*B.Tech.*Computer Science and Engineering(Artificial Intelligence and Machine Learning)

KURUKSHETRA UNIVERSITY, KURUKSHETRA

MODIFIED SCHEME OF EXAMS W.E.F THE SESSION 2024-25

SEMESTER-III

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam(Hours)
						End Semester Exam	Internal assessment	Practical Exam	Total	
1	B23-CAM-201	Data Structures	4:0:0	4	4	70	30	0	100	3
2	B23-CAM-203	Modern Computer Architecture	3:0:0	3	3	70	30	0	100	3
3	B23-CSE-205	Object Oriented Programming	4:0:0	4	4	70	30	0	100	3
4	B23-CSE-207	IT Workshop (Python)	3:0:0	3	3	70	30	0	100	3
5	B23-BSC-205	Mathematical Concepts for AI	3:0:0	3	3	70	30	0	100	3
6	B23-CAM-209	Artificial Intelligence	3:0:0	3	3	70	30	0	100	3
7	B23-CAM-211	Data Structures Lab	0:0:3	3	1.5	0	40	60	100	3
8	B23-CSE-211	Object Oriented Programming Lab	0:0:3	3	1.5	0	40	60	100	3
9	B23-CSE-213	IT Workshop (Python) Lab	0:0:2	2	1	0	40	60	100	3
10	B23-MAC-202	Essence of Indian Traditional Knowledge	2:0:0	2	1	--	100	0	100	3
TOTAL				**30**	**25**	**420**	**400**	**180**	**1000**	

Note:

- NCC/NSS/Sports/Yoga/Technical/cultural club/society activities may also be joined by students in second year and will be evaluated in 7th semester by the institute based upon continuous evaluation model as per guidelines.
- The Syllabus of B23-CSE-205, B23-CSE-207, B23-CSE-211, B23-CSE-213 subjects are same with B.Tech (CSE) scheme.

*B.Tech.*Computer Science and Engineering(Artificial Intelligence and Machine Learning)

KURUKSHETRA UNIVERSITY, KURUKSHETRA

MODIFIED SCHEME OF EXAMS W.E.F THE SESSION 2024-25

SEMESTER-IV

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam(Hours)
						End Semester Exam	Internal assessment	Practical Exam	Total	
1	B23-CAM-202	Introduction to Machine Learning	3:1:0	4	4	70	30	0	100	3
2	B23-ESC-220	Internet of Things	3:1:0	4	4	70	30	0	100	3
3	B23-CSE-204	Design and Analysis Algorithms	3:1:0	4	4	70	30	0	100	3
4	B23-CAM-208	Data Base System	3:1:0	4	4	70	30	0	100	3
5	--	Open Elective-I	3:0:0	3	3	70	30	0	100	3
6	B23-CAM-210	Machine Learning Lab	0:0:3	3	1.5	0	40	60	100	3
7	B23-CSE-212	Design & Analysis Algorithms Lab	0:0:3	3	1.5	0	40	60	100	3
8	B23-CAM-214	DBS Lab	0:0:2	2	1	0	40	60	100	3
9	B23-MAC-201	Environmental Studies	3:0:0	3	1	70	30	0	100	3
TOTAL				**30**	**24**	**420**	**300**	**180**	**900**	

Note:

- All students have to undertake the industrial training for 6 to 8 weeks after 4th semester which will be evaluated in 5th semester.
- The course of Open Elective will be offered at 1/3rd strength or 20 students (whichever is smaller) of the section.

Open Elective –I	
Intellectual Property Rights (IPR) and Regulatory	B23-OCA-202
International and Corporate Law	OE23-OCA-204
Cyber Law and Ethics-	OE23-OCA-206

B23-CAM-201	Data Structures						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal assessment**	**Total**	**Time**
4	0	0	4.0	70	30	100	3 Hour
Purpose	To introduce the principles and paradigms of Data Structures for design and implement the software systems logically and physically.						
Course Outcomes (CO)							
CO 1	To introduce the basic concepts of Data structure , basic data types ,searching and sorting based on array data types.						
CO 2	To introduce the structured data types like Stacks and Queue and its basic operations's implementation.						
CO 3	To introduce dynamic implementation of linked list.						
CO 4	To introduce the concepts of Tree and graph and implementation of traversal algorithms.						

Unit-1

Introduction to Data Structures, Data Types, Built in and User Defined Data Structures, Data Structure Operations, Applications of Data Structure, Analysis of an Algorithm, Asymptotic Notations, Time-space trade off .

Arrays, Arrays(One Dimensional , Two Dimensional and Multi-Dimensional), Sparse Matrices, Searching from Array using Linear and Binary Searching Algorithm, Sorting of Array using Selection, Insertion,Bubble Sort.

Unit-2

Stacks: ADT Stack and Its Operations, Algorithm and their complexity analysis, Applications of Stack, Conversion and Evaluation, Implementation of Merge Sort and Quick Sort Algorithm.

Queues: ADT Queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue, Operations on each type of Queues, Applications of Queues.

Unit-3

Linked Lists: Need of Dynamic Data Structures, Singly Linked List and Its Dynamic Implementation, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from Linked Lists, Comparison between Static and Dynamic, Implementation of Linked List.

Circular Link Lists and Doubly Link List, Dynamic Implementation of Primitive Operations on Doubly Linked Lists and Circular Linked List, Linked representations of Stacks and Queues.

Unit-4

Trees: Definition, Basic Terminology, Binary Tree, Static and Dynamic Implementation of a Binary Tree, Primitive Operations on Binary Trees, Binary Tree Traversals, Representation of Infix, Post-Fix and Prefix Expressions using Trees.

Different types of Trees: Binary Search Trees**,** B+ Trees, AVL Trees, Threaded Binary Trees, Balanced Multi- way Search Trees, Implementation of Heap Sort Algorithm.

Graphs: Basic Terminologies and Representations, Graph Search and Traversal Algorithms and Complexity Analysis.

Suggested Books:

- Theory and Problems of Data Structures by Jr. Symour Lipschetz, Schaum's outline, TMH.
- Data Structures and Algorithms by PAI, TMH.

