Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in Light of NEP-2020
B.Tech. (CSE- Artificial Intelligence and Machine Learning-Microsoft)SEMESTER-II (2021-2025)

| COURSE CODE | CATEGORY | COURSE NAME | TEACHING & EVALUATION SCHEME | | | | | L | T | P | CREDITS |
| | | | THEORY | | | PRACTICAL | | | | | |
			END SEM University Exam	Two Term Exam	Teachers Assessment *	END SEM University Exam	Teachers Assessment *				
BTMACS 201	BS	Mathematics-II	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;   **C** - Credit;
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Course Educational Objectives (CEOs):

The student will have ability to:
1. To introduce the students with the Fundamentals of the Calculus of Matrices, Differential Equations, Numerical Analysis and Statistics.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to
1. Understand and apply the basics of the calculus of matrices.
2. Solve the fundamental problems of the ordinary differential equations.
3. Apply the advanced techniques to find the solution of the ordinary differential equations.
4. Know the techniques of the numerical analysis.
5. Find the numerical solution of the ODE.
6. Understand and apply the basics of the statistical methods.

Syllabus:

UNIT I   10HRS
Calculus of Matrices: Systems of linear equations and their solutions.Matrices, determinants, rank and inverse.Linear transformations. Range space and rank, null space and nullity. Eigenvalues and eigenvectors.Similarity transformations.Diagonalization of Hermitian matrices.

UNIT II   9HRS
Differential Equation: Ordinary Differential Equations: First order linear and nonlinear ordinary differential equations, exactness and integrating factors. Ordinary linear differential equations of n-th order, solutions of homogeneous and non-homogeneous equations.Operator method.Method of undetermined coefficients and variation of parameters.

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BTMACS 201	BS	Mathematics-II	60	20	20	0	0	3	1	0	4

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UNIT III   8HRS
Numerical Analysis:Interpolation and Curve Fitting: Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton Gregory Polynomial Form; Lagrange Polynomial Interpolation; Approximation by Least Square Method.
Numerical Differentiation and Integration: Discrete Approximation of Derivatives: Forward and Backward Difference Forms, Numerical Integration, Simple Newton Cotes Rules: Trapezoidal and Simpson's (1/3) Rules; Weddle's Rule.

UNIT IV   7HRS
Numerical Solution of ODE: Euler's Method for Numerical Solution of ODE; Modified Euler's Method; Runge Kutta Method (RK2, RK4); Multistep Method: Predictor- Corrector method.

UNIT V   8HRS
Probability Theory and Random Process : Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, binomial, Poisson and normal random variable, probability distributions, functions of random variables; mathematical expectations, Definition and classification of random processes, discrete-time Markov chains.

Text Books:
1. G. Strang, Linear Algebra And Its Applications, 4th Edition, Brooks/Cole, 2006
2. S. L. Ross, Differential Equations, 3rd Edition, Wiley, 1984.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall, 1995.
4. W.E. Boyce and R.C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 7th Edition, Wiley, 2001.
5. E,K. E. Atkinson, Numerical Analysis, John Wiley, Low Price Edition (2004).
6. S. D. Conte and C. de Boor, Elementary Numerical Analysis An Algorithmic Approach, McGraw- Hill, 2005.
7. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi

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Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
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BTMACS 201	BS	Mathematics-II	60	20	20	0	0	3	1	0	4

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References:
1. E. Kreyszig, Advanced Engineering Mathematics, 9th Edition, Wiley, 2005.
2. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 5th Ed, Wiley,1999.
3. J. Stewart, Calculus: Early Transcendentals, 5th Ed, Thomas Learning (Brooks/ Cole), Indian Reprint, 2003.
4. J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 2nd Edition, Texts in Applied Mathematics, Vol. 12, Springer Verlag, 2002.
5. J. D. Hoffman, Numerical Methods for Engineers and Scientists, McGraw Hill, 2001.
6. M.K Jain, S.R.K Iyengar and R.K Jain, Numerical methods for scientific and engineering computation (Fourth Edition), New Age International (P) Limited, New Delhi,2004.
7. S. C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, McGraw Hill2008.

