Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTCSH107	**BS**	**Linear Algebra**	**60**	**20**	**20**	**0**	**0**	**3**	**1**	**0**	**4**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

COURSE OBJECTIVES:
The student will have ability to:
1. Know the fundamental principles of the Linear algebra.
2. Understand and apply the basics of the Matrices and Vector Space.

Course Outcomes (COs):
After Upon completion of the subject, students will be able to:
1. Apply the techniques to find the Solution of Linear equations.
2. Apply the basics of the calculus of the Determinants.
3. Apply the basics of the calculus of the Matrices.
4. Apply the concept of Singular value decomposition and Principal component analysis in Image Processing and Machine Learning**.**

Syllabus:

UNIT I 10HRS
Introduction to Matrices and Determinants: Solution of Linear Equations; Cramer's rule; Inverse of a Matrix.

UNIT II 9HRS
Ordinary Vectors and linear combinations: Rank of a matrix; Gaussian elimination; LU Decomposition; Solving Systems of Linear Equations using the tools of Matrices.

UNIT III 8HRS
Vector space: Dimension; Basis; Orthogonally; Projections; Gram-Schmidt orthogonalization and QR decomposition

UNIT IV 7HRS
Eigen values and Eigen vectors; Positive definite matrices; Linear transformations; Hermitian and unitary matrices

UNIT V 8HRS
Singular value decomposition and Principal component analysis; Introduction to their applications in Image Processing and Machine Learning.

Chairperson	Chairperson	Controller of Examination	Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya,Indore		

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTCSH107	**BS**	**Linear Algebra**	**60**	**20**	**20**	**0**	**0**	**3**	**1**	**0**	**4**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal.
2.

References:

1. Advanced Engineering Mathematics, 7th Edition, Peter V. O'Neil.
2. Advanced Engineering Mathematics, 2nd Edition, Michael. D. Greenberg.
3. Introduction to linear algebra, 5th Edition, Gilbert Strang.
4. Applied Mathematics (Vol. I & II), by P. N. Wartikar & J. N. Wartikar.
5. Digital Image Processing, R C Gonzalez and R E Woods
6. https://machinelearningmastery.com/introduction-matrices-machine-learningCourse

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTEC 104	**BEC**	**Digital Logic & Circuit Design**	**60**	**20**	**20**	**30**	**20**	**3**	**1**	**2**	**5**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The objective of this course is to:
1.Use of Boolean algebra and Karnaugh Map to simplify logic function.
2.Describe the operation of different Combinational and Sequential Logic Circuits.

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. Design an optimal digital logic circuit to meet the given specifications.
2. Evaluate the performance of the given digital logic circuit based on specific criteria for reliable system implementation.

Syllabus:

UNIT I **10HRS**

Number System & Codes: Introduction to number systems, Binary numbers, Octal & Hexadecimal Numbers, Number base Conversion, Signed binary numbers : 1"s Complement & 2"s Complement representation and their arithmetic operation, Floating point representation, binary codes, BCD,ASCII, EBCDIC, Gray codes, Error detecting and Correcting codes, Hamming codes.

UNIT II **9HRS**

Boolean algebra and Logic gates: Introduction, Logic operations, Axioms and laws of Boolean algebra, Demorgan"s theorem, Boolean functions, Canonical and standard forms. Logic gates and their applications, universal gates, NAND-NOR implementation of logic functions. Minimization techniques for logic functions-K-map, Tabular / QuineMcCluskey method.

UNIT III **8HRS**

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTEC 104	**BEC**	**Digital Logic & Circuit Design**	**60**	**20**	**20**	**30**	**20**	**3**	**1**	**2**	**5**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Combinational logic: Arithmetic circuits- Half adder, Full adder, Halfsubtractor, Full subtractor, Parallel and Serial adder, BCD adder, Multiplexer, De-multiplexer, Encoder & Decoder.

UNIT IV **7HRS**

Sequential logic: Introduction, Latch and Flip Flop- S-R, D, JK and T, State diagram, characteristic equation, state table and excitation table, Flip flop conversion, applications of Flip flop, Counters, Registers.

UNIT V **8HRS**

Semiconductor Memories and A/D and D/A converters: Semiconductor Memory – RAM, ROM- Organization, operation and their Types, PLD- PAL, PLA, PROM, FPGA, Analog to Digital (A/D)and Digital to Analog (D/A) converters and their types.

