

**Scheme & Syllabus for B.Tech (Computer
Science & Engineering) (IInd Year) according to
Choice Based Credit System (CBCS)**

(Semester IIIrd and Semester IVth)

**For Session 2019-20 onwards
(Batch 2018-2019 onwards)**



**Department of Computer Science & Engineering
School of Engineering & Technology**

**CENTRAL UNIVERSITY OF HARYANA
MAHENDERGARH-123031
HARYANA**

15/2/19
15/2/19
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15/2/2019
15/2/19

Scheme –B. Tech. (CSE 2nd Year)
THIRD SEMESTER

CODE	SUBJECT	L	T	P	CREDIT	Theory	Practical	Internal Assessment	Total Marks
BT CS 301	Data Structures and Algorithms	3	1	-	4	70	-	30	100
BT MT 301	Mathematics-III	3	1	-	4	70	-	30	100
BT CS 302	Digital Electronics	3	-	-	3	70	-	30	100
	GEC-I*	3	1	-	4	70	-	30	100
BT HUM 304	Fundamentals of Management	3	-	-	3	70	-	30	100
BT CS 303	Computer Organization & Architecture	3	1	-	4	70	-	30	100
BT CS 304	Data Structures & Algorithms Lab	-	-	2	1.0	-	35	15	50
BT CS 305	Digital Electronics Lab	-	-	2	1.0	-	35	15	50
	Total	18	4	4	24	420	70	210	700

*GEC to be taken from other department

List of GEC for other department

CODE	GEC SUBJECTS
BT CS 301	Data Structure & Algorithms
BT CS 303	Computer Organization & Architecture

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FOURTH SEMESTER

CODE	SUBJECT	L	T	P	CREDIT	Theory	Practical	Assessment	Internal Marks	Total
BT CS 401	Database Management System (DBMS)	3	1	-	4	70	-	30		100
BT CS 402	Object Oriented Programming using C++ (OOPS)	3	1	-	4	70	-	30		100
BT ECO 507A	Economics	3	-	-	3	70	-	30		100
BT AUD 308A	Environmental Sciences	3	-	-	-	70	-	30		100
BT CS 403	Discrete Structures	3	-	-	3	70	-	30		100
	GEC-II*	3	1	-	4	70	-	30		100
BT CS 404	DBMS Lab	-	-	2	1.0	-	35	15		50
BT CS 405	C++ Programming LAB	-	-	2	1.0	-	35	15		50
	Total	18	3	4	20	420	70	210		700

*GEC to be taken from other department

List of GEC for other department

CODE	GEC SUBJECTS
BT CS 402	Object Oriented Programming using C++ (OOPS)

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**Third Semester
Data Structures & Algorithms**

BT CS 301

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UNIT-1

Data structures and Algorithms: an overview: concept of data structure, choice of right data structures, types of data structures, basic terminology Algorithms, how to design and develop an algorithm: stepwise refinement, use of accumulators and counters; algorithm analysis, complexity of algorithms Big-oh notation.

Arrays: Searching Sorting: Introduction, One Dimensional Arrays, **Operations Defined:** traversal, selection, searching, insertion, deletion, and sorting. Multidimensional arrays, address calculation of a location in arrays.

Searching: Linear search, Recursive and Non recursive binary Search.

Sorting: Selection sort, Bubble sort, Insertion sort, Merge sort, Quick sort, Shell sort, Heap sort

UNIT-2

Stacks and queues: Stacks, array representation of stack, Applications of stacks. Queues, Circular queues, array representation of Queues, Deque, priority queues, Applications of Queues.

Pointers: Pointer variables, Pointer and arrays, array of pointers, pointers and structures, Dynamic allocation.

Linked Lists: Concept of a linked list., Circular linked list, doubly linked list, operations on linked lists. Concepts of header linked lists. Applications of linked lists, linked stacks, linked Queues.

UNIT-3

Trees: Introduction to trees, binary trees, representation and traversal of trees, operations on binary trees, types of binary trees, threaded binary trees, B Trees, Application of trees.

Graphs: Introduction, terminology, 'set, linked and matrix' representation, Graph traversal techniques: BFS, DFS, operations on graphs, Minimum spanning trees, Applications of graphs

UNIT-4

Introduction to file handling, Data and Information, File concepts, File organization, files and streams, working with files. AVL trees, Sets, list representation of sets, applications of sets.

Text Books:

- 1 A.M. Tenenbaum, Langsam, Moshe J. Augentem , "Data Structures using C", Pearson
- 2 Reema Thareja , "Data Structures using C", OUP India Pub.