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			THEORY			PRACTI CAL					
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HUCS101	AECC	Communication Skills	60	20	20	30	20	1	0	2	2

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Course Educational Objectives (CEOs):

1. Develop the second language learners 'ability to enhance and demonstrate LSRW Skills.
2. Enable students to acquire English Language Skills to further their studies at advanced levels.
3. Prepare students to become more confident and active participants in all aspects of their under graduate programs

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Enhance confidence in their ability to read, comprehend, organize, and retain written in formation.
2. Write grammatically correct sentences for various forms of written communication to express oneself.

Syllabus:

UNIT I   **10HRS**
   C**ommunication**: Nature, Meaning, Definition,Verbal and Non Verbal Communication Barriers to Communication.

UNIT II   **9HRS**
   Basic Language Skills: Grammar and usage- Parts of Speech, Tenses, S-V Agreement, Preposition, Article.

UNIT III   8**HRS**

   Basic Language Skills: Types of Sentence, Direct - Indirect, Active - Passive voice, Phrases& Clauses.

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HUCS101	AEC C	Communication Skills	60	20	20	30	20	1	0	2	2

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;   **C** - Credit;
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UNIT IV   **7HRS**
   Business Correspondence: Business Letter, Parts & Layouts of Business Resume and Job application, E-mail writing.

UNIT V   **8HRS**
   Report Writing: Importance of Report, Types of Report, Structure of a Report.

List of Practical's:
1. SelfIntroduction
2. Reading Skills and ListeningSkills
3. OralPresentation
4. Linguistics andPhonetics
5. JAM (Just aMinute)
6. GroupDiscussion

Suggested Readings:
1. Ashraf Rizvi.(200**5).**EffectiveTechnical Communication. NewDelhi:TataMcGrawHill
2. Adair, John (2003). Effective Communication. London: Pan Macmillan Ltd.
3. A.J.ThomsonandA.V.Martinet(1991).APracticalEnglishGrammar(4thed).Newyork:Ox-fordIBH Pub.
4. Kratz, Abby Robinson (1995). Effective Listening Skills. Toronto: ON: Irwin Professional Publishing.
5. Prasad, H. M.(2001) How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill.
6. Pease, Allan. (1998).Body Language. Delhi: SudhaPublications.

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BTCS201N	DCC	Data Structure and Algorithms	60	20	20	30	20	3	1	2	5

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Course Educational Objectives (CEOs):

1. To understand efficient storage mechanisms of data for an easy access.
2. To design and implementation of various basic and advanced data structures.
3. To introduce various techniques for representation of the data in the real world.
4. To develop application using data structures.
5. To understand the concept of protection and management of data.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to

1. Get a good understanding of applications of Data Structures.
2. Develop application using data structures.
3. Handle operations like searching, insertion, deletion, traversing mechanism etc.on various data structures.
4. Decide the appropriate data type and data structure for a given problem.
5. Select the best algorithm to solve a problem by considering various problem characteristics, such as the data size, the type of operations, etc.

Syllabus:

UNIT I   **10HRS**
Introduction: Overview of Data structures, Types of data structures, Primitive and Non Primitive data structures and Operations, Introduction to Algorithms & complexity notations. Characteristic of Array, One Dimensional Array, Operation with Array, Two Dimensional Arrays, Three or Multi-Dimensional Arrays, Sparse matrix, Drawbacks of linear arrays. Strings, Array of Structures, Pointer and one dimensional Arrays, Pointers and Two Dimensional Arrays, Pointers and Strings, Pointer and Structure.

