

# **LUCKNOW UNIVERSITY, LUCKNOW**

## **Bachelor of Vocation (B.Voc) - Software Development (Under Faculty of Sciences)**

### **For the Award of**

<b>Award</b>	<b>Duration</b>
<b>Certificate (Software Development)</b>	<b>1 Year</b>
<b>Diploma (Software Development)</b>	<b>2 Year</b>
<b>B.Voc. Degree (Software Development)</b>	<b>3 Year</b>
<b>B.Voc. Research (Software Development)</b>	<b>4 Year</b>

# **BVOC- SOFTWARE DEVELOPMENT**

## PROGRAM SPECIFIC OUTCOMES

### **PSO1:**

Apply the fundamentals of mathematics, science and engineering knowledge to understand, analyze and develop computer programs in the areas related to algorithms, multimedia, big data analytics, machine learning, artificial intelligence and networking for efficient design of computer-based systems of varying complexity.

### **PSO2:**

Apply appropriate techniques and modern engineering hardware and software tools for the design and integration of computer system and related technologies, to engage in lifelong learning for the advancement of technology and its adaptation in multi-disciplinary environments.

### **PSO3:**

Implementation of professional engineering solutions for the betterment of society keeping the environmental context in mind, be aware of professional ethics and be able to communicate effectively.

# **BVOC- SOFTWARE DEVELOPMENT**

## **Introduction**

The main aim of this course is to give out skills related to Computer Science and Software Development. Bachelor of Vocational Studies is a practical and skill-oriented program which focuses on important practical knowledge along with theoretical knowledge.

Following are the program outcomes:

## **Program Outcomes**

- PO1: Improve their computer literacy, their basic understanding of operative systems and a working knowledge of software commonly used in academic and professional environments.
- PO2: Do Academic and Professional Presentations - Designing and delivering an effective presentation and developing the various IT skills to the electronic databases.
- PO3: Use the Systems Analysis Design paradigm to critically analyse a problem. Solve the problems (programming, networking, and database and Web design) in the Information Technology environment. Function effectively on teams to accomplish a common goal and demonstrate professional behavior.
- PO4: Develop IT-oriented security issues and protocols. Design and implement a web page.

## B.Voc. (Software Development) Syllabi

Faculty of Science, University of Lucknow, Lucknow

### B.Voc. (Software Development) Eight Semester Syllabi-2021 Structure

Semester	Majore-1			Majore-2		Minor	CC/CV	Credits	Total Credits	Award
	Paper		Credits	Paper	Credits					
Semester-1	P1	Fundamentals of Computers & Information Technology	4	Web Designing	4	Fundamentals of Mathematics	4	CC1	4	24
	P2	Problem Solving Techniques & C Programming	4	Introduction to Database Management System	4					
Semester-2	P3	Data Structure using C	4	PHP	4	Communication Skills	4	VC1	4	24
	P4 (Lab)	Lab on Data Structure & C Programming	4	Computer Graphics & Multimedia	4					
Semester-3	P5	ASP.NET and C#	4	Data Communication & Computer Network	4	Digital Electronics	4	CC2	4	24
	P6 (Lab)	Lab on ASP.NET & C#	4	Operating System	4					
Semester-4	P7	Python Programming	4	Software Engineering	4	Cyber Security	4	VC2	4	24
	P8	Design & Analysis of Algorithms	4	E-Commerce and M-Commerce	4					
Semester-5	P9	JAVA Programming	4	Software Testing	4			Internship/ Term Paper	4	24
	P10	Data Warehousing & Mining	4	Network & Information Security	4					
	P11	Cryptography -(Optional - a)	4							
Relational Database Management System using Oracle- (Optional - b)										
Semester-6	P12	Artificial Intelligence	4	Mobile Application Development using Android				Minor Project	4	24
	P13	Internet of Things	4	Digital Marketing						
	P14	Cryptography Lab- (Optional - a)	4							
RDBMS-Lab-(Optional - b)										
Semester-7	P15	Advanced JAVA Programing	4					Research Methodology	4	24
	P16	Machine Learning	4							
	P17	Data Science	4							
	P18	Cloud Computing- (Optional - X1)	4							
		Linux Server Administration-(Optional - X2)								
P19	Theory of Computation- (Optional - Y1)	4								
	Compiler Design-(Optional - Y2)									
Semester-8								Major Project	24	24

## Annexure 1

### 1<sup>st</sup>Year: B. Voc. - Software Development (Certificate)

#### First Semester:

SUBJECT CODE	SUBJECT NAME	Credit(s)	Semester Examination	Internal Examination	Total
BVNSD 1.1	Fundamentals of Computers and Information Technology	4	70	30	100
BVNSD 1.2	Problem Solving Techniques and C Programming	4	70	30	100
BVNSD 1.3	Web Designing	4	70	30	100
BVNSD 1.4	Introduction to Database management System	4	70	30	100
BVNSD 1.5	Fundamental of Mathematics	4	70	30	100
BVNSD 1.6	CC1	4			100