- Fundamentals of Data structures by Ellis Horowitz and Sartaj Sahni, Pub, 1983, AW.
- Data Structures and Algorithms by A.V. Aho, J.E. Hopcroft and T.D. Ullman, Original edition, Addison-Wesley, 1999, Low Priced Edition.
- Data Structures and Program Design in C by Robert Kruse, PHI,
- Shukla, Data Structures using C++, Wiley India
- Introduction to Computers Science -An Algorithms Approach , Jean Paul Tremblay, Richard B. Bunt, 2002,T.M.H.
- Data Structure and the Standard Template library – Willam J. Collins, 2003, T.M.H.

B23-CAM-203	Modern Computer Architecture						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal assessment**	**Total**	**Time**
3	0	0	3.0	70	30	100	3Hrs.
Purpose	This course introduces the principles of computer organization and the basic architecture concepts. The course emphasizes performance and cost analysis, instruction set design, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O systems.						
Course Outcomes (CO)							
CO1	Be familiar with computer arithmetic and digital logic related to computer architecture						
CO2	Be familiar with computer architecture and instruction set architecture.						
CO3	Be familiar with understanding the concept of memory hierarchy and basic computer organization and design						
CO4	Be acquainted with the basic knowledge of I/O devices organization.						

UNIT-I

Digital Logic and Architecture: History of computer architecture, Von Neumann Architecture, Flynn's Classification of Computers, combinational vs sequential logic, physical constraints (gate delay, fan-in, fan-out, energy/power), MIPS, MFLOPS.

Computer Arithmetic: Representation of numeric data, signed and unsigned arithmetic; Range, precision and errors in floating-point arithmetic; Digital arithmetic algorithms for Addition, Subtraction, Multiplication using Booth's algorithm.

UNIT-II

Computer Architecture: Computer architecture for artificial intelligence applications, AI-assisted Design for Architecture (AIDArc). Common Bus System, General register organization, stack organization

Instruction Set Architecture: Basic organization of computing machine: fetch, decode, and execute; Instruction set types, instruction format, addressing modes, subroutine call and return mechanisms.

UNIT-III

Basic Computer Organization and Design: Storage systems, Types of cache memory: address mapping, block size, replacement, and store policies; virtual memory system: page table and TLB. Advanced Optimizations of Cache Performance, Memory Technology and Optimizations,

Case Study: Memory Hierarchies in Intel Core i7 and ARM Cortex-A8.

CISC vs RISC Designs, Design of arithmetic and logic unit (ALU). control unit: hardwired realization vs micro-programmed realization, multi-cycle implementation, Instruction level parallelism, instruction pipelining, pipeline hazards.

UNIT-IV

Input-output organization: I/O interface. I/O Bus and interface modules, I/O versus Memory Bus. Asynchronous data transfer: Strobe control, Handshaking, Asynchronous serial transfer. Modes of Transfer: Programmed I/O, Interrupt driven I/O, Priority interrupt; Daisy chaining, Parallel Priority interrupt. Direct memory Access, DMA controller and transfer.

Text Book:

- J.L. Hennessy and D.A. Patterson. Computer Architecture: A Quantitative Approach. 5th Edition, Morgan Kauffmann Publishers, 2012.

- J.P. Shen and M.H. Lipasti. Modern Processor Design: Fundamentals of Superscalar Processors. McGraw-Hill Publishers, 2005.
- D.B. Kirk and W.W. Hwu. Programming Massively Parallel Processors. 2nd Edition, Morgan Kauffmann Publishers, 2012.
- David A. Patterson, John L. Hennessy - second edition: "Computer Organization and Design: the hardware/software interface", Morgan Kaufmann.
- Harvey G. Cragon, "Memory Systems and Pipelined Processors", Jones and Bartlett.

B23-CSE-205	Object Oriented Programming						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Minor Test**	**Total**	**Time**
4	0	0	4.0	70	30	100	3 Hour
Purpose	To introduce the principles and paradigms of Object Oriented Programming Language for design and implement the Object Oriented System.						
Course Outcomes (CO)							
CO1	To introduce the basic concepts of object oriented programming language and the its representation.						
CO2	To allocate dynamic memory, access private members of class and the behavior of inheritance and its implementation.						
CO3	To introduce polymorphism, interface design and overloading of operator.						
CO4	To handle backup system using file, general purpose template and handling of raised exception during programming.						

UNIT–1

Introduction to C++, C++ Standard Library, Illustrative Simple C++ Programs. Header Files, Namespaces, Application of object oriented programming. Control flow, variables and assignments statements, conditional execution, looping, function calls including recursion.

Object Oriented Concepts, Introduction to Objects and Object Oriented Programming, Encapsulation, Polymorphism, Overloading, Inheritance, Abstract Classes, Accessifier (public/ protected/ private), Class Scope and Accessing Class Members, Constant, Class Member, Structure and Class.Macro vs Inline Functions.

UNIT-2

Friend Function and Friend Classes, This Pointer, Dynamic Memory Allocation and Deallocation (New and Delete), Static Class Members, Constructors, parameter Constructors and Copy Constructors, Deconstructors,

Introduction of inheritance, Types of Inheritance, Overriding Base Class Members in a Derived Class, Public, Protected and Private Inheritance, Effect of Constructors and Deconstructors of Base Class in Derived Classes.

UNIT-3

Polymorphism, Pointer to Derived class, Virtual Functions, Pure Virtual Function, Abstract Base Classes, Static and Dynamic Binding, Virtual Deconstructors.

Fundamentals of Operator Overloading, Rules for Operators Overloading, Implementation of Operator Overloading Like <<,>> Unary Operators, Binary Operators.

UNIT-4

Text Streams and binary stream, Sequential and Random Access File creation and updation, Stream Input/ Output Classes, Stream Manipulators.

Basics of C++ Exception Handling, Try, Throw, Catch, multiple catch, Re-throwing an Exception, Exception specifications.

Templates: Function Templates, Overloading Template Functions, Class Template, Class Templates and Non- Type Template arguments.

Suggested Books:

- The complete reference C ++ by Herbert shieldt Tata McGraw Hill.
- Object Oriented Programming in Turbo C++ by Robert Lafore, 1994, The WAITE Group Press.
- Shukla, Object Oriented Programming in c++, Wiley India.
- C++ How to Program by H M Deitel and P J Deitel, 1998, Prentice Hall.
- Programming with C++ By D Ravichandran, 2003, T.M.H.