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UNIT II   9HRS
Linked List: Linked List as an ADT, Linked List Vs. Arrays, Dynamic Memory Allocation & De-allocation for a Linked List, Types of Linked List: Circular & Doubly Linked List. Linked List operations: All possible insertions and deletion operations on all types of Linked list Reverse a Single Linked List; Divide a singly linked list into two equal halves, Application of Linked List.

UNIT III   8HRS
Stack: The Stack as an ADT, Stack operation, Array Representation of Stack, Link Representation of Stack, Application of stack – Recursion, Polish Notation . Types of Recursion, problem based on Recursion: Tower of Hanoi
The Queue :The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Types of Queue :Circular Queue & Dequeue, Introduction of Priority Queue, Application of Queues.

UNIT IV   7HRS
Tree: Definitions and Concepts of Binary trees, Types of Binary Tree, Representation of Binary tree: Array & Linked List. General tree, forest, Expression Tree. Forest and general tree to binary tree conversion. Binary Search Tree Creation, Operations on Binary Search Trees: insertion, deletion & Search an element, Traversals on Binary SEARCH TREE and algorithms. Height balanced Tree: AVL, B-Tree, 2-3 Tree, B+Tree: Creation, Insertion & Deletion.
Graph: Definitions and Concepts Graph Representations: Adjacency MATRIX, Incidence matrix, Graph TRAVERSAL (DFS & BFS), Spanning Tree and Minimum Cost Spanning Tree: Prim's & Kruskal's Algorithm.

UNIT V   8HRS
Sortings: Sorting Concept and types of Sorting, Stable & Unstable sorting. Concept of Insertion Sort, Selection sort, Bubble sort, Quick Sort, Merge Sort, Heap & Heap Sort, Shell Sort & Radix sort. Algorithms and performance of Insertion, selection, bubble, Quick sort & Merge sort.

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Text Books:
1. Ashok N. Kamthane, "Introduction to Data structures", 2nd Edition, Pearson Education India,2011.
2. Tremblay & Sorenson, "Introduction to Data- Structure with applications", 8th Edition, Tata McGrawHill,2011.
3. Bhagat Singh & Thomas Naps, "Introduction to Data structure", 2nd Edition, Tata Mc-GrawHill 2009.
4. Robert Kruse, "Data Structures and Program Design",2nd Edition,PHI,1997.
5. Lipschutz Seymour,"Data structures with C" ,1st Edition ,Mc- GrawHill,2017.

References:
1. Rajesh K. Shukla ,Data Structures Using C & C++, Wiley-India 2016.
2. ISRD Group ,Data Structures Using C, TataMcGraw-Hill 2015.
3. E. Balagurusamy ,"Data Structure Using C" ,Tata McGraw-Hill 2017.
4. Prof. P.S. Deshpande, Prof. O.G. Kakde, C & Data Structures, Charles River Media 2015 .
5. Gav Pai, Data Structures, Tata McGraw-Hill, 2015.

List of Practical:
1. To develop a program to find an average of an array using AVG function.
2. To implement a program that can insert, delete and edit an element in array.
3. To implement an algorithm for insert and delete operations of circular queue and implement the same using array.
4. Write a menu driven program to implement the push, pop and display option of the stack with the help of static memory allocation.
5. Write a menu driven program to implement the push, pop and display option of the stack with the help of dynamic memory allocation.
6. Write a menu driven program to implementing the various operations on a linear queue with the help of static memory allocation.
7. Write a menu driven program to implementing the various operations on a linear queue with the help of dynamic memory allocation.
8. Write a menu driven program to implement various operations on a linear linked list.
9. Write a menu driven program to implement various operations on a circular linked list

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BTCS201N	DCC	Data Structure and Algorithms	60	20	20	30	20	3	1	2	5

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10. Write a program for implementation of Bubble sort
11. Write a program for Insertion sort
12. Write a program for Merge Sort
13. Write a program to implement Heap sort
14. Write a program to implement Quick sort
15. Write a program to Construct a Binary Search Tree and perform deletion, inorder traversal on it
16. Write a program to develop an algorithm for binary tree operations and implement the same.
17. Write a program to design an algorithm for sequential search, implement and test it.
18. Write a program to develop an algorithm for binary search and perform the same.