#### Second Semester:

SUBJECT CODE	SUBJECT NAME	Credit(s)	Semester Examination	Internal Examination	Total
BVNSD 2.1	Data Structures Using C	4	70	30	100
BVNSD 2.2	Lab on Data Structures and C Programming (Practical Paper)	4	70	30	100
BVNSD 2.3	PHP	4	70	30	100
BVNSD 2.4	Computer Graphics and Multimedia	4	70	30	100
BVNSD 2.5	Communication Skills	4	70	30	100
BVNSD 2.6	VC1	4			100

**2<sup>nd</sup>Year: B. Voc. - Software Development (Diploma).**

**Third Semester:**

SUBJECT CODE	SUBJECT NAME	Credit(s)	Semester Examination	Internal Examination	Total
BVNSD 3.1	ASP.NET and C#	4	70	30	100
BVNSD 3.2	Lab on ASP.NET and C# (Practical Paper)	4	70	30	100
BVNSD 3.3	Data Communication and Computer Network	4	70	30	100
BVNSD 3.4	Operating System	4	70	30	100
BVNSD 3.5	Digital Electronics	4	70	30	100
BVNSD 3.6	CC2	4			100

**Fourth Semester:**

SUBJECT CODE	SUBJECT NAME	Credit(s)	Semester Examination	Internal Examination	Total
BVNSD 4.1	Python Programming	4	70	30	100
BVNSD 4.2	Design and Analysis of Algorithms	4	70	30	100
BVNSD 4.3	Software Engineering	4	70	30	100
BVNSD 4.4	E-Commerce and M- commerce	4	70	30	100
BVNSD 4.5	Cyber Security	4	70	30	100
BVNSD 4.6	VC2	4			100

**CC/CV Choices**

Co-Curricular (CC)	Curricular Vocation (CV)
Management Organization	CISCO Certification
Spirituality and Personality Development	SWAYAM Certification
Management Information System	Google Digital Certification
Office Automation	Computer Hardware & Assembly

### 3<sup>rd</sup> Year: B. Voc. - Software Development (Degree)

#### **Fifth Semester:**

SUBJECT CODE	SUBJECT NAME	Credit(s)	Semester Examination	Internal Examination	Total
BVNSD 5.1	JAVA Programming	4	70	30	100
BVNSD 5.2	Data warehousing and Mining	4	70	30	100
BVNSD 5.3	Software Testing	4	70	30	100
BVNSD 5.4	Network and Information Security	4	70	30	100
BVNSD 5.5A	Cryptography.	4	70	30	100
BVNSD 5.5B	Relational Database Management System Using Oracle				
BVNSD 5.6	Internship/ Term Paper	4			

#### **Sixth Semester:**

SUBJECT CODE	SUBJECT NAME	Credit(s)	Semester Examination	Internal Examination	Total
BVNSD 6.1	Artificial Intelligence	4	70	30	100
BVNSD 6.2	Internet of Things	4	70	30	100
BVNSD 6.3	Mobile application development using Android	4	70	30	100
BVNSD 6.4	Digital Marketing	4	70	30	100
BVNSD 6.5A	Cryptography LAB (Practical Paper)	4	70	30	100
BVNSD 6.5B	RDBMS LAB(Practical Paper)				
BVNSD 6.6	Minor Project	4			100

Note: 1.Those students who have opted BVNSD 5.5A in fifth semester must choose BVNSD 6.5A in sixth semester.

2. Those students who have opted BVNSD 5.5B in fifth semester must choose BVNSD 6.5B in sixth semester.

#### **4<sup>th</sup> Year: B. Voc. - Software Development (Research)**

##### **Seventh Semester:**

SUBJECT CODE	SUBJECT NAME	Credit(s)	Semester Examination	Internal Examination	Total
BVNSD 7.1	Advanced JAVA Programming	4	70	30	100
BVNSD 7.2	Machine Learning	4	70	30	100
BVNSD 7.3	Data Science	4	70	30	100
BVNSD 7.4A	Cloud Computing	4			
BVNSD 7.4B	Linux Server Administration		70	30	100
BVNSD 7.5A	Theory of Computation	4			
BVNSD 7.5B	Compiler Design		70	30	100
BVNSD 7.6	Research Methodology	4	70	30	100

##### **Eighth Semester:**

SUBJECT CODE	SUBJECT NAME	Credit(s)	Project Report	Project viva	Total
BVNSD 8	MAJOR PROJECT	24	400	200	600