Reference Books:

- 1 A.V. Aho, J.E. Hopcroft and T.D. Ullman, "Data Structures and Algorithms", Original edition, Addison-Wesley.
- 2 Ellis Horowitz & Sartaj Sahni, "Fundamentals of Data Structure", OBS Pub.
- 3 Introduction to Computers Science -An algorithms approach. Jean Paul Tremblay, Richard B. Bunt. T.M.H.
- 4 Lipschutz Seymour . "Data Structures with C (Schaum's Outline Series)", Mcgraw Hill

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UNIT-1

Multivariable Calculus (Differentiation): Limit, continuity and differentiability of functions of two or more variables, Partial differentiation, Euler's theorem on homogeneous functions, change of variables, chain rule, Taylor's theorem (two variables), approximate calculations, Jacobian, maxima and minima of two independent variables, Lagrange's method of multipliers.

UNIT-2

Ordinary differential Equations of first order and first degree: Exact, Reducible to Exact, linear and Bernoulli's equations. Linear differential Equations of higher order with constant coefficients, Cauchy - Euler Differential Equation, Legendre Linear Equation, Method of variation of parameters, Method of undetermined coefficient. Application of ordinary differential equations.

UNIT-3

Laplace Transform: Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.

UNIT-4

Fourier Series: Periodic functions, Fourier series, Euler's formula, Change of intervals, Half range sine and cosine series.

Fourier Transform: Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem.

Text Books:

- [1] E. Kreyszig, *Advanced Engineering Mathematics*, 10 edition. Hoboken, NJ: Wiley.
- [2] B. Ramana, *Higher Engineering Mathematics*, 1st edition. New Delhi: McGraw Hill Education.
- [3] B. S. Grewal, *Higher Engineering Mathematics 44th Edition*. Khanna Publishers.
- [4] R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics 4/e*), Fourth edition edition. Oxford: Narosa Publishing House Pvt. Ltd. - New Delhi.

Reference Books:

- [1] J. R. Hass, C. E. Heil, and M. D. Weir, *Thomas' Calculus*, 14 edition. Boston? Pearson.
- [2] P. S. Das and C. Vijayakumari, *Engineering Mathematics*, First edition. Place of publication not identified: Pearson Education.
- [3] J. Bird, *Higher Engineering Mathematics, 7th ed.*, 7 edition. Abingdon, Oxon ; New York, NY: Routledge.
- [4] T. Veerarajan, *Engineering Mathematics*. McGraw Hill Education India Pvt Ltd.

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Digital Electronics

BT CS 302

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UNIT - 1

Binary Systems: Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic.

Boolean Algebra And Logic Gates: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions canonical and standard forms, other logic operations, Digital logic gates, integrated circuits.

UNIT -2

Gate – Level Minimization: The map method, Four-variable map, Five-Variable map, product of sums simplification Don't-care conditions. NAND and NOR implementation other Two-level implementations, Exclusive – Or function, Hardware Description language (HDL).

Combinational Logic: Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Subtractor, Decimal Adder, Binary multiplier, magnitude comparator, Decoders, Encoders, Multiplexers, HDL for combinational circuits.

UNIT -3

Synchronous Sequential Logic: Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, HDL for sequential circuits, State Reduction and Assignment, Design Procedure.

Registers and Counters: Registers, shift Registers, Ripple counters synchronous counters, other counters, HDL for Registers and counters.

UNIT -4

Memory, CPLDs, and FPGAs: Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array programmable Array logic, Sequential Programmable Devices.

Asynchronous Sequential Logic: Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of state and Flow Tables, Race-Free state Assignment Hazards, Design Example.

Text Books :

1. JAIN, *MODERN DIGITAL ELECTRONICS 4E*. Tata McGraw-Hill Education.
2. Mano and Ciletti, *Digital Design*. Pearson Education India.
3. Gill Nasib Singh and Dixit J.B., *Digital Design and Computer Organisation*. University Science Press (An Imprint of Laxmi Publications Pvt. Ltd.), New Delhi.
4. M. M. Morris, *Computer System Architecture 3e (Update)* by Pearson. Third edition. Pearson Education.

Reference Books :

1. H. Taub and D. L. Schilling, *Digital Integrated Electronics*. McGraw-Hill.
2. A. P. Malvino and D. P. Leach, *Digital principles and applications*. McGraw-Hill.
3. W. Stallings, *Computer Organization and Architecture: Designing for Performance (ninth Edition)*.
4. D. A. Patterson and J. I. Hennessy, *Computer Organization and Design: The Hardware/software Interface*. Morgan Kaufmann.