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BTCS202N	DCC	Object Oriented Programming	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;

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Course Educational Objectives (CEOs):

1. To explain abstract data types, classes and different types of objects.
2. To analyze the public, protected and private modes of inheriting the classes.
3. To demonstrate the overloading of functions and operators to grant them a different meaning.
4. To provide complete knowledge of Object Oriented Programming through C++ and to enhance the programming skills of the students by giving practical assignments to be done in labs.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to:

1. Identify and describe the components of object-oriented technology and justify their relevance.
2. Implement inheritance for code reusability and polymorphism.
3. Implement object oriented approach for real world scenarios.
4. Use advance features like temples and exception to make programs supporting reusability and sophistication
5. Develop the applications using object oriented programming with C++.

Syllabus
Unit-I   10HRS
Concepts of OOP: Introduction OOP, Procedural vs. Object Oriented Programming, Principles of OOP, Benefits and applications of OOP. C++ Basic Overview, Program structure, namespace, identifiers, variables, constants, enum, operators, typecasting, control structures.
Unit-II   9HRS
C++ Functions: The Main Function, Function prototyping, Simple functions, Call and Return by reference, Inline functions, Macro Vs. Inline functions, Overloading of functions, default arguments.

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BTCS202N	DCC	**Object Oriented Programming**	60	20	20	30	20	2	0	2	3

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Unit-III   **8HRS**
Objects and Classes: Basics of object and class in C++, Private and public members, static data and function members, constructors and their types, destructors, operator overloading, friend function.
Inheritance: Concept of Inheritance, types of inheritance, access modifiers, overriding, virtual base class.

Unit-IV   **7HRS**
Polymorphism: Polymorphism and its types, Pointers in C++, Pointes and Objects, this pointer, virtual and pure virtual functions, Implementing polymorphism, Abstract Methods and Classes.
Exception Handling, Templates function and class in C++

Unit-V   **8HRS**
I/O and File management: Concept of Streams, Cin and Cout Objects, C++ Stream Classes, Unformatted and Formatted I/O,   Manipulators, File Stream, C++ File Stream Classes, File Management Functions, File Modes, Binary and Random Files.

Text Books:
1. David Parsons; Object oriented programming with C++; Second edition; BPB publication; 1997.
2. Robert Lafore; Object oriented programming in C++ ; Fourth edition ; Pearson publication;2002 .
3. E Balagurusamy; Object oriented programming with C++; Seven edition; TMH; 2017.
4. Herbert Schildt ; Java Complete Reference;Seven edition; McGrawHill; 2006 .

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References:

1. John R Hubbard; Programming in C++ (Schaum); Third edition; TMH; 2000.
2. Venugopal; Mastering C++ ; second edition ;TMH; 2006.
3. Steven Holzner; C++ Programming Black Book; First Edition; Coriolis Group,U.S;2001.
4. E Balagurusamy; Programming with java a primer; Fourth edition; TMH ; 2011.

List of Experiments:

1. Write a program to display the following output using a single cout statement. Maths=90, Physics=74, Chemistry=76
2. Write a program to read 2 numbers from the keyboard and display the larger value on the screen.
3. Write a function using reference variables as arguments to swap the values of a pair of integers.
4. Write a macro that obtains the largest of 3 numbers.
5. Define a class to represent a bank account. Include the following members:
   Data members
      1.Name of the depositor
      2.Account number
      3.Type of account
      4.Balance amount in the account
   Member functions
      1.To assign initial values
      2.To deposit an amount
      3.To withdraw an amount after checking the balance
      4.To display name and balance
      Write a main program to test the program.
6. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and odd 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 may be a DM object or DB object, depending on the units in which the result are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