<b>Fundamentals of Computers and Information Technology</b>	
<b>BVNSD 1.1</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
This module give the basic knowledge of computer its functioning, various part of computer, knowledge of hardware and software and even concept of information and technology.	
<b>Course Objectives:</b>	
The main objective of this module to give basic knowledge of computer including hardware and software.	
<b>Unit 1:</b>	<b>10 Hours</b>
Computers: History and classification; Organization of Computers; Memory: Primary, Secondary, Virtual and Cache; Computer Operation- Instruction Cycle, Program flow of control with and without interrupts; Number systems: Decimal, Binary, Octal, Hexadecimal and their conversion; Binary Addition, Subtraction and Multiplication; Floating point representation; Introduction to Computer Languages; Information: Definition, Characteristics & Interpretation.	
<b>Unit 2:</b>	<b>10 Hours</b>
Input devices: Keyboard, Mouse, Joy Stick, Light Pen, Touch Screen, Voice Recognition Device, MICR, OCR, OMR, Barcode Reader, Webcam, Touch Pad, Smart Card etc. Output devices: VDU, Printer, Plotter, Speaker, projector etc. Processing Systems: User Based- single, multi; Process Based: Batch Processing, Multi processing, Multi programming, Multi threading.	
<b>Unit 3:</b>	<b>10 Hours</b>
Meaning of Software; Relationship between Hardware and Software; Types of Software: System Software, Application Software, Firmware; Functions of System Software; Type of System Software: Operating Systems, Language Translators, Utility Programs, Communications Software; Application Software; Commonly Used Application Software: MS-Word, MS-Excel, MS-Power Point.	
<b>Unit 4:</b>	<b>10 Hours</b>
Network Topologies: Bus, Ring, Star, Tree etc; Type of Computer Network: LAN, MAN WAN. Network Medium: Wired and Wireless; Network Protocols: TCP/IP, Http, Ftp, Telnet etc. Introduction to www, Internet and its H/W & S/W requirements, Protocols governing to the world wide web, ISP, Web browsers, Web server, Domain names, DNS, Search engines, Electronic Mail, e-commerce, Basics of HTML and its tags.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Analyse the fundamental concepts of computers with the present level of knowledge of the students.	
<b>CO2:</b> Understand the operating systems, programming languages, peripheral devices, networking, multimedia and internet	
<b>CO3:</b> Understand binary, hexadecimal and octal number systems and their arithmetic.	
<b>CO4:</b> Visualize how computer network work.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Computer Fundamentals: P.K. Sinha (BPB Publications)</li> <li>2. Fundamentals Of Computers (3rd Edition): V. Rajaraman (PHI)</li> <li>3. Fundamentals of IT for BCA: S. Jaiswal (Galgotia)</li> <li>4. Foundation of Information Technology: D.S. Yadav (New Age International Pvt. Ltd.)</li> <li>5. Fundamentals of Information Technology: Deepak Bharihoke (Excel Books)</li> </ol>	

<b>Problem Solving Techniques and C Programming</b>	
<b>BVNSD 1.2</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
C language is one of the most popular language to learn the coding at initial level. It contains all fundamental construct which are used in advance language including object oriented and web language. It provide the facilities to write the simple as well as complex program.	
<b>Course Objectives:</b>	
The main objective of this module to give fundamental knowledge of program writing and execution.	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
Problem Identification and Solving Techniques: Top- down and Bottom- up Approach; Introduction to Algorithm; Design Tools: Structure Charts, Input Processing Output (IPO) Charts, Flowcharts, Pseudo code; Components of a Program; Structured Design and Modularity.	
<b>Unit 2:</b>	<b>7 Hours</b>
I/O in C; Variables; Scope; Data types; Storage Classes; Operators: Types, Precedence and Associativity, Operations. Condition Execution: If- else, nested if, Switch Statements, Limitations on Case Values, Break, and Default with Switch. Iterative Constructs: while, do-while, for loop, Use of break, continue.	
<b>Unit 3:</b>	<b>7 Hours</b>
Array: Array Notation and Representation, Manipulating Array Elements, Using Multidimensional Arrays, Arrays of Unknown or Varying. Structures: Concept, Working with Array of Structure, Union. Functions: Introduction, Types of Functions, Functions with Array, Recursive Functions.	
<b>Unit 4:</b>	<b>7 Hours</b>
Pointers: concept; declaration, pointer arithmetic, applications. File Handling: Opening & Closing File, Different Modes, Random Access. Preprocessor: Types, Defining and Calling Macros, Conditional Compilation, Passing Values to the Compiler.	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Write a Program to swap the value of two variable.</li> <li>2. Write a program to calculate compound interest and simple interest.</li> <li>3. Write a program to find the sum of digit of inputted number.</li> <li>4. write a program to find given number is palendrome or not.</li> <li>5. Write a program to find given number is prime number.</li> <li>6. Write a program to print fabonacci series.</li> <li>7. Write a program to input 10 array element find out minimum and maximum.</li> <li>8. Write a program to input 10 number find search a given number in the array.</li> <li>9. Write a program to multiply two matrix.</li> <li>10. Write a program to transpose the matrix.</li> <li>11. swap the value using call by value and call by reference.</li> <li>12. open a file is reading and writing mode to read and write employee records.</li> <li>13. write a program to add two matrix 3x4.</li> <li>14. search an element from 5x5 matrix.</li> <li>15. write a program to check given number is magic number or not.</li> </ol>	

**Course Outcomes(COs):**

**CO1:** Understand the syntax and semantics of the C language

**CO2:** Recognize how to develop and implement a program in the C language

**CO3:** Demonstrate an understanding of basic building block of programming.

**CO4:** Design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage.

**Text Books:**

1. Problem Solving and Program Design in C: Jeri R. Hanly & Elliot B. Koffman ( Pearson Addison-Wesley).
2. Computer Science- A Structured Programming Approach Using C.; Behrouz A. Forouzan, Richard F. Gilberg and Thomson (Course Technology Inc)
3. Programming Techniques Through C: A Beginners Companion 1st Edition: Venkateshmurthy (Pearson Education)
4. Let us C: Yashwant P. Kanetkar (BPB Publication) Programming in ANSI C: E. Balagurusamy (McGraw-Hill)