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BT HUM 304

Unit-1

Meaning of management, Definitions of Management, Characteristics of management, Importance of Management; Management as Art, Science and Profession; Development of Management thoughts- Fayol's principles of Management, Taylors Scientific Management, Elton Mayo's Human Relations School, System's Approach to Management; Principles of Management, Management Processes- Planning, Organizing, Staffing, Leading and Controlling; Delegation and Decentralization.

Unit-2

Production Management : Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

Unit-3

Marketing Management - Definition of marketing, Marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

Unit-4

An Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management, Role of Financial Manager. Brief Introduction to the concept of capital structure and various sources of finance.

Text Books:

1. Robins S.P. and Couiter M., Management, Prentice Hall India, 10th ed.
2. Stoner JAF, Freeman RE and Gilbert DR, Management, 6th ed., Pearson Education.
3. Tripathy PC & Reddy PN, Principles of Management, Tata McGraw Hill.

Reference Books:

1. Pandey I. P., Financial Management (11th ed.). New Delhi: Vikas Publishing House.
2. Kotler, P., Keller K. L. Marketing Management (5th ed.). Pearson.
3. Robbins, S. P., DeCenzo, D., Agarwal, M. N., & Bhattacharyya, S. Essentials of Management (6 ed.). New Delhi: Pearson Education.

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UNIT-1

Introduction: Historical overview, economic trends, underlying technologies, Data Representation-Data Types, Complements, Fixed-Point Representation, Floating-Point Representation, Error Detection and Correction, Addition, Subtraction, Multiplication and Division algorithms and hardware.

Register Transfer and Micro operations: Register transfer language, Inter-Register Transfer, Arithmetic Micro-operations, Logic and Shift micro-operations Language, Control functions.

UNIT-2

Arithmetic Logic Unit: Arithmetic, logic and shift micro operations. Constructing an arithmetic logic shift unit

Basic Computer Architecture and Design: Computer registers, Computer Instructions-Instruction Set Completeness, Classifying Instruction Set Architecture, Basic steps of Instruction Execution, Hardwired Control, Micro programmed Control, Horizontal and Vertical Microprogramming, Interrupts.

Central Processing Unit: General Register Organization, Stack Organized CPU, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, RISC Vs CISC.

UNIT-3

Pipelining: Parallel and pipeline Processing, Pipeline Control, Pipeline Implementations, Conflicts Resolution, and Pipeline Hazards, Vector Processing, and Array Processors.

Memory Organization: Memory Systems: principle of locality, principles of memory hierarchy Caches, associative memory, main memory, Virtual memory, Paging and Segmentation, Memory Interleaving.

UNIT-4

Input Output Organization: I/O performance measures, types and characteristics of I/O devices, I/O Modes-Programmed I/O, Interrupt Initiated I/O and DMA. Buses: connecting I/O devices to processor and memory, interfacing I/O devices to memory, processor, and operating system.

Parallel Computers: Classification, SIMD, MIMD Organizations, Connection Networks, Data Flow Machines, and Multithreaded Architectures.

Text Books :

1. D. A. Patterson and J. L. Hennessy, *Computer Organization and Design MIPS Edition: The Hardware/Software Interface*, Newnes.
2. C. Hamacher and Z. Vranesic, *Computer Organization 5th Edition*.
3. Gill Nasib Singh and Dixit J.B., *Digital Design and Computer Organisation*, University Science Press (An Imprint of Laxmi Publications Pvt. Ltd.), New Delhi.

Reference Books :

1. W. Stallings, *Computer Organization and Architecture: Designing for Performance*, Pearson-Prentice Hall.
2. Zacker, *Networking: The Complete Reference*, Tata McGraw-Hill Education.
3. J. P. Hayes, *Computer Architecture and Organization*, WCB/McGraw-Hill

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Data Structure & Algorithms Lab

BT CS 304

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1. Write a program to search an element in a two-dimensional array using linear search.
2. Using iteration & recursion concepts write programs for finding the element in the array using Binary Search Method
3. Write a program to perform following operations on tables using functions only a) Addition b) Subtraction c) Multiplication d) Transpose
4. Using iteration & recursion concepts write the programs for Quick Sort Technique
5. Write a program to implement the various operations on string such as length of string concatenation, reverse of a string & copy of a string to another.
6. Write a program for swapping of two numbers using 'call by value' and 'call by reference' strategies.
7. Write a program to implement binary search tree. (Insertion and Deletion in Binary search Tree)
8. Write a program to create a linked list & perform operations such as insert, delete, update, reverse in the link list
9. Write the program for implementation of a file and performing operations such as insert, delete, update a record in the file.
10. Create a linked list and perform the following operations on it
a) add a node b) Delete a node
11. Write a program to simulate the various searching & sorting algorithms and compare their timings for a list of 1000 elements.
12. Write a program to simulate the various graph traversing algorithms.
13. Write a program which simulates the various tree traversal algorithms.

