmental Science

Detailed Contents	Contact hours
Unit-I **Introduction to Environmental Studies** Multidisciplinary nature of Environmental Studies: Scope & Importance Need for Public Awareness	4 Hours
Unit-II **Ecosystems** Concept of an Ecosystem: Structure & functions of an ecosystem (Producers, Consumers& Decomposers) Energy Flow in an ecosystem: Food Chain, Food webband Ecological Pyramids Characteristic features, structure & functions of following Ecosystems: • Forest Ecosystem • Aquatic Ecosystem (Ponds, Lakes, River & Ocean)	11 Hours
Unit-III **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	14 Hours
UNIT IV **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	10 Hours
UNIT V **Environmental Pollution & Social Issues** Types, Causes, Effects & Control of Air, Water, Soil & Noise Pollution Nuclear hazardsand 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	10 Hours
UNIT VI **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 onenvironmental issues in a village	8 Hours

Text Books:

1. Bharucha, E. Text Book for Environmental Studies. University GrantsCommission, 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, Clanderson Press Oxford (TB)

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.	Consider the following schema for a Library Database: BOOK (*Book_id, Title, Publisher_Name, Pub_Year*) BOOK_AUTHORS (Book_id, Author_*Name*) PUBLISHER (*Name, Address, Phone*) BOOK_COPIES (*Book_id, Branch_id, No-of_Copies*) BOOK_LENDING (*Book_id, Branch_id, Card_No, Date_Out, Due_Date*)LIBRARY_BRANCH (*Branch_id, Branch_Name, Address*) Write SQL queries to 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 2018 3. 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 witha simple query. 5. Create a view of all books and its number of copies that are currently available in theLibrary.
10.	Consider the following schema for Order Database: SALESMAN (*Salesman_id, Name, City, Commission*) CUSTOMER (*Customer_id, Cust_Name, City, Grade, Salesman_id*) ORDERS (*Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id*)Write SQL queries to 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 ofa 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 casebefore 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.