B23-CSE-207	IT Workshop (Python)						
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal assessment**	**Total**	**Time**
3	0	0	3.0	70	30	100	3 Hours
Purpose	To familiarize the students with the basics of Python Programming						
Course Outcomes							
CO1	To Study Fundamental concept of Python.						
CO2	To Study and implement expression and Strings methods						
CO3	To Study and implement tuples , list and dictionary operations.						
CO4	To Study and implement exception handling and file operation.						

Unit-1

Familiarization with the basics of Python programming: Introduction to Python, Features of Python, Execution modes: interactive mode and script mode, Python character set, use of indentation, Python tokens(keyword, identifier, literal, operator, punctuator), variables, use of comments, Knowledge of data types: Number(Integer, Floating point, Complex).

Errors: syntax errors, logical errors, and run-time errors

Unit-2

Expressions: Statement, Type conversion, and input/output: Precedence of Operators,Arithmetic operators, relational operators, logical operators, assignment operators, augmented assignment operators, identity operators (is, is not),Expression, evaluation of an expression, type-conversion, Flow of Control,Conditional statements, Iterative Statements

Strings: Introduction, string operations (concatenation, repetition, membership and slicing), traversing a string using loops, built-in functions/methods–len(), capitalize(), title(), lower(), upper(), count(), find(), index(), endswith(), startswith(), isalnum(), isalpha(), isdigit(), islower(), isupper(), isspace(),lstrip(), rstrip(), strip(), replace(), join(), partition(), split()

Unit-3

Array: Access the Elements of an Array, Length of an Array, Adding Array Elements, Removing Array Elements, Adds and remove the element at the specified position. **Lists, Tuples, Dictionary**: introduction, indexing, list operations, traversing a list using loops, built-in functions/methods–len(), list(), append(), extend(), insert(), count(), index(), remove(), pop(), reverse(), sort(), sorted(), min(), max(), sum().

Introduction to Python modules: Importing module using 'import ' and using from statement, importing math module (pi, e, sqrt(), ceil(), floor(), pow(), fabs(), sin(), cos(), tan()); random module (random(), randint(), randrange()), statistics module (mean(), median(), mode()).Functions and its types (Built-in Functions, Functions defined in Module, User Defined Functions), arguments, default parameters, positional parameters, Function Returning Value(s), Recursion, Scope of a Variable.

Unit-4

Files: Introduction to files, types of files (Text file, Binary file, CSV file),Text file: opening a text file, file open modes (r, r+, w, w+, a, a+ etc), closing a text file, opening a file using with clause, writing/appending

data to a text file using write() and writelines(), reading from a text file using read(), readline() and readlines

Reference Books:

1.The Complete Reference Python By Martin C Brown Publication by McGraw Hill.
2. Let us Python By Yashwant Kanetkar

B23-BSC-205	Mathematical Concepts for AI						
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal assessment**	**Total**	**Time**
3	**0**	**-**	**3**	**70**	**30**	**100**	**3 h**
Purpose	To familiarize the prospective students with the fundamentals of probability & statistics and how to apply the principles to model and analyze various phenomena in fields like finance, economics, and engineering, aiding in making informed decisions and predicting outcomes.						
Course Outcomes							
CO1	To introduce the fundamental concepts of probability to analyze and predict outcomes in real-life situations.						
CO 2	Probability theory provides models of probability distributions(theoretical models of the observable reality involving chance effects) to be tested by statistical methods which has various engineering applications..						
CO 3	To make the students familiar about basic statistics to analyze data sets using various measures of central tendency and dispersion						
CO 4	Upon completion of Unit IV, students will proficiently apply correlation and regression techniques, including calculating coefficients and determining lines of regression, to analyze relationships between variables in datasets.						

UNIT-I

Basic Probability: Introduction, additive law of probability, Conditional Probability, Independent Events, Bayes' Theorem.

Random Variables: Discrete random variables, probability distribution, Probability mass function and distribution function, Expectation, Moments, Variance and standard deviation of discrete random variables.

UNIT-II

Continuous Probability distribution:

Continuous random variables, probability distribution, Probability density function and distribution function, Expectation, Moments, Variance and standard deviation of Continuous random variables.

Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions.

UNIT-III

Basic Statistics:

Measures of Central tendency: Mean, median, quartiles, mode, Geometric mean, Harmonic mean,

Measures of dispersion: Range, Quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, Skewness and Kurtosis.

UNIT-IV

Correlation & Regression: Introduction,Correlation, Coefficient of correlation, methods of calculations, Lines of regression, Rank correlation.

Suggested Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed.,Wiley, 1968.
5. N.P. Bali and and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
8.Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

B23-CAM-209	Artificial Intelligence						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal assessment**	**Total**	**Time**
3	**0**	**0**	**3**	**70**	**30**	**100**	**3 Hour**
Purpose	To obtainthrough understanding of the discipline of Artificial Intelligence and its scope in various emerging areas.						
Course Outcomes (CO)							
CO 1	To determine a fundamental understanding of Artificial Intelligence (AI) and its core principles.						
CO 2	To demonstrate fundamental concepts of problem solving, searching, inference, and perception.						
CO 3	To demonstrate proficiency in applying AI techniques in various domains						
CO 4	To examine role of AI in various application areas.						

UNIT – 1

Scope of AI: Introduction to Artificial Intelligence, History of Artificial Intelligence, Artificial Intelligence Languages, Multi Agent Systems, natural language processing, vision and speech processing, robotics, expert systems.

UNIT – 2

Problem Solving, Searching and Planning: Problem spaces and search, Heuristic and Informed search strategies, Minmax search, Alpha-beta pruning.
Search and optimization (gradient descent), Adversarial search, Planning and scheduling, Case study: Health CareSystem.

UNIT – 3

Knowledge Engineering, Representation, Reasoning and finding Optimal Paths: Knowledge and Knowledge based system, Knowledge and rationality, Logic and inference, Propositional and predicate logic, Ontologies, Bayesian Reasoning, Temporal reasoning, Knowledge Discovery: Data and Web Mining.