<b>Web Designing</b>	
<b>BVNSD 1.3</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Web design refers to the design of websites that are displayed on the internet. It usually refers to the user experience aspects of website development rather than software development. Web design used to be focused on designing websites for desktop browsers; however, since the mid-2010s, design for mobile and tablet browsers has become ever-increasingly important.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To define terms associated with basic Web page development.</li> <li>2. To explain the development of the World Wide Web (WWW).</li> <li>3. To explain the use of Hypertext Markup Language (HTML), Cascading Style Sheets(CSS), JavaScript, JQuery, Bootstrap and AJAX.</li> <li>4. To develop static website.</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
Basics Of Web, Protocols Governing The Web, Web Development Strategies, Web Applications, Domains And Hosting, Types Of Websites (Static And Dynamic Websites) <b>Introduction To HTML:</b> What Is HTML, HTML Documents, Basic Structure Of An HTML Document, Creating An HTML Document , Mark Up Tags , Heading-Paragraphs , Line Breaks	
<b>Unit 2:</b>	<b>7 Hours</b>
<b>Elements Of HTML:</b> HTML Tags., Working With Text, Working With Lists, Tables and Iframe(Google Map, YouTube Video), Working With Hyperlinks, Images And Multimedia, Symbols, Working With Forms And Controls	
<b>Unit 3:</b>	<b>7 Hours</b>
Evolution, Syntax & Types Of CSS, CSS Selectors, Color Code(Color Name, Hex Code RGB, Decimal Code RGB, RGBA), Background And Color Gradients, Fonts & Text Styles, Google Font, Overflow and Align, Creating Boxes & Columns, Positioning And Floating Elements, Table Layouts, List Styles, Effects, Drag And Drop Feature, Spell Check Bootstrap: Introduction, Grid, Image, Button, Table, Modal	
<b>Unit 4:</b>	<b>7 Hours</b>
Lexical Structure of Java Script, Variable, Operator, Control Flow, Popup Boxes, Functions, Events, Animations, Built-In/ Standard Java Script Objects (String, Math, Date Etc.), Working with Browser Objects, Document Objects, Validation, Errors, Exception Handling and Security. <b>JQuery:</b> Introduction, Hide/Show, Fade, Slide, Animation; <b>AJAX</b> Introduction, AJAX Load Function; Introduction of XML	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Design Resume using HTML and CSS.</li> <li>2. Design Image Gallery using Bootstrap.</li> <li>3. Design Menu using CSS.</li> <li>4. Design a page layout using Bootstrap.</li> <li>5. Design Login page with proper validation and also use CSS.</li> <li>6. Design Registration form with proper validation and also use CSS.</li> <li>7. Design Customize Popup Box.</li> </ol>	

**Course Outcomes(COs):**

**CO 1:** Understand principle of Web page design and about types of websites.

**CO 2:** Visualize and Recognize the basic concept of HTML and application in web designing.

**CO 3:** Recognize and apply the elements of Creating Style Sheet (CSS).

**CO 4:** Understand the basic concepts of responsive web page.

**CO 5:** Apply the basic concepts of Java Script.

**Text Books:**

1. Steven M. Schafer, "HTML, XHTML, and CSS Bible, 5ed", Wiley India

2. Ian Pouncey, Richard York, "Beginning CSS: Cascading Style Sheets for Web Design", Wiley India

<b>Introduction to Database Management System</b>	
<b>BVNSD 1.4</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
The DBMS (Database management system ) is one of the most important module because this module it is learn how the records are maintain, how the records are store and retrieve. File management concept and record managements concept are also cover in this module.	
<b>Course Objectives:</b>	
The main objective of this module is to give fundamental knowledge of data base, data base management.	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
An overview of database management system, Advantages of Database Management System, Database System vs. File System, Database System Architecture, Data Models Schema and Instances, Data Independence and database Language and Interfaces, Data Definitions Language,DML, Overall Database Structure.	
<b>Unit 2:</b>	<b>7 Hours</b>
ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key,candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.	
<b>Unit 3:</b>	<b>7 Hours</b>
Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.	
<b>Unit 4:</b>	<b>7 Hours</b>
Characteristics of SQL; Advantages of SQL; SQL Data Types and Literals; DDL,DML, DCL, and TCL; Controlling user access; SQL Operators and their Procedure; Adding/ Alerting/ Dropping Constraints; Views and Indexes; Queries and sub queries/ nested queries; Aggregate Functions, Insert (single & bulk), Update and Delete Operations in SQL; Different types of joining; Date Functions; Type Conversion Functions.	
<b>Practical:</b>	<b>12 Hours</b>
<p><b>Part I:</b> Getting familiar with SQL (Maximum number of turns allotted: 3)</p> <ol style="list-style-type: none"> <li>1) Creating tables.</li> <li>2) Insertion, Deletion, Updation and Retrieval of data.</li> <li>3) Arithmetic operations, Logical operations and Pattern matching.</li> <li>4) Concept of Grouping (Group by clause, Having Clause).</li> <li>5) Use Aggregate function in query.</li> <li>6) Write commands for Joins, Union and Intersection.</li> <li>7) Concept of Sub-query.</li> <li>8) Concept of Data constraints (Unique Key, Primary Key, Foreign Key).</li> <li>9) Creating Views and Indexes.</li> </ol> <p><b>Part II:</b> Relational Database Implementation Implement the following mini-project's database schemas and give an expression in SQL for each of the queries.</p> <p><b>Project 1. Library Management System:</b>  Create the following schema, enter at least 5 records in each table and answer the queries given below.  <b>LibraryBooks</b> (Accession number, Title, Author, Department, PurchaseDate, Price)  <b>IssuedBooks</b> (Accession number, Borrower)</p>	