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1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. Design of half adder and full adder using NAND gates.
4. To verify the operation of multiplexer & Demultiplexer.
5. To verify the operation of comparator.
6. To verify the truth tables of S-R, J-K, T & D type flip flops.
7. Set up R-S & JK flip flops using NAND Gates.
8. To verify the operation of bi-directional shift register.
9. To design & verify the operation of 3-bit synchronous counter.
10. To design and verify the operation of synchronous UP/DOWN decade counter using J K flip-flops & drive a seven-segment display using the same.
11. To design and verify the operation of asynchronous UP/DOWN decade counter using J K flip-flops & drive a seven-segment display using the same.
12. Study of MUX & DeMUX Circuits and ICs

NOTE: At least ten experiments are to be performed; atleast seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

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BT CS 401

UNIT-1

Introduction: An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure.

Data Modeling using the Entity Relationship Model:

ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model.

UNIT-2

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL, Advantage of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.

UNIT-3

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

UNIT-4

Crash Recovery: Failure classification, recovery concepts based on deferred update, recovery concepts based on intermediate update, shadow paging, check points, on-line backup during database updates

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction.

Text Books:

1. A.Silberschatz, H.F. Korth and S. Sudarshan, "Database System Concepts" 6th edition, McGraw-Hill, International Edition.
2. Bipin Desai, "Introduction to Database Management system" Revised Edition, Galgotia Pub.
3. Shyamkant B. Navathe, "Fundamental of Database systems" 7th Edition, Pearson.

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Reference Books:

1. R.Elmasri and S.B. Navathe, "Fundamentals of Database Systems" 3rd edition, Addison-Wesley, Low Priced Edition.
2. C.J. Date, "An Introduction to Database Systems", 8th edition, Pearson.
3. C.J.Date and S. Swamynathan, "An Introduction to database system", 8th Edition, Pearson Education.
4. Shio Kumar Singh, "Database System Concepts, designs and applications". 2nd Edition, Pearson Education.

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BT CS 402

UNIT-1

Object oriented thinking: Need for OOP Paradigm. Procedural programming vs object oriented programming, object oriented concepts.

Functions: Main function, function prototyping, inline functions, reference variables, call by reference, Defaults arguments, Function overloading, Math library functions.

UNIT-2

Class: Difference between C structure and class, specifying a class, Defining member functions: inside and outside class, scope resolution operator, Array within a class, array of objects, Static data members and member functions, Object as function arguments, Returning objects, Friend function, memory allocation for objects, Pointer to Members, pointer to object, This pointer local classes.

Constructor and destructor: Constructor, Types of constructors: Default, Parameterized and Copy constructor, Constructor overloading, constructor with default parameter, Dynamic initialization of objects, Destructor

UNIT-3

Operator overloading and Type Conversion: Defining operator overloading, overloading unary and binary operator, Data Conversion: Basic to User Defined , User defined to basic, Conversion from one user-defined to other.

Inheritance and polymorphism: Base class, derived class, visibility modes, derivation and friendship, Types of inheritance, Containership, virtual function binding, pure virtual functions, Abstract class, pointer to derived class.

UNIT-4

Console IO operations: C++ stream classes, Unformatted IO operations, formatted IO operations, managing output with manipulators.

Working with files: Classes for file stream operations, opening and closing files, detection of File opening modes, file Pointers, Error handling during file operations, command line arguments. Templates: Class template, class template with parameter, function template, function template with parameter.

Text Books and Reference Books:

1. Bjarne Stroustrup, "C++ Programming language", 3rd edition, Pearson education Asia
2. Lafore R. "Object oriented Programming in C++", 4th Ed. Techmedia, New Delhi.
3. Yashwant Kenetkar, "Let us C++", 1st Ed., Oxford University Press.
4. B.A. Forouzan and R.F. Gilberg, CompilerScience, "A structured approach using C++" Cengage Learning, New Delhi.