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BTCS202N	**DCC**	**Object Oriented Programming**	60	20	20	30	20	2	0	2	3

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7. Design a constructor for bank account class.
8. A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message "Required copies not in stock" is displayed.
    Design a system using a class called books with suitable member functions and Constructors. Use new operator in constructors to allocate memory space required.
9. Improve the system design in exercise 8 to incorporate the following features:
    (a) The price of the books should be updated as and when required. Use a private meneber function to implement this.
    (b) The stock value of each book should be automatically updated as soon as a transaction is completed.
    (c) The number of successful transactions should be recorded for the purpose of statistical analysis. Use static data members to keep count of transaction.
10. Design a C++ Class 'Complex' with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading (using either member functions or friend functions).

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COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME					L	T	P	CREDITS
			THEORY			PRACTICAL					
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTCS202N	DCC	Object Oriented Programming	60	20	20	30	20	2	0	2	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical;   **C** - Credit;

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11. 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 costumer 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 balance.

12. Create a base class shape. Use this class to store two double type values that could be used to compute area of figures. Derive two specific classes called triangle and rectangle from the base shape. Add to the base a member function getdata() to initialize base class data member and another member function display_area() to compute and display the area of figures. Make display_area() as a virtual function and redefine it the derived class to suit their requirements.

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BTCS404	DCC	Computer System Organization	60	20	20	30	20	2	0	2	3

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Course Educational Objectives (CEOs):

1. To understand the basic model of a modern computer with its various processing units.
2. To impart knowledge on CPU and it's processing of programs.
3. To provide the information for hardware utilization methodology.
4. To impart knowledge of Multiprocessor and inter-process communication.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes.

The students will be able to:
1. Understand the architecture of a modern computer.
2. Explain the functional behavior of CPU and its other processing units.
3. Knowledge of the Peripherals of a Computer System.
4. Give the information to speed-up the working of Computer System.

Syllabus

UnitI **10HRS**
Computer Basics: Von Newman model, CPU, Memory, I/O, Bus, Memory registers, Program Counter, Accumulator, Instruction register, Micro-operations, Register Transfer Language, Instruction cycle, Instruction formats and addressing modes.

UnitII **9HRS**
Control Unit Organization: Hardwired control unit, Micro-programmed control unit, Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Microprogramming. **Arithmetic and Logic Unit**: Arithmetic Processor, Addition, subtraction, multiplication, and division, Floating point, and decimal arithmetic.

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BTCS404	DCC	Computer System Organization	60	20	20	30	20	2	0	2	3

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Unit-III   8HRS
Input Output Organization: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor, Data transferring approaches and modes.

Unit-IV   7HRS
Memory organization: Memory Hierarchy, Cache Memory - Organization and types of cache mappings, Virtual memory, Memory Management Hardware.

Unit-V   8HRS
Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, Vector and array processors, Interconnection structure and inter-processor communication.

Textbooks:
1. M. Morris Mano, Computer System Architecture, Fourth edition, Pearson Education, 2015.
2. William Stallings, Computer Organization and Architecture, Seventh Edition, PHI, 2009.
3. Andrew S. Tanenbaum, Structured Computer Organization, Sixth Edition, Pearson Education, 2016.
4. John P. Hayes, Computer Architecture and Organizations, Third edition, Mc-Graw Hills, New Delhi, 2017

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BTCS404	DCC	Computer System Organization	60	20	20	30	20	2	0	2	3

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References:
1. John L. Hennessy and David A. Patterson, Computer Architecture a quantitative approach, Fourth Edition, Elsevier, 2007.
2. Ramesh Gaonkar, Microprocessor Architecture, Programming and Applications with 8085, fifth Edition, Prentice Hall, 2015.
3. Nicholas Carter, Computer Architecture (Schaum's), Third Edition, TMH, 2012.
4. Carl Hamacher, Computer Organization, Fifth Edition, TMH, 2002.