- a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
- b) Delete the record of book titled “Database System Concepts”.
- c) Change the Department of the book titled “Discrete Mathematics” to “CSE”.
- d) List all books that belong to “CSE” department.
- e) List all books that belong to “CSE” department and are written by author “Navathe”.
- f) List all computer (Department=“CSE”) that have been issued.
- g) List all books which have a price less than 500 or purchased between “01/01/2015” and “01/01/2019”.

**Project 2. Student Management System:**

Create the following schema, enter at least 5 records in each table and answer the queries given below.

**Student** (College roll number, Name of student, Date of birth, Address, Marks(rounded off to whole number) in percentage at 10 + 2, Phone number)

**Paper Details** (Paper code, Name of the Paper)

**Academic\_details** (College roll number, Paper code, Attendance, Marks in home examination)

- a) Identify primary and foreign keys. Create the tables and insert at least 5 records in each table.
- b) Design a query that will return the records (from the second table) along with the name of student from the first table, related to students who have more than 75% attendance and more than 60% marks in paper 2.
- c) List all students who live in “Lucknow” and have marks greater than 60 in paper 1.
- d) Find the total attendance and total marks obtained by each student.
- e) List the name of student who has got the highest marks in paper 2.

**Project 3. Human Resource Management System:**

Create the following tables, enter at least 5 records in each table and answer the queries given below.

**EMPLOYEE** ( Person\_Name, Street, City )

**WORKS** ( Person\_Name, Company\_Name, Salary )

**COMPANY** ( Company\_Name, City )

**MANAGES** ( Person\_Name, Manager\_Name )

- a) Identify primary and foreign keys.
- b) Alter table employee, add a column “email” of type varchar(20).
- c) Find the name of all managers who work for both Samba Bank and NCB Bank.
- d) Find the names, street address and cities of residence and salary of all employees who work for “Samba Bank” and earn more than \$10,000.
- e) Find the names of all employees who live in the same city as the company for which they work.
- f) Find the highest salary, lowest salary and average salary paid by each company.
- g) Find the sum of salary and number of employees in each company.
- h) Find the name of the company that pays highest salary.

**Course Outcomes(COs):**

**CO1:** Design SQL queries to create database tables and make structural modifications.

**CO2:** Design SQL queries to add data to the database, edit existing data, and to delete data from the database.

**CO3:** Implement basic and advanced SQL queries to retrieve data from the database.

**CO4:** Understand and applies indexing mechanisms in databases.

**Text Books:**

1. An Introduction To Database System: Date C. J. (Addision Wesley)
2. Database Concepts: Korth, Silbertz, Sudarshan (Tata Mcgraw-Hill)
3. Fundamentals Of Database Systems: Elmasri, Navathe ( Pearson Education)
4. Database Management System: Gupta, G.K. (Tata Mcgraw-Hill)
5. An introduction to Database Systems: Bipin Desai (Galgotia Publication)

<b>Fundamental Of Mathematics</b>	
<b>BVNSD 1.5</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Discrete mathematics describes processes that consist of a sequence of individual steps, as compared to forms of mathematics that describe processes that change in a continuous manner. The major topics we cover in this course are single-membership sets, mathematical logic, induction, and proofs. We will also discuss counting theory, probability, recursion, graphs, trees, and finite-state machines.	
<b>Course Objectives:</b>	
This course provide an fundamental knowledge of Discrete Structures covering the topics Set Theory , Functions and Natural Numbers, Algebraic Structures, Lattices, Propositional Logic and Predicate Logic, Tree and Graph.	
<b>Unit 1:</b>	<b>10 Hours</b>
<b>Matrices:</b> Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix.	
<b>Unit 2:</b>	<b>10 Hours</b>
<b>Set Theory:</b> Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.	
<b>Unit 3:</b>	<b>10 Hours</b>
<b>Trees:</b> Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring, Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences. Combinatory: Introduction, Counting Techniques, Pigeonhole Principle.	
<b>Unit 4:</b>	<b>10 Hours</b>
<b>Lattices:</b> Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice. <b>Boolean Algebra:</b> Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand the Matrices and operations.	
<b>CO2:</b> Analyse the basic principles of sets and operations in sets, demonstrate an understanding of relations and functions and be able to determine their properties.	
<b>CO3:</b> Demonstrate different traversal methods for trees and graphs, Model problems in Computer Science using graphs and trees.	
<b>CO4:</b> Understand the Lattices, Boolean Algebra and Theory of Logic.	