UNIT – 4

Applications of AI in Various domains: AI in Marketing, AI in Banking, AI in Finance, AI in Agriculture, AI in Health Care, AI in Gaming, AI in Space Exploration, AI in Autonomous vehicles, AI in Chatbots, AI inCreativity.

Suggested books:

1. E. Rich and K. Knight, “Artificial Intelligence”, TMH, 2nd Ed.,1992.

2. N. J. Nilsson, “Principles of AI”,Narosa Publ. House,1990.
3. M. N. Hoda, “Foundation Course in Artificial Intelligence”, Vikas Pub.,2004.
4. Artificial Intelligence“ RBMishra,PHI

B23-CAM-211	Data Structures Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal assessment**	**Practical Exam**	**Total**	**Time**
0	0	3	1.5	40	60	100	3
Purpose	To introduce the principles and paradigms of Data Structures for design and implement the softwaresystems logically and physically.						
Course Outcomes (CO)							
CO1	To introduce the basic concepts of Data structure, basic data types, searching and sorting based onarray data types.						
CO2	To introduce the structured data types like Stacks and Queue and its basic operation's implementation.						
CO3	To introduce dynamic implementation of linked list.						
CO4	To introduce the concepts of Tree and graph and implementation of traversal algorithms.						

1. Write a program for Binary search methods.
2. Write a program that implements the following sorting: (i) Bubble Sort (ii) Selection Sort (iii) Insertion Sort.
3. Write a program to implement Stack and its operation using (i) Arrays (ii) Linked List.
4. Write a program that implements the following : (i) Quick Sort (ii) Merge Sort (iii) Heap Sort.
5. Write a program to implement Queue and its operation using (i) Arrays (ii) Linked List.
6. Write a program to implement Circular Queue and its operation using Arrays.
7. Write a program to implement singly linked list for the following operations: Create, Display, searching,traversing and deletion.
8. Write a program to implement doubly linked list for the following operations: Create, Display, inserting,counting, searching, traversing and deletion.
9. Write a program to implement circular linked list for the following operations: Create, Display, inserting,counting, searching, traversing and deletion.
10. Write a program to implement the tree traversal methods.
11. Write a program to perform the following operations :
    (i) Insert an element into a AVL tree.
    (ii) Delete an element from a AVL tree.
    (iii) Search for a key element in a AVL tree.

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B23-CSE-211	Object Oriented Programming Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Practical Exam**	**Total**	**Time**
0	0	3	1.5	40	60	100	3 Hour
Purpose	To introduce the principles and paradigms of Object Oriented Programming Language for design and implement the Object Oriented System.						
Course Outcomes (CO)							
CO1	To introduce the basic concepts of object oriented programming language and the its representation.						
CO2	To allocate dynamic memory, access private members of class and inheritance,Constructors.						
CO3	To introduce polymorphism, interface design and overloading of operator.						
CO4	To handle backup system using file, general purpose template and handling of raised exception during programming.						

Q1. Raising a number n to a power p is the same as multiplying n by itself p times. Write a function called power
( ) that takes a double value for n and an int value for p, and returns the result as double value. Use a default argument of 2 for p, so that if this argument is omitted, the number will be squared. Write a main ( ) function that gets values from the user to test this function.

Q2. Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class. b) Write a Program to Invoking Derived Class Member Through Base Class Pointer.

Q3. Create the equivalent of a four function calculator. The program should request the user to enter a number, an operator, and another number. It should then carry out the specified arithmetical operation: adding, subtracting, multiplying, or dividing the two numbers. (It should use a switch statement to select the operation). Finally it should display the result. When it finishes the calculation, the program should ask if the user wants to do another calculation. The response can be 'Y' or 'N'. Some sample interaction with the program might look like this.

Enter first number, operator, and second number: 10/ 3 Answer = 3.333333
Do another (Y/ N)? Y
Enter first number, operator, second number 12 + 100 Answer = 112
Do another (Y/ N) ? N

Q4. A phone number, such as (212) 767-8900, can be thought of as having three parts: the area code (212), the exchange (767) and the number (8900). Write a program that uses a structure to store these three parts of a phone number separately. Call the structure phone. Create two structure variables of type phone. Initialize one, and have the user input a number for the other one. Then display both numbers. The interchange might look like this:

- Enter your area code, exchange, and number: 415 555 1212
- My number is (212) 767-8900
- Your number is (415) 555-1212

Q5. Create two classes DM and DB which store the value of distances. DM stores distances in metres and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The

object that stores the results maybe a DM object or DB objects, depending on the units in which the results are required. The display should be in the format of feet and inches or metres and cenitmetres depending on the object on display.

Q6. Create a class rational which represents a numerical value by two double values- NUMERATOR and DENOMINATOR. Include the following public member Functions:

- constructor with no arguments (default).
- constructor with two arguments.
- void reduce( ) that reduces the rational number by eliminating the highest common factor between the numerator and denominator.
- Overload + operator to add two rational number.
- Overload >> operator to enable input through cin.
- Overload << operator to enable output through cout. Write a main ( ) to test all the functions in the class.

Q7. Consider the following class definition class father {

protected : int age; public;

father (int x) {age = x;} virtual void iam ( )

{ cout < < "I AM THE FATHER, my age is : "<< age<< end1:}

};

Derive the two classes son and daughter from the above class and for each, define iam ( ) to write our similar but appropriate messages. You should also define suitable constructors for these classes. Now, write a main ( ) that creates objects of the three classes and then calls iam ( ) for them. Declare pointer to father. Successively, assign addresses of objects of the two derived classes to this pointer and in each case, call iam ( ) through the pointer to demonstrate polymorphism in action.

Q8. Write a program that creates a binary file by reading the data for the students from the terminal. The data of each student consist of roll no., name (a string of 30 or lesser no. of characters) and marks.

Q9. A hospital wants to create a database regarding its indoor patients. The information to store include

a) Name of the patient
b) Date of admission
c) Disease
d) Date of discharge

Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about all the to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

Q10. Create a class **Employee** with a name and salary. Create a class **Manager** inherit from **Employee**. Add an instance variable, named department, of type string. Supply a method to **to String** that prints the manager's name, department and salary. Create a class **Executive** inherits from **Manager**. Supply a method **to String** that prints the string **"Executive"** followed by the information stored in the **Manager** superclass object. Supply a test program that tests these classes and methods.