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BT- ECO-507A

Economics

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3-0-0**Unit-1****Introduction to Economics**

Definition of Economics-various definitions, circular flow of economic activity, Production possibility curve Economic laws and their nature. Relation between Science, Engineering, Technology and Economics. Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance, the concept of equilibrium

Unit-2**Market Demand**

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand, the indifference curve theory, consumers surplus

Unit-3**Various Concepts of Cost**

Objective of business firm. Meaning of production and factors of production: Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale. Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run.

Unit-4**Types of Market**

Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets) Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices. Nature and characteristics of Indian economy (brief and elementary introduction), national income concept, Privatization - meaning, merits and demerits, Balance of payment, Globalization of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, IMF, World Bank.

Text Books:

1. P.N. Chopra, "Principles of Economics". (Kalyani Publishers).
2. K.K. Dewett, "Modern Economic Theory" (S.Chand).
3. Stonier and Hague, "A Text Book of Economic Theory". (Longman's Landon)

Reference Books:

1. M.L. Jhingan, "Micro Economic Theory", (S.Chand)
2. H.L. Ahuja, "Micro Economic Theory", (S.Chand)
3. S.K. Mishra, "Modern Micro Economics", (Pragati Publications).
4. Mishra & Puri, "Indian Economy".

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Environmental Sciences

BT AUD 308A

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UNIT-1

Introduction to Environmental Science and Natural Resources

The multidisciplinary nature of Environmental Studies. Definition, scope and importance, need for public awareness

Renewable and non-renewable resources: Land resources: Land as a resource, land degradation, soil erosion and desertification. Forest resources: Use and over-exploitation, deforestation, case studies. Water resources: Use and over-utilization of surface and ground water

UNIT-2

Ecosystems, Biodiversity and its Conservation

Concept of an ecosystem. Structure and function of an ecosystem. Energy flow in the ecosystem. Food chains, food webs and ecological pyramids.

Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Hot-spots of biodiversity. Threats to biodiversity. Endangered and endemic species of India. Conservation of biodiversity.

UNIT-3

Environmental Pollution, Environment policies & laws

Definition, Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Nuclear hazards. Solid waste management. Pollution case studies.

Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

UNIT-4

Human Population and Environment and Fieldwork

Human population growth. Impacts on environment, human health and welfare. Environmental Movements: Chipko, silent valley, Bishnois of Rajasthan.

Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc.

Text Books and Reference books:

1. Cunningham, W.P. and Saigo, B.W., Environmental Science. W.M.C. Brown Publishers, New York, USA.
2. Enger, D.E. and Smith B.F., Environment Science—A Study of Interrelationships. W.M.C. Brown Publishers, New York, USA.
3. Gupta, P.K., Elements of Biotechnology, Rastogi Publications, Meerut.

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4. Negi, B.S., Geography of Resources, Kedar Nath Ram Nath, Meerut.
5. Odum, E.P., Fundamentals of Ecology, Natraj Publishers, Dehradun.
6. Kaushik A and Kaushik C P. Perspectives in Environmental Studies, New age International Publishers, New Delhi.
7. Rastogi, V.B., Environmental Biology and Biochemistry, Kedar Nath Ram Nath, Meerut and Delhi.

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BT CS 403

UNIT-1

Set Theory: Algebra of sets, Classes of sets, Power Sets, Multi sets, Cartesian Product, Representation of relations, Types of relation, Equivalence relations and partitions, Partial ordering relations.

Recursion And Recurrence Relation: Linear recurrence relation with constant coefficients, Homogeneous solutions, Particular solutions, Total solution of a recurrence relation using generating functions.

UNIT-2

Propositional Calculus: Basic operations: AND (\wedge), OR (\vee), NOT (\sim), Implication and bi-implication, Truth value of a compound statement, propositions, tautologies, contradictions, Universal and Existential quantifiers, methods of proof, Mathematical Induction, Propositional logic, Hypothesis and Inference.

Techniques of Counting: Permutations with and without repetition, Combination, Pigeonhole principle.

UNIT-3

Algebraic Structures: Definition and examples of a monoid, Semigroup, Groups and rings, Homomorphism, Isomorphism and Automorphism, Subgroups and Normal subgroups, Cyclic groups, Integral domain and fields, Cosets, Lagrange's theorem.