**Text Books:**

1. Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006.
2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004. Liptschutz, Seymour, “Discrete Mathematics”, McGraw Hill.
3. Trembley, J.P & R. Manohar, “Discrete Mathematical Structure with Application to Computer Science”, McGraw Hill.
4. Deo, Narsingh, “Graph Theory With application to Engineering and Computer.Science.”, PHI. Swapan Kumar Sarkar, “Discrete Mathematics S Chand & Co Ltd. 2016.

<b>Data Structures Using C</b>	
<b>BVNSD 2.1</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Data structure is an implementation of C,Java,Python and other language in which knowledge of program logic development and Algorithm of the problem are given.The concept of static programming and Dynamic programming both are teach.	
<b>Course Objectives:</b>	
The main objective of this course is to develop the Program development logic and various technique to solve the scientific as well as commercial problem	
<b>Unit 1:</b>	<b>10 Hours</b>
Representation of Single and Multidimensional Arrays; SparseArrays– Lower and Upper Triangular Matrices and Tridiagonal Space Matrices with Vector Representation.	
<b>Unit 2:</b>	<b>10 Hours</b>
Stack, Queues, Singly Linked List, Doubly Linked List, Circular Linked Lists, Implementing Pointers and Objects, Representing Rooted Trees.	
<b>Unit 3:</b>	<b>10 Hours</b>
Heap Sort, Quick Sort, Counting Sort, Radix Sort, Bucket Sort, Median and Order Statistics.	
<b>Unit 4:</b>	<b>10 Hours</b>
Introduction and Terminology; Traversal of Binary Trees; Recursive Algorithms for Tree Operations such As Traversal, Insertion, Deletion; Binary Search Tree; B-Tree; Indexing with Binary Search Trees. Direct Address Tables, Hash Tables, Hash Functions, Open Addressing.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Analyze algorithms and algorithm correctness.	
<b>CO2:</b> Implement searching and sorting techniques.	
<b>CO3:</b> Demonstrate stack, queue and linked list operation.	
<b>CO4:</b> Understand the concepts of tree and graphs.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Fundamentals of Data structures Using C: Horwitz and Sahni (Silicon Press)</li> <li>2. Data Structures &amp; Algorithms: R.S.Salaria (KhannaPublishers)</li> <li>3. Data Structures using C and C++: Langsam, Augenstein, and Tenenbaum (PHI)</li> <li>4. Introduction to Algorithms: Thomas H. Coreman, Charles E.Leiserson and Ronald L.Rivest (MIT Press)</li> </ol>	

<b>Lab on Data Structures and C Programming (Practical Paper)</b>	
<b>BVNSD 2.2</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Data structure is an implementation of C, Java, Python and other language in which knowledge of program logic development and Algorithm of the problem are given. The concept of static programming and Dynamic programming both are teach.	
<b>Course Objectives:</b>	
The main objective of this course is to develop the Program development logic and various technique to solve the scientific as well as commercial problem	
<b>Practical:</b>	<b>40 Hours</b>
<ol style="list-style-type: none"> <li>1. Write a program to manipulate stack using push, pop, display and search operation.</li> <li>2. Write a program to convert infix expression into postfix and postfix into infix.</li> <li>3. Write a program to implement queue using Insert, Delete, search operation.</li> <li>4. Write a program to implement circular queue using Insert, Delete, search operation.</li> <li>5. Write a program to implement dequeue using Insert, Delete, search operation.</li> <li>6. Write a program to implement Linear Linked List. Using inset, delete, add at beg, append, display and count function.</li> <li>7. Write a program to implement circular Linked List. Using inset, delete, add at beg, append, display and count function.</li> <li>8. Write a program to implement Doubly Linked list. Using inset, delete, add at beg, append, display and count function.</li> <li>9. Write a program to construct the Binary tree and also traverse the binary tree in in order, pre order, post order.</li> <li>10. Write program to perform following sorting. <ol style="list-style-type: none"> <li>a) bubble sorting</li> <li>b) Quick sorting</li> <li>c) Selection sorting</li> <li>d) Heap sorting</li> <li>e) Merge Sorting.</li> </ol> </li> <li>11. Perform the binary search.</li> </ol>	

12. Perform the linear search.
13. Write a program to implement DFS, BFS.
14. Write a program to implement direct search.
15. Write a program to implement prims algo.