Q11. Imagine a tollbooth with a class called toll Booth. The two data items are a type unsigned int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes both these to 0. A member function called payingCar ( ) increments the car total and adds 0.50 to the cash total. Another function, called nopayCar ( ), increments the car total but adds nothing to the cash total. Finally, a member function called displays the two totals. Include a program to test this class. This program should allow the user to push one key to count a paying car, and another to count a nonpaying car.

Pushing the ESC kay should cause the program to print out the total cars and total cash and then exit.

Q12. Write a function called reversit ( ) that reverses a string (an array of char). Use a for loop that swaps the first and last characters, then the second and next to last characters and so on. The string should be passed to reversit ( ) as an argument. Write a program to exercise reversit ( ). The program should get a string from the user, call reversit ( ), and print out the result. Use an input method that allows embedded blanks. Test the program with Napoleon's famous phrase, "Able was I ere I saw Elba)".

Q13. Create a class Student with a name and roll no. as data member. Create a Class Template for student class. The program should also implement template overloading.

Q14. Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed.

Create a class account that stores customer name, account number and type of account. From this derive the classes

cur_acct and sav_acct to make them more specific to their requirements. Include necessary member functions in order to achieve the following tasks:

a) Accept deposit from a customer and update the balance.
b) Display the balance.
c) Compute and deposit interest.
d) Permit withdrawal and update the balance.
e) Check for the minimum balance, impose penalty, necessary and update the balance.
f) Do not use any constructors. Use member functions to initialize the class members.

B23-CSE-213	IT Workshop (Python) Lab						
L	**T**	**P**	**Credit**	**Internal assessment**	**Practical Exam**	**Total**	**Time**
0	0	2	1	40	60	100	3 Hours
Purpose	The course is designed to provide Basic knowledge of Python.						
Course Outcomes							
CO1	To study fundamentals of python programming and implement basic programs.						
CO2	To implement the searching technique using python.						
CO3	To implement sorting techniques using python.						
CO4	To implement matrix multiplication using python.						

LIST OF PROGRAMS

1. **Write a program to compute the GCD of two numbers.**
2. **Write a program to find the square root of a number**
3. **Write a program to find the Exponentiation (power of a number)**
4. **Write a program to find the maximum of a list of numbers**
5. **Write a program for Linear search and Binary search**
6. **Write a program for Selection sort**
7. **Write a program for Insertion sort**
8. **Write a program to find first n prime numbers**
9. **Write a program to multiply matrices**
10. **Write a program that take command line arguments (word count)**
11. **Write a program to find the most frequent words in a text read from a file**

B23-MAC-202	Essence of Indian Traditional Knowledge						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical Exam**	**Total**	**Time**
2	**-**	**-**	**1**	**100**	**-**	**100**	**3**
Purpose	To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system , analyse and apply to their day to day life.						
	Course Outcomes						
CO 1	The students will be able to understand , connect up and explain basics of Indian traditional knowledge in modern scientific perspective						
CO2	The students will be able to understand Holistic Health using Indian Knowledge System						
CO3	The students will be able to Manage thoughts and Emotions , will learn positivity, self regulation and control						
CO4	The students will be able to Achieve Consciousness through Indian Knowledge System						

Unit 1

Introduction to Indian Traditional knowledge: Define traditional knowledge, importance, kinds of traditional knowledge. Philosophical systems, Basics of Rajyoga and Karamyoga,
Benefits of Rajyoga and Karamyoga.

Unit 2

Holistic Health using Indian Knowledge System:
Basic principles of natural life style, Benefits through five elements. Healing through food, Chakras and Mudras.
Physical, Mental, Emotional and Spiritual health using traditional knowledge .

Unit 3

Positivity: Traditional approaches. Happiness: objective and subjective measures of wellbeing, life satisfaction. Resilience, Self-regulation and self-control, optimism, self-esteem. Managing thoughts and Emotions with the help of Rajyoga. Achieving Powers for Self Mastery.

Unit 4

Achieving Consciousness through Indian Knowledge System: Emotional intelligence, Indian approach to Psychology. Consciousness; levels, body-mind relationship, self motivation, Self and Identity in modern Psychology and Indian thought., Spirituality and well being.

Reference and Text Books:

Mahadevan, M., Bhat, V.R. & Pavana N. (2022). Introduction to Indian Knowledge System: Concepts and Applications. PHI Learning

- Baumgardner, SR & Crothers, MK (2009). Positive Psychology. Prentice Hall/Pearson Education.
- Cornelissen, R.M., Misra G. & Varma S. (2014). Foundations & Applications of Indian Psychology. Pearson Education.

Rajyoga Education and Consciousness Improvement Programme for Educators, Rajyoga Education and Research Foundation.

Rajyoga Meditation Course, Thoughkart, Jaipur(Rajasthan), India.

Prakartik Swasthya Shastra, Publisher Natural Lifestyle

B23-CAM-202	Introduction to Machine Learning						
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	1	0	4.0	70	30	100	3 Hrs.

Purpose	Machine learning for students looking to implement solutions to real-world machine learning problems.
CO 1	Understanding the Basics of Machine Learning.
CO 2	To learn the various machine learning techniques.
CO3	Knowledge about different types of Neural Networks based machine learning approaches.
CO4	Comparison of various machine learning algorithms.

UNIT- 1

Introduction to the Machine Learning, Design a Learning System- Selection of Training set, Selection of Target Function, Selection of a Function Approximation Algorithm, Perspective and issues in Machine Learning, Applications of Machine Learning.

UNIT- 2

Linear Regression and Logistic Regression, Support Vector Machine, Decision Trees, Issues in Decision Tree Learning.

UNIT- 3

Neural Networks - Perceptron Learning, Backpropagation, Supervised Machine Learning Algorithms, Unsupervised Machine Learning Techniques.

UNIT- 4

Bias and Fairness in Machine Learning, Detecting Bias, Achieving Fairness in Machine Learning Comparing Machine Learning Algorithms.