List of Experiments:
1. Study of peripherals, components of a Computer System.
2. Write a C program for sum of two binary numbers.
3. Write a C program for multiplication of two binary numbers.
4. Write a C program to implement Booth's algorithm for multiplication.
5. Write a C program to implement Restoring Division Algorithm.
6. Write the working of 8085 simulator GNUsim8085 and basic architecture of 8085 along with small introduction.
7. Study the complete instruction set of 8085 and write the instructions in the instruction set of 8085 along with examples.
8. Write an assembly language code in GNUsim8085 to implement data transfer instruction.
9. Write an assembly language code in GNUsim8085 to store numbers in reverse order in memory location.
10. Write an assembly language code in GNUsim8085 to add two 8 bit numbers stored in memory and also storing the carry.

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BTCS204N	DCC	Principle of Programming Language	60	20	20	0	0	3	0	0	3

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Course Educational Objectives (CEOs):

The student will have ability to:
1. To improve the background for choosing appropriate programming languages for certain classes of programming problems.
2. To be able in principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language.
3. To understand the significance of an implementation of a programming language in a compiler or interpreter
4. To Increase the ability to learn new programming languages
5. To Increase the capacity to express programming concepts and choose among alternative ways to express things.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The students will be able to

1. Students will gain insight and develop understanding to the underlying principles and concepts of programming languages. Also Gain an overview of programming language translation process.
2. Students will be able to competent with analyzing programming language design issues related to data types, expressions and control structures.
3. Students will be able to describe the concept of sub-programming with the help of Functions. Also develop understanding with the parameter passing techniques and concept of function overloading.
4. Students will be able to analyze various memory management techniques as well as apply various concepts of object oriented programming.
5. Students will be able to develop understanding with the exception handling concept and gain knowledge of logical and functional programming.

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BTCS204N	DCC	Principle of Programming Language	60	20	20	0	0	3	0	0	3

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Syllabus

UNIT I	**Preliminary Concepts:** Reasons for Studying, Concepts of Programming Languages, Programming Domains, Language Evaluation Criteria, Influences on Language Design, Language Categories, Programming Paradigms – Imperative, Object Oriented, Functional Programming , Logic Programming.	**8HRS**
UNIT II	**Data Types:** Introduction, Primitive, Character, User Defined, Record, Union, Pointer and Reference Types, Design and Implementation Uses Related to these Types. Names, Variable, Concept of Binding	**8HRS**
UNIT III	**Expressions and Statements:** Arithmetic Relational and Boolean Expressions, Short Circuit Evaluation Mixed Mode Assignment, Assignment Statements, Control Structures.	**8HRS**
UNIT IV	**Subprograms and Blocks:** Fundamentals of Sub-Programs, Scope and Lifetime of Variable, Static and Dynamic Scope, Design Issues of Subprograms and Operations, Local Referencing Environments, Parameter Passing Methods, Overloaded Sub-Programs, Generic Sub-Programs.	**8HRS**
UNIT V	**Abstract Data Types:** Abstractions and Encapsulation, Introductions to Data Abstraction, Static and Stack Based Storage Management. Heap Based Storage Management. Garbage Collection. Object Oriented Programming in Smalltalk, C++, Java, C#, Php, Perl.	**8HRS**

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Text Books:
1. Robert .W. Sebesta "Concepts of Programming Languages", 10th Edition, Pearson Education, 2008.
2. D. A. Watt, "Programming Language Design Concepts, Wiley dreamtech, rp-2007.
3. Louden and Lambart,"Programming Languages: Principles and Practices", 3rd Edition, Cengage Learning, 2011

References:
1. Gabbrielli and Martini "Programming Languages: Principles and Paradigms., Springer, 2010.
2. Peter Sestoft,"Programming Language Concepts", Springer, 2017.
3. A.B. Tucker, R.E. Noonan, "Programming Languages", 2nd Edition, Tata McGraw Hill.
4. Terrance W Pratt, "Programming Languages: Design and Implementation" Pearson Education.