**Course Outcomes(COs):**

**CO1:** Analyze and write code linked list programs.

**CO2:** Implement code searching and sorting techniques.

**CO3:** Demonstrate & code stack, queue and tree list operation.

**CO4:** Implement code graphs concepts

**Text Books:**

5. Fundamentals of Data structures Using C: Horwitz and Sahni (Silicon Press)
6. Data Structures & Algorithms: R.S.Salaria (KhannaPublishers)
7. Data Structures using C and C++: Langsam, Augenstein, and Tenenbaum (PHI)
8. Introduction to Algorithms: Thomas H. Coreman, Charles E.Leiserson and Ronald L.Rivest (MIT Press)

<b>PHP</b>	
<b>BVNSD 2.3</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
The Hypertext Preprocessor (PHP) is a programming language that allows web developers to create dynamic content that interacts with databases. PHP is basically used for developing web based software applications. This subject helps you to build your base with PHP.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To understand how server-side programming works on the web.</li> <li>2. To study basic PHP structure and components.</li> <li>3. To enable to design dynamic webpage.</li> <li>4. To create a database in phpMyAdmin.</li> <li>5. To read and process data in a MySQL database.</li> <li>6. To design website and learn how to host website on server.</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
PHP Configuration, Syntax, Structure, Strings, Numbers, Time & Date, Variable, Array and Functions, flow controls.	
<b>Unit 2:</b>	<b>7 Hours</b>
Web Forms Handling, Environment Variables, File and Directory Handling, Identifying data Origin and Data Validation, Redirecting Pages, Cookies, Session and User Tracking. PHP Mailer, Object Oriented PHP Introduction, PHP functions, CAPTCHA for Real User Detection, Using Exceptions to Handle Errors.	
<b>Unit 3:</b>	<b>7 Hours</b>
<b>MYSQL:</b> Data Types, Functions, Conversion; Creation: DB, Table, constraints etc., Importing and Exporting DB <b>PHP-MYSQL:</b> Communicating with MYSQL; Creating, Inserting, Updating and Deleting from Database using PHP.	
<b>Unit 4:</b>	<b>7 Hours</b>
Validation Application using PHP and AJAX, Web-services; Retrieving and Insert Data using MYSQL, PHP and AJAX;	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Design Contact Form using PHP Mailer.</li> <li>2. Design Form with CAPTCHA for real user detection.</li> <li>3. Design Login page with proper validation and use session to track user.</li> <li>4. Design Registration page with proper validation using MYSQL, PHP and AJAX.</li> <li>5. Display all record from database table using PHP, MYSQL.</li> <li>6. Search particular record from database using PHP, MYSQL and AJAX.</li> <li>7. Design Simple Blogging or News Portal Website also host website on server</li> </ol>	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand about installation, configuration, and administer PHP, web server, and database tools and extensions.	
<b>CO2:</b> Apply Object-Oriented Design principles in PHP.	
<b>CO3:</b> Write code for connection to databases to fetch, store, and update persistent information.	
<b>CO4:</b> Analyse learn to avoid SQL injection attacks using parameter binding and input sanitization.	
<b>CO5:</b> Understand business logic in the database using stored procedures in addition Test and debug object-oriented PHP scripts.	

**Text Books:**

1. HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, AJAX, PHP and JQuery: Kogent Learning (Dreamtech)
2. PHP: The Complete Reference : Steven Holzner (McGraw-Hill)
3. Beginning HTML, XHTML, CSS, and Javascript: Jon Duckett (Wiley India)
4. JavaScript and jQuery -The Missing Manual: David Sawyer McFarland (O'Reilly)
5. PHP and MYSQL by Example: Ellie Quigley (PHI)

<b>Computer Graphics and Multimedia System</b>	
<b>BVNSD 2.4</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
<p>It is difficult to display an image of any size on the computer screen. This method is simplified by using Computer graphics. Graphics on the computer are produced by using various algorithms and techniques. This subject describes how a rich visual experience is provided to the user by explaining how all these processed by the computer. Graphics and Multimedia-now a day probably the most talked about technology in the field of computer. This technology is nowadays largely adopted by most computer based applications to bridge the gap between a human user &amp; the computer. By this, multiple media are implemented and used in computer based application to enhance their understanding ability before a common man. This multiple media include text, sound, video, graphics animation etc. This paper will expense the students to the various concepts of these media and their implementation in computer based application. This will also expose the students to various multimedia implementation techniques like data compression, &amp; various multimedia standards.</p>	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. The basic objective of the course is to introduce the student with fundamental concept and theory of computer graphics.</li> <li>2. To explore the fundamentals and underlying theories of Multimedia and animation to design and develop 2D/3D animations, film-making, visual effects for the creative media</li> <li>3. To innovate best practices for elements of design, virtual reality and gaming.</li> <li>4. To identify the basic hardware and software requirements for multimedia development and playback.</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
<b>Introduction:</b> Computer Graphics, Advantages and application Types of Graphics, Various Tools Used in Graphic Designing, components of computer graphics ,Graphic Displays, Conceptual Framework of Interactive Graphics	
<b>Unit 2:</b>	<b>7 Hours</b>
Use of Various Tools such as Pick Tools, Zoom Tools, Free Hand Tools, Square Tools, Rectangle Tools, Text Tools, Fill Tools, etc. and all Fonts used in Designing of Monograms, Logos, Posters, Stickers, Greeting Cards, Visiting Cards etc.	
<b>Unit 3:</b>	<b>7 Hours</b>
Introduction to Adobe Photoshop & Documents, Various Graphic Files and Extensions, Vector Image and Raster Images, Various Color Modes and Models, Screen and Work Area, Photoshop Tools & Palettes, Use of Layers & Filters, Working with Images.	
<b>Unit 4:</b>	<b>7 Hours</b>
Introduction to Flash; Basics of Multimedia; Color Models-An Overview, Primary & Secondary Color Models; Multimedia Presentation-Images, Pictures, Text, Time Line, Motion Tween, Shape Tween, Animation, Audio, Video, Details of Action Script.	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Design SBI, PNB, Google, YouTube and WhatsApp Logo using Corel Draw.</li> <li>2. Create a Visiting Card by using appropriate tools in Photoshop.</li> <li>3. Create a banner to advertise of your college using Photoshop.</li> <li>4. Change the background of any photo and improve graphics of photo using Photoshop.</li> <li>5. Do the animation for objects.</li> <li>6. Appling MASK for the picture.</li> <li>7. Applying buttons on animations.</li> </ol>	