Suggested Books:

1. Introduction to Machine Learning with Python by Deepti Chopra and Roopal Khurana, Published by Bentham Science Pvt Ltd., 2023
2. Introduction to Machine Learning with Python by Andreas C. Muller and Sarah Guido Published by O'Reilly Media Inc., 2016

B23-ESC-220	Internet of Things						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	1	0	4.0	70	30	100	3Hrs.
Purpose	This course introduces the principles of IoT and the basic architecture concepts. The course emphasizes implementation of various logic related to IoT and understanding the concept of data communication among IoT device, data storage, data analytics and data security.						
Course Outcomes (CO)							
CO1	Be familiar with IoT architecture and Communication services related to computer architecture						
CO2	Be familiar with the design of IoT microcontroller and understanding the concept of applying different logics.						
CO3	Be familiar with understanding the concept of data communication through various IoT devices						
CO4	Be acquainted with the basic knowledge of data storage, data analytics and security in IoT						

UNIT-1

IoT: History of IOT, Requirements, Functionalists, and structure of IOT, IoT enabling technologies, IoT Architecture, IoT communication and networking protocols, Role of wired and wireless communication, IoT services and applications, IoT Standards, Fog Computing, Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT. Balock chain and IoT, AI and IoT

UNIT-2

IOT Data Acquisition & Platforms: Micro Controllers (Arduino uno/mega2560, Rasberry-Pi, ARM), Real-time systems, and embedded software, Hardware & Software Requirements

UNIT-3

IOT Data Communication: Ipv4/Ipv6, Ethernet/GigE, MIPI, M-PHY, UniPro, SPMI, BIF, Super Speed USB Inter-Chip (SSIC), Mobile PCIe (M-PCIe) and SPI, GSM , 2G ,3G ,4G and 5G, IEEE 802.15.4, IEEE 802.15.4e, 802.11ah, Relay Access Point (AP), Grouping of station, Target Wake Time (TWT)

UNIT-4

IOT Data Storage & Retrieval: Cloud Storage, Databases Connectivity with IOT and uses, Case Study over Cloud Services And Administration, Case Study of Big Data & Hadoop Platforms

IOT Data Analytics & Security: Analysis Of data using the Ipython Module, Data Cleaning in IoT, Attack, Defense, and Network Robustness of Internet of Things, Authentication in IoT, Security Protocols for IoT Access Networks

Books and references:

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)
3. Research papers

B23-CSE-204	Design and Analysis of Algorithms						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	1	-	4.0	70	30	100	3 Hrs.
Purpose	To introduce advanced data structures & algorithms concepts involving their implementation for solving complex applications.						
Course Outcomes (CO)							
CO1	Learn the basic concepts of data structures and their analysis.						
CO2	Study the concept of dynamic programming and various advanced data structures.						
CO3	Learn various graph algorithms and concepts of computational complexities.						
CO4	Study various string matching algorithms						

UNIT-1
Introduction

Review :- Elementary Data Structures, Algorithms & its complexity(Time & Space), Analysing Algorithms, Asymptotic Notations, Pseudocode Conventions, Binary search trees.

Recurrence relation:- Methods for solving recurrence(Substitution, Recursion tree, Master theorem).

UNIT-2
Advanced Design and analysis Techniques

Dynamic programming:- Elements, Matrix-chain multiplication, longest common subsequence,

Greedy algorithms:- Elements , Activity- Selection problem, Huffman codes, Task scheduling problem, Knapsack problem.

Backtracking algorithms:- Graph coloring, N-Queen problem, Hamiltonian path and circuit.

UNIT-3
Graph Algorithms

Review of graph algorithms:-Traversal Methods(Depth first & Breadth first search),Topological sort, Strongly connected components, Minimum spanning trees- Kruskal's and Prim's Algorithm, Single source shortest paths, Relaxation, Dijkstra's Algorithm, Bellman- Ford algorithm, Single source shortest paths for directed acyclic graphs, Floyd-Warshall algorithm,

UNIT-4
Computational Complexity

Basic Concepts, Polynomial vs Non-Polynomial Complexity, NP- hard & NP-complete classes. The Naïve string-matching algorithm, Rabin-Karp Algorithm, String matching with finite automata.

Text Books :

1. Corman, Leiserson and Rivest : Introduction to Algorithms, 2/e, PHI
2. Harsh Bhaisn, Algorithms: Design And Analysis Oxford University Press,2015.

Reference Books:

1. Aho, Hopcroft and Ullman : The Design and Analyses of Computer Algorithms. Addison Wesley.
2. R.B.Patel, Expert Data Structures with C, Khanna Publications , Delhi, India, 2ndEdition 2004, ISBN 81-87325-07-0, pp.1-909.

3. R.B.Patel& M.M.S Rauthan, Expert Data Structures with C++, Khana Publications, Delhi , India, 2ndEdition 2004,ISBN : 87522-03-8.
4. Horowitz, Ellis and Sahni, Sartaj : Fundamentals of Computer Algorithms, Galgotia Publications

B23-CAM-208	Data Base System						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**1**	**0**	**4**	**70**	**30**	**100**	**3 Hour**
Purpose	To familiarize the students with Data Base Management system						
Course Outcomes							
CO 1	To provide introduction to relational model and ER diagrams.						
CO 2	To realize about query processing & constraints .						
CO 3	To comprehend about the concept of functional dependencies& normalization .						
CO 4	To learn the concept of failure recovery and concurrency control.						

UNIT-1

Introduction: DBMS an overview, Types of Database¸ Data Models-, Network, Hierarchical, Object Oriented and Relational Model, Levels of abstraction. Database Administrator role, Database Users, Three Schema architecture of DBMS, Advantages of DBMS.

Entity-Relationship Model: : Entities, Attributes and Entity Sets, Relation and Relationships sets, Mapping and participation Constraints, Keys, Entity-Relationship Diagram- Conversion of E-R Diagram to Relational Database. Weak Entity Sets, Extended E-R features.

UNIT-2

Relational Model: Structure of relational Databases, Relational Algebra and Relational Calculus, Operations on Relational Algebra, Operations on Relational Calculus, Tuple Relational Calculus, Domain Relational Calculus.

SQL and Integrity Constraints: Concept of DDL, DML, DCL & TCL. Basic Structure, Set operations, Aggregate Functions, Introduction to views, Nested Sub queries, Stored procedures and triggers, Null Values, Domain Constraints, Referential Integrity Constraints.