Text Books:

1. M. Morris Mano,"Digital Logic and Computer Design", Pearson Education, 2016.
2. S Salivahanan and S Arivazhagan: Digital Circuits and Design,4th Edition, Vikas Publishing House, 2012.

Reference Books:

1. A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI, 2016.
2. Floyd and Jain, "Digital Fundamentals", 10th Edition, Pearson Education India, 2011.
3. Roland J. Tocci, Widmer,Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson 2009.
4. Stephen Brown, Zvanko Vranesic, "Fundamentals of Digital Logic Design", 3rd Edition, McGraw Hill, 2017.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTEC 104	**BEC**	**Digital Logic & Circuit Design**	**60**	**20**	**20**	**30**	**20**	**3**	**1**	**2**	**5**

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

List of Practical's:

1. To study and test of operation of all logic gates for various IC"s (IC7400,IC7403,IC408,IC74332,IC7486).
2. Verification of DeMorgan"s theorem.
3. To construct of half adder and fulladder.
4. To construct of half subtractor and full subtractor circuits.
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Design a BCD to excess 3codeconverter.
8. Design a Multiplexer/Demultiplexer
9. Analysis of various flip flops with Preset and Clear capability.
10. Design of Johnson and Ring counter.
11. Design of synchronous and asynchronous up/down counters.

Chairperson	Chairperson	Controller of Examination	Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya,Indore		

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTCS202M	**DCC**	**Object Oriented Programming with C++**	**60**	**20**	**20**	**30**	**20**	**3**	0	**2**	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

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

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTCS202M	**DCC**	**Object Oriented Programming with C++**	**60**	**20**	**20**	**30**	**20**	**3**	0	**2**	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

arguments.

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 .

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.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTCS202M	**DCC**	**Object Oriented Programming with C++**	**60**	**20**	**20**	**30**	**20**	**3**	0	**2**	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

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.
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

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTCS202M	**DCC**	**Object Oriented Programming with C++**	**60**	**20**	**20**	**30**	**20**	**3**	0	**2**	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

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).
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.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTIT201M	**DCC**	**Data Communication**	**60**	**20**	**20**	**0**	**0**	**3**	0	**0**	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

The student will have ability to:
1. To understand the concepts of data communications.
2. To be familiar with the Transmission media and Tools.
3. To study the functions of OSI layers.
4. To learn about IEEE standards in computer networking.
5. To get familiarized with different protocols and network components.

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 Process and functions of data communications
2. Understand Transmission media and Tools
3. Understand the functions of OSI layers
4. Understand IEEE standards in computer networking
5. Understand different protocols and network components

Syllabus

UNIT–I 10HRS

Introduction: Data Communication Components, Types of Connections, Transmission Modes, Network Devices, Topologies, Protocols and Standards, OSI Model, Transmission Media, Bandwidth, Bit Rate, Bit Length, Baseband and Broadband Transmission, Attenuation, Distortion, Noise, Throughout, Delay and Jitter.

UNIT–II 9HRS

Data Encoding: Unipolar, Polar, Bipolar, Line and Block Codes. Multiplexing: Introduction and History, FDM, TDM, WDM, Synchronous and Statistical TDM.Synchronous and Asynchronous transmission, Serial and Parallel Transmission.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTIT201M	**DCC**	**Data Communication**	**60**	**20**	**20**	**0**	**0**	**3**	0	**0**	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT–III 8HRS

Error Detection & Correction: Correction, Introduction–Block Coding–Hamming Distance, CRC, Flow Control and Error Control, Stop and Wait, Error Detection and Error Go Back– N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, CSMA/CD, CDMA/CA

UNIT–IV 7HRS

Network Switching Techniques: Circuit, Message, Packet and Hybrid Switching Techniques.X.25, ISDN.Logical Addressing, Ipv4, Ipv6, Address Mapping, ARP, RARP, BOOTP and DHCP, User Datagram Protocol, Transmission Control Protocol, SCTP.

UNIT–V 8HRS

Application Layer Protocols: Domain Name Service Protocol, File Transfer Protocol, TELNET, WWW and Hyper Text Transfer Protocol, Simple Network Management Protocol, Simple Mail Transfer Protocol, Post Office Protocol v3.