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BTAIML201N	DCC	Data Fundamentals	60	20	20	30	20	3	0	2	4

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Course Educational Objectives (CEOs):

1. To introduce the concepts of Cloud Computing.
2. To understand the concepts Data Behavior on Cloud.
3. To familiar various tool to Handling Data on Azure.

Course Outcomes (COs):

 After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The students will be able to

1. Understand Core data concepts on Azure
2. Familiar with the use of relational data in Azure
3. Understand the use of non-relational data in Azure

Syllabus:

UNIT I   10HRS
Explore core data concepts
Describe features of structured data, Describe features of semi-structured, Describe features of unstructured data, Describe common formats for data files, Describe types of databases, Describe features of transactional workloads, Describe features of analytical workloads, Identify roles and responsibilities for data workloads, Describe responsibilities for database administrators, Describe responsibilities for data engineers, Describe responsibilities for data analysts

UNIT II   9 HRS

 Identify considerations for relational data on Azure
Identify features of relational data, Describe normalization and why it is used, Identify common structured query language (SQL) statements, Identify common database objects, Describe the Azure

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BTAIML201N	DCC	Data Fundamentals	60	20	20	30	20	3	0	2	4

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SQL family of products including Azure SQL Database, Azure SQL Managed Instance, and SQL Server on Azure Virtual Machines, Identify Azure database services for open-source database systems

UNIT III   9 HRS
Describe considerations for working with non-relational data on Azure
Describe capabilities of Azure storage , Describe Azure Blob storage, Describe Azure File storage, Describe Azure Table storage, Identify use cases for Azure Cosmos DB, Describe Azure Cosmos DB APIs

UNIT IV   8 HRS
Describe an analytics workload on Azure
Describe common elements of large-scale analytics, Describe considerations for data ingestion and processing, Describe options for analytical data stores, Describe Azure services for data warehousing, including Azure Synapse Analytics, Azure Databricks, Azure HDInsight, and Azure Data Factory, Describe consideration for real-time data analytics, Describe the difference between batch and streaming data, Describe technologies for real-time analytics including Azure Stream Analytics, Azure Synapse Data Explorer, and Spark structured streaming,

UNIT V   9 HRS
Microsoft Power BI
Describe data visualization in Microsoft Power BI, Identify capabilities of Power BI, Describe features of data models in Power BI, Identify appropriate visualizations for data

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References:

1. https://docs.microsoft.com/en-us/learn/modules/explore-core-data-concepts/
2. https://docs.microsoft.com/en-us/learn/modules/explore-roles-responsibilities-world-of-data/
3. https://docs.microsoft.com/en-us/learn/modules/explore-relational-data-offerings/
4. https://docs.microsoft.com/en-us/learn/modules/explore-provision-deploy-relational-database-offerings-azure/
5. https://docs.microsoft.com/en-us/learn/modules/explore-provision-deploy-non-relational-data-services-azure/
6. https://docs.microsoft.com/en-us/learn/modules/explore-non-relational-data-stores-azure/
7. https://docs.microsoft.com/en-us/learn/modules/examine-components-of-modern-data-warehouse/
8. https://docs.microsoft.com/en-us/learn/modules/explore-fundamentals-stream-processing/
9. https://docs.microsoft.com/en-us/learn/modules/explore-fundamentals-data-visualization/

LIST of EXPERIMENTS:
1. Provision Azure relational database services
2. Explore Azure Storage
3. Explore Azure Cosmos DB
4. Explore Azure Synapse Analytics
5. Analyze streaming data
6. Process streaming data using Spark
7. Explore Azure Synapse Data Explorer
8. Visualize data with Power BI
9. Basic SQL command on SQL Server 18