UNIT-3

Relational Database Design:

Functional Dependencies, Armstrong's axioms for functional dependency, Closure of a set of functional dependency,minimal cover, Different anomalies in designing a Database, Normalization using functional dependencies.

Normal Forms-1st normal form, 2nd normal form, 3rd normal form, Boyce-Codd normal form, 4th normal form, 5th normal form, concept of Denormalization.

Transaction Management & Concurrency Control: ACID Properties, Transaction states, Serializability of Transaction, Testing for Serializability and concurrency control, Lock based concurrency control (2PL, Deadlock), Time stamping methods , Validation.

Recovery System: Types of Failures, Recovery Techniques, ARIES.

Suggested Books:

- Ramez Elmasri, Shamkant B. Navathe," Fundamentals of Database systems", Pearson

- Korth, Silberschatz, Sudarshan: database concepts, MGH,
- R. Ramakrishnan and J. Gehrks database management system; MGH, International edition,
- C. J. Date, data base systems: 7th edition, Addison Wesley, Pearson Education, Chakrabarti, Advance database management systems, Wiley Dreamtech

B23-OCA-202	Intellectual Property Rights (IPR) and Regulatory						
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**0**	**0**	**3**	**70**	**30**	**100**	**3 Hrs.**
Purpose	The subject introduces various categories of intellectual property like patents, copyrights, trademarks, industrial designs, geographical indications, trade secrets etc.						
CO 1	Introduction to Intellectual Property.						
CO 2	To understand about Patents in detail.						
CO3	To learn about Copyrights and Trademarks.						
CO4	Knowledge about Industrial Designs and Geographical Indications.						

UNIT-1

Introduction to Intellectual Property - Origin of IP, History of IP in India, Patents, Copyrights and Related Rights, Trademarks, Geographical Indications, Trade Secrets, Industrial Designs, Major Amendments in IP Laws and Acts in India, IP Organizations in India, Indian Web Portals for Patents and Technologies.

UNIT-2

Categories of Intellectual Property, Conditions for obtaining Patent Protection, Rights associated with Patents, Enforcement of Patent Rights, Inventions eligible for Patenting, Non-Patentable Matters, Patent Infringements, Process of Patenting, World Intellectual Property Organization.

UNIT-3

Classes of Copyrights, Criteria for Copyright, Ownership of Copyright, Copyrights of the Author, Copyright Infringements, Non-copyright Work, Validity of Copyright, Transfer of Copyrights to a Publisher; Trademarks Eligibility Criteria, Classification of Trademarks, Validity of Trademark, Types of Trademark Registered in India, Process of Trademarks Registration.

UNIT-4

Industrial Designs Eligibility Criteria, Acts and Laws to Govern Industrial Designs, Design Rights, Procedure for Registration of Industrial Designs, Importance of Design Registration, Classification of Industrial Designs, Acts, Laws and Rules pertaining to Geographical Indications (GI), Ownership of GI, Identification of Registered GI, Classes of GI, Non-Registerable GI, Protection of GI, Procedure for GI Registration, Criteria for Trade Secrets, Rights Associated with Trade Secrets, Enforcement of Trade Secrets, Disparity between Trade Secrets and Patents.

Suggested Books:

1. Intellectual Property: A Primer for Academia by Prof. Rupinder Tewan, Ms. Manita Bhardwaj, Publication Panjab University Chandigarh, 2021
2. Intellectual Property Rights - Law and Practice, Publication by Institute of Company Secretaries of India, New Delhi, 2014.

O23-OCA-204	International & Corporate Law						
L	**T**	**P**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	**0**	**0**	**3**	**70**	**30**	**100**	**3 Hrs.**

Purpose	The Purpose is to impart knowledge about various international and national laws.
CO 1	To acquire basic knowledge of international law and comparison with municipal law.
CO 2	Jurisdiction of law and state & non state entities.
CO3	To acquire conceptual understanding of company Act.
CO4	Knowledge of share capital and importance of SEBI.

UNIT-1

Definition nature and basis of international law, sources of international law, Relationship between international and municipal law, Subjects of international law, position of individual in international law,
Prescribed Case Law: *North Sea continental shelf case ICJ Report 1969, P. 39*

UNIT-2

Nature of State, Non state entities, state jurisdiction, settlement of international disputes
Nationality: Extradition; Asylum; Diplomatic Agents and Treaties, Purpose and Principles of UNO.

UNIT-3

Emergence of corporations as business organizations and brief introduction of company Act, Company- Definition and kinds of companies; Nature of company, Corporate personality, lifting the corporate veil, Formation of company- Registration & incorporation, memorandum of association &its importance, Article of association and, its relation with memorandum of association,
Prescribed Case Law: *Salomon V. Salomon & company Ltd. (1897) A.C.22*

UNIT-4

Kinds of share and share capital, Issue of share at premium and discount
Debentures- Nature, scope and kinds of debentures
Dividend- Meaning, manner and time of payment of dividend
Composition and functions of SEBI

Book Recommended:

1. Kapoor, S.K. : International Law and Human Rights
2. Tandon, M.P. : Public International Law
3. The Companies Act 2013
4. Rai, Kailash: Company Law
5. The Securities and Exchange Board of India Act, 1992

OE23-OCA-206	Cyber Law and Ethics						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time**
3	-	-	3.0	70	30	100	3 Hrs.
Purpose	To gain a broad understanding in order to get cyber law and ethics.						
Course Outcomes							
CO1	To facilitate the basic knowledge of cyber Law.						
CO2	To learn about how to maintain the Confidentiality, Integrity and Availability of information technology act.						
CO3	To get enable to fix the various Cyber Law and Related Legislation.						
CO4	To deal with the Cyber Ethics.						

UNIT-1: Introduction to Cyber Law

Evolution of computer technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

UNIT-2: Information Technology Act

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

UNIT-3: Cyber Law and Related Legislation

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

UNIT-4: Cyber Ethics

The Importance of Cyber Law, Significance of cyber Ethics, Need for Cyber regulations and Ethics. Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Block chain Ethics.

Suggested Books:

1. Cyber Security : Understanding Cyber Crimes , Computer Forensics and Legal Perspectives By Nina Godbole, Sunit Belapur , Wiley
2. Understanding cybercrime: phenomena , and legal challenges response, ITU 2012.