TEXT BOOKS:

1. Behrouz A. Forouzan, “Data communication and Networking”, Fourth Edition, Tata McGraw Hill, 2011.

REFERENCES:

1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Fifth Edition,Elsevier, 2012.
2. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education,2007.
3. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring theInternet”, Pearson Education, 2005.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTIBM204N	**DCC**	**Data Visualization**	**60**	**20**	**20**	0	**0**	**2**	0	**2**	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

The student will have ability to:

1. To introduce students to the fundamentals of data visualization and its importance in data analysis.
2. To develop basic programming skills in Python and R for data visualization tasks.
3. To understand the role of visualization in exploring, analyzing, and interpreting data.
4. To provide hands-on experience with popular visualization tools such as Matplotlib, R, and Power BI.
5. To enable students to create meaningful visual representations and dashboards for real-world datasets

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. Explain the importance and principles of data visualization.
2. Apply Python libraries such as NumPy, Pandas, and Matplotlib for data analysis and visualization.
3. Perform basic data analysis and visualization using R programming.
4. Interpret statistical and visual outputs to draw meaningful insights from data.
5. Create interactive dashboards and reports using Power BI for business and analytical use cases.

Syllabus:

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTIBM204N	**DCC**	**Data Visualization**	**60**	**20**	**20**	0	**0**	**2**	0	**2**	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT I 10 HRS

Python for Data Visualization

Introduction to Python, Features and Applications of Python, Installation of Python, Introduction to Jupyter Notebook, Script vs Notebook Environment, Python Basics: Variables and Data Types, Operators, Conditional Statements, Loops (for, while), Functions. Introduction to NumPy: Concept of Arrays, NumPy Array Creation. Introduction to Pandas: Concept of Series and DataFrame, DataFrame Creation

UNIT II 9 HRS

Data Visualization using Matplotlib

Overview of Matplotlib, Importance of Visualization in Python, Basic Plot Types: Line Plot, Bar Chart, Scatter Plot, Histogram, Pie Chart. Customization of Plots: Titles, Labels, Legends, Colors and Styles, Specialized Visualization Tools using Matplotlib, Advanced Visualization Concepts, Practical Case Discussion using Sample Dataset

UNIT III 8 HRS

Foundations of R Programming

Overview of R Programming, Importance and Applications of R in Data Analysis, Installation of R and RStudio, Understanding RStudio Interface and Basic Structure of R Environment, Data Types in R: Numeric, Character, Logical, Integer, Factors. Basic Data Structures in R (Vectors, Lists), Writing and Executing Simple R Commands

UNIT IV **7 HRS**
Data Analysis and Visualization using R

Introduction to Descriptive Data Analysis, Basic Functions for Data Description: Mean, Median, Mode, Variance, Standard Deviation, Summary Functions. Interpreting Statistical Output, Data Visualization in R, Basic Plotting Techniques: Bar Plot, Line Plot, Histogram, Box Plot, Understanding the Importance of Visualization in Data Interpretation

UNIT V **8 HRS**
Power BI as a Data Visualization Tool

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTIBM204N	**DCC**	**Data Visualization**	**60**	**20**	**20**	0	**0**	**2**	0	**2**	3

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Introduction to Power BI, Components of Power BI (Desktop, Service, Mobile – overview), Data Importing and Data Sources, Creating Basic Visualizations in Power BI, Filters and Slicers, Creating Simple Dashboards, Understanding Relationships: 1 to 1, many to 1, 1 to many and many to many, Real-World Case Example

Text Books:

1. Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly Media.

2. Kieran Healy, Data Visualization: A Practical Introduction, Princeton University Press.

Reference Books:

1. Jake VanderPlas, Python Data Science Handbook, O'Reilly.

2. Hadley Wickham, ggplot2: Elegant Graphics for Data Analysis, Springer.

3. Microsoft Documentation, Power BI Documentation.

List of Practical:

1. Write a Python program to check whether a number is even or odd using an if-else statement.
2. Write a Python program to calculate the factorial of a given number using a loop.
3. Write a Python program to create two NumPy arrays, stack them vertically, sort the values column-wise, and print both the original and sorted arrays.
4. Write a Python program to create a bar plot, pie plot, histogram plot, line chart using matplotlib.
5. Create a random dataset with values ranging from 10 to 20 in R, then determine the minimum and maximum values and calculate the range.
6. Calculate the Interquartile Range (IQR) along with Q1 (First Quartile), Q2 (Median), and Q3 (Third Quartile) with dummy data.
7. Write an R program to define a dataset, create a line graph, and visualize trends in the data.
8. Upload any Dataset and perform the Data transformation steps in PowerBI
9. Upload a Dataset and perform data modeling in PowerBI
10. Create a Dynamic Dashboard of a Dataset Product sales analysis in PowerBI.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTIT208M	**SEC**	**Unix Programming**	**0**	**0**	**0**	**30**	**20**	**0**	0	**2**	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The student will have ability to:-

1. Provide introduction to UNIX Operating System and its File System.
2. Gain an understanding of important aspects related to the SHELL and the process
3. Develop the ability to formulate regular expressions and use them for pattern matching.
4. Provide a comprehensive introduction to SHELL programming, services and utilities.
5. Develop the ability to perform different networking tasks.