UNIT-4

Graphs: Introduction to graphs, Directed and Undirected graphs, Homomorphic and Isomorphic graphs, Subgraphs, Cut points and Bridges, Multigraph and Weighted graph, Paths and circuits, Shortest path in weighted graphs, Eulerian path and circuits, Hamilton paths and circuits, Planar graphs, Euler's formula, Coloring graph problem, Bipartite graphs, Travelling salesman problem, Trees, Spanning trees.

Text Books:

- 1 B. Kolman, R. Busby, and S. C. Ross, *Discrete Mathematical Structures*, 6 edition, Upper Saddle River, NJ: Pearson.
- 2 C.L. Liu, and Mohapatra, *Elements of Discrete Mathematics: A Computer Oriented Approach*, 4th edition, New York: Mc Graw Hill India.
- 3 B. Ram, *Discrete Mathematics*, 1 edition, Pearson.
- 4 J.-P. Tremblay and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, 1 edition, New Delhi, India: McGraw Hill Education.

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Reference Books:

1. J. L. Gersting, *Mathematical Structures for Computer Science*, 6th Edition edition. New York: W. H. Freeman.
2. S. Lipschutz, M. L. Lipson, and V. H. Patil, *Discrete Mathematics*, Revised Third edition. McGraw Hill Education.
3. R. Johnsonbaugh, *Discrete Mathematics*, 7 edition. Upper Saddle River, N.J: Pearson.
4. A. Doerr and K. Levasseur, *Applied Discrete Structures for Computer Science*. Subsequent edition. New York: Macmillan Coll Div.

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BT CS 404

1. Write the queries for Data Definition and Data Manipulation language.
2. Write SQL queries using Logical operators (=, <, >, etc.).
3. Write SQL queries using SQL operators (Between.... AND, IN(List), Like, ISNULL and also with negating expressions).
4. Write SQL query using character, number, date and group functions.
5. Write SQL queries for Relational Algebra (UNION, INTERSECT, and MINUS, etc.).
6. Write SQL queries for extracting data from more than one table (Equi-Join, Non-Equi-Join , Outer Join)
7. Write SQL queries for sub queries, nested queries.
8. Write programs by the use of PL/SQL.
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS.
10. Create VIEWS, CURSORS, and TRIGGRS & write ASSERTIONS.
11. Create FORMS and REPORTS.
12. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
13. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
14. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN). GROUP BY, HAVING and Creation and dropping of Views.
15. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
16. i) Creation of simple PL/SQL program which includes declaration section, executable section and exception --Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
ii) Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
17. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
18. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT --IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
20. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
21. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
22. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.

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1. Write a program to read a matrix of size $m \times n$ from the keyboard and display the same using function.
2. Program to make the use of inline function.
3. Write a function `power ()` which raise a number m to a power n . The function takes double value of m and integer value of n and returns the result. Use a default value of n is 2 to make the function to calculate squares when this argument is omitted.
4. Program to show that the effect of default arguments can be alternatively achieved by overloading.
5. Write a class `ACCOUNT` that represents your bank account and then use it. The class should allow you to deposit money, withdraw money, calculate interest, send you a message if you have insufficient balance.
6. Write a class `STRING` that can be used to store strings, add strings, equate string, output strings.
7. Create the class `TIME` to store time in hours and minutes. Write a friend function to add two `TIME` objects.
8. Create two classes `DM` and `DB`. `DM` stores the distance in meter and centimeters and `DB` stores the distance in feet and inches. Write a program to add object of `DM` with the object of `DB` class.
9. Write a program to create an abstract class named `Shape` that contains an empty method named `number Of Sides ()`. Provide three classes named `Trapezoid`, `Triangle` and `Hexagon` such that each one of the classes inherits the class `Shape`. Each one of the classes contains only the method `number Of Sides ()` that shows the number of sides in the given geometrical figures.
10. Program to demonstrate the concept of:
 - a. *Default constructor*
 - b. *Parameterized constructor*
 - c. *Copy constructor*
 - d. *Constructor overloading*
11. Program to demonstrate the concept of destructor.
12. Program to show multiple inheritance
13. Program to show multilevel inheritance
14. Program to show hybrid inheritance
15. Program to show the concept of containership.
16. Program to overload unary operator.
17. Program to overload binary operator
18. Program to show the concept of run time polymorphism using virtual function.
19. Program to work with formatted and unformatted IO operations.
20. Program to read the name and roll numbers of students from keyboard and write them into a file and then display it.
21. Program to copy one file onto the end of another, adding line numbers
22. Write a function template for finding the minimum value contained in an array.

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