B23-CAM-210	Machine Learning Lab						
L	**T**	**Practical**	**Credit**	**Internal Assessment**	**Practical Exam**	**Total**	**Exam Time**
0	0	3	1.5	40	60	100	3 Hrs
Purpose	It provide students with hands-on experience in experimenting and analysing various machine learning algorithms.						
	Course Outcomes						
CO1	Implement Python Programs.						
CO 2	Implement Machine Learning Algorithms.						
CO 3	Compare and contrast Machine Learning Algorithms.						
CO 4	Analyse the trends in datasets using descriptive statistics.						

LIST OF PRACTICALS

1. Implement Python Program to demonstrate matrices addition, subtraction and multiplication.

2 Implement the Linear Regression algorithm using Python.

3. Implement the Logistic Regression algorithm using Python.

4. Implement the K-nearest Neighbour algorithm.

5. Implement the Decision Tree algorithm.

6. Implement the Random Forest algorithm.

7. Implement the Naive Bayesian Classification algorithm.

8. Implement the Support Vector Machine algorithm.

9. Implement the Perceptron Neural Learning Network.

10. Implement the Backpropagation Learning using Python.

B23-CSE-212	Design and Analysis of algorithms Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical Exam**	**Total**	**Time**
--	--	3	1.5	40	60	100	3 Hour
Purpose	The student will learn the algorithm analysis techniques, become familiar with the different algorithm design techniques and understand how to implement various algorithms						
Course Outcomes (CO)							
CO1	The student should be able to Design algorithms for various computing problems						
CO2	The student should be able to Analyse the time and space complexity of algorithms.						
CO3	The student should be able to critically analyse the different algorithm design techniques for a given problem.						
CO4	The student should be able to modify existing algorithms to improve efficiency.						

List of Practicals

1. Program to find the given element in Binary Search Tree.
2. Program to implement Binary Search Tree.
3. Program to implement Prim's algorithm using greedy method.
4. Program to implement Kruskal's algorithm using greedy method.
5. Program to implement graph traversal using Breadth First Search.
6. Program to implement graph traversal using Depth First Search.
7. Program to implement N queen's problem.
8. Program to implement all pairs shortest path.
9. Program to implement Activity Selection Problem.
10. Program to implement Knapsack problem.
11. Program to implement Graph Coloring Problem.
12. Program to implement Naïve String matching algorithm.

B23-CAM-214	DBS Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical**	**Total**	**Time**
0	**0**	**2**	**1**	**40**	**60**	**100**	**3 Hours**
Purpose	**To familiarize the students with the basics of Data base management system.**						
Course Outcomes							
CO1	To understand basic DDL, DML and DCL commands.						
CO2	To learn about various integrity constraints & clauses.						
CO3	To understand the concept of relational algebra.						
CO4	To understand the sub queries, nested queries, views & trigger.						
CO5	To learn various queries using different types of operators & functions .						

1. Write the queries for Data Definition Language (DDL) in RDBMS.
2. Write the queries for Data Manipulation Language (DML) in RDBMS.
3. Write the queries for Data Control Language (DCL) in RDBMS.
4. To perform various integrity constraints on relational database.
5. Create a database and perform the Group by clause , having clause and Order by Clause.
6. Write SQL queries for relational algebra
7. Write SQL queries for extracting data from more than one table
8. Write SQL queries for sub queries and nested queries
9. Write SQL queries to implement views.
10. Write trigger for before and after insertion, deletion and updation process.
11. Implementation of different types of operations in SQL
    - Arithmetic Operator
    - Logical Operator
    - Comparison Operator
    - Special Operator
12. Implementation of different types of functions with suitable examples
    - Number Function
    - Aggregate Function
    - Character/string Function
    - Date Function

B23-MAC-201	Environmental Studies						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**End Semester Exam**	**Total**	**Time**
3	--	--	1	30	70	100	3 Hour
Purpose							
Course Outcomes (CO)							
CO1	Students will be able to understand the importance of natural resources.						
CO2	Students will understand the concept of an ecosystem, its structure, and its functions.						
CO3	The students will be able to understand the causes and impacts of various environmental pollution.						
CO4	Students will be able to understand the relationship between human population and the environment.						

UNIT-1

Introduction to Environmental studies: The Multidisciplinary nature of environmental studies Definition; Scope and importance, Need for public awareness.

Natural Resources: Forest resources: Use and Over-exploitation, deforestation. Timber extraction, mining, dams, and their effects, Water resources: Use and over-utilization of surface and groundwater, conflicts over water, dams benefits and problems, Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Energy resources: renewable and non-renewable energy sources, Land resources: land degradation, soil erosion, and desertification.

UNIT-2

Ecosystems: Concept of an ecosystem, Structure, and function of an ecosystem, Energy flow in the ecosystem, Ecological succession, Food chains, food webs, and ecological pyramids. Major types of ecosystem-Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem.

Biodiversity and its Conservation: Introduction-Definition: genetic, species, and ecosystem diversity. Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-3

Environmental pollution: Causes, effects, and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Nuclear hazards, and Solid waste Management: Causes, effects, and control measures of urban and industrial wastes, Disaster management: floods, earthquake, cyclone and landslides.

Social Issues and the Environment: Sustainable development, Water conservation, rainwater harvesting, Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, and wasteland reclamation. Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act., and Forest Conservation Act.

UNIT-4

Human population and the Environment: Population growth, Population Explosion-Family welfare Programme, Environment and human health. Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Drugs and their effects; Useful and harmful drugs; Use and abuse of drugs; Stimulant and depressant drugs. Concept of drug de-addiction. Legal position on drugs and laws related to drugs.

Field Work (Practical)-

- 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, and birds.
- Study of simple ecosystems- pond, river, hill slopes, etc.

Suggested Readings:

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Kaushik, Anubha and Kaushik, C.P. (2004 Perspectives in Environmental Studies, New age International Publishers.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad -380013, India, Email: mapin@icenet. net (R).
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
5. Clerk B.S., Marine Pollution, Clanderson Pross Oxford (TB).
6. Cunningham, W.P.Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.

Down to Earth, Centre for Science and Environment (R).