COURSE OUTCOMES:
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. Describe the architecture and features of UNIX Operating System .
2. Distinguish UNIX Operating System from other Operating Systems.
3. Demonstrate UNIX commands for file handling and process control.
4. Show the working of vi editor in all its modes using various commands.
5. Write Regular expressions for pattern matching and apply them to various filters for a specific task.
6. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem.
7. Diagnose network using different networking utilities of UNIX.

SYLLABUS:

UNIT I: 10HRS
Introduction to UNIX - The UNIX Operating System, The UNIX Architecture, Features of UNIX, Internal and External Commands, Command Structure.
General purpose utilities: cal, date, echo, printf, bc, script, passwd, path, who, uname, tty, pwd, cd, mkdir, rmdir.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTIT208M	**SEC**	**Unix Programming**	**0**	**0**	**0**	**30**	**20**	**0**	0	**2**	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT II: 9 HRS

Handling Files - The File System,touch, cat, cp, rm, mv, more, file, ls, wc, pg, comm, gzip, tar, zip, df, du, The vi editor.
Security by file Permissions: chmod, umask .
Networking commands: ping, telnet, ftp, finger, arp, rlogin.

UNIT III: 8 HRS

Shell Basics - Types of shells, Shell Functionality, Work Environment, Writing script & executing basic script, Debugging script, Making interactive scripts, Variables (default variables), Mathematical expressions. Conditional statements: If-else-elif, Test command, Logical operators - AND, OR, NOT, Case –esac. Loops: While, For, Until, Break & continue.

UNIT IV: 7HRS

Command Line Arguments & Regular Expression - Command line arguments: Positional parameters, Set & shift, IFS. Functions & file manipulations: Processing file line by line, Functions. Regular Expression & Filters: Regular expression, grep, cut , paste, sort , head , tail , nl , pipe ,tr, tree , meta characters.

UNIT V: 8HRS

SED and AWK - SED: Scripts, Operation, Addresses, commands, Applications.

AWK: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays, String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications awk .

TEXT BOOKS:

1. Sumitabha Das: “YOUR UNIX – The Ultimate Guide”, Tata McGraw Hill.

REFERENCES:

1. Behrouz A. Forouzan, Richard F. Gilbery, “Unix and Shell Programming”,Cengage Learning India.
2. Graham Glass, King Ables, “Unix for programmers and users”, Pearson Education.
3. N.B. Venkateswarlu, “Advanced Unix programming”, B S Publications.

Shri Vaishnav Vidyapeeth Vishwavidyalaya
Shri Vaishnav Institute Of Information Technology
B.Tech. (CSE-Data Science/Artificial Intelligence-IBM)
Choice Based Credit System (CBCS)-2025-29
SEMESTER-II

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*				
BTIT208M	**SEC**	**Unix Programming**	**0**	**0**	**0**	**30**	**20**	**0**	0	**2**	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

4. Yashavant Kanetkar, "Unix Shell programming", 1st Edition, BPB Publisher.
5. Stephen Prata "Advanced UNIX: A Programming's Guide", BPB Publications.
6. Maurice J. Bach "Design of UNIX O.S. ", PHI Learning.
7. Brian W. Kernighan & Robe Pike, "The UNIX Programming Environment", PHI Learning.

LIST OF EXPERIMENTS:

1. Perform installation of UNIX/LINUX operating system.
2. Study of UNIX general purpose utility commands.
3. Execution of various file/directory handling commands.
4. Working with the vi editor: Creating and editing a text file with the vi text editor using the standard vi editor commands.
5. Write a shell script for calculator (to perform basic arithmetic and logical calculations).
6. Write a shell script that will take an input file and remove identical lines (or duplicate lines from the file).
7. Shell scripts to explore system variables such as PATH, HOME etc.
8. Execution of various system administrative commands.
9. Write awk script that uses all its features.
10. Write a shell script to display list of users currently logged in.
11. Write a shell script to delete all the temporary files.
12. Write shell script to perform different string operations of arrays.