8. Do animation for Fire-effect.
9. Do the animation for RGB colors(Color concept).

**Course Outcomes(COs):**

**CO1:**Understand the basics of computer graphics, different graphics systems and applications of computer graphics

**CO2:**Apply the tools of Adobe Photoshop and coral draw.

**CO3:**Implement the use of social media effectively for productive use

**Text Books:**

1. Corel draw X6 The Official Guide: Gary Bouton (McGraw Hill)
2. Photoshop CS6 Professional : John Goldstein (Create Space)
3. Multimedia Systems: John F. Koegel Buford (Pearson)
4. Adobe Pagemaker 7.0: Adobe(Adobe Systems)
5. Flash Boys: Michael Lewis (Allen Lane: The Penguin Press)
6. Learning ActionScript 3.0: A Beginner's Guide by Rich Shupe (Author), Zevan Rosser (Author)

<b>Communication Skills</b>	
<b>BVNSD 2.5</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Communication Skills is a subject which will help the students in identifying various effective ways to communicate in the outside world efficiently. It will enhance the self-confidence within the students and firm their conversational skills.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To understand communication strategies and principles for effective communication in personal as well as professional arena.</li> <li>2. To appropriately apply modes of expression, i.e., descriptive, expositive, narrative, scientific, and self-expressive, in written, visual, and oral communication.</li> <li>3. To develop an ability write a documented paper and/or to give an oral presentation.</li> <li>4. To develop the ability to communicate via electronic mail, Internet, and other technologies for presenting business messages.</li> </ol>	
<b>Unit 1:</b>	<b>10 Hours</b>
Communication: Meaning and Definition, Process, functions, Objectives & Importance of Communication, Essentials of good communication, 7C's of Communication, Types of Communication, Communication Barriers	
<b>Unit 2:</b>	<b>10 Hours</b>
Oral Communication: Meaning, nature and scope, Principle of effective oral communication, Techniques of effective speech, Types of oral communication, the art of listening – Principles of good listening, Group Discussion-Practical aspects, Interview skills	
<b>Unit 3:</b>	<b>8 Hours</b>
Written Communication- Purpose of writing, Forms of written communication, Principles of Effective writing, Writing Techniques, Electronic Writing Process	
<b>Unit 4:</b>	<b>12 Hours</b>
Business Letters & Reports: Need and functions of business letters, Planning & layout of business letter, Kinds of business letters, Essentials of effective correspondence, Drafting of business letters: Enquiries and replies, Placing and fulfilling orders, Complaints and follow-up Sales letters, Circular letters Application for employment and resume, Report Writing: Kind and Objective of Reports.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand the parameters of communication for developing practical approach to be implemented further.	
<b>CO2:</b> Understand how to shape their personality with the help of different skills of interactions that can be used at organizational level.	
<b>CO3:</b> Present themselves by means of subjective practical skills that can be used at global level.	
<b>CO4:</b> Develop their fluency in speaking, reading and writing English language.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Achieving Communication Effectiveness-Dr. M. Mehrotra- MRI Publications</li> <li>2. Business Communication – K.K.Sinha – Galgotia Publishing Company, New Delhi</li> <li>3. Business Communication-Urmila Rai, S.M. Rai, Himalaya Publishing House</li> <li>4. Media &amp; Communication Management-Raydu,C.S.; Himalaya Publishing House</li> </ol>	

<b>ASP.NET with C#</b>	
<b>BVNSD 3.1</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
ASP.net and c# is very simple and used in server side programming, most of the web application are developed using this module.	
<b>Course Objectives:</b>	
The main objective of this module is to learn web based application development.	
<b>Unit 1:</b>	<b>10 Hours</b>
An overview of the .NET framework. Common Language Runtime (CLR), CLS and CLS, Microsoft Intermediate Language (MSIL), the .NET Framework class library (FCL), ASP.NET to support Internet development and ADO.NET to support database applications. Languages supported by .NET, an introduction to Visual Studio.	
<b>Unit 2:</b>	<b>10 Hours</b>
An introduction to C#, Program structure, Basic IO, including output to the console and messages boxes, Data types, Arithmetic operations and expressions, Relational and logical operations, Control structures, "if", "while", "do-while", "for", and "switch", Name spaces and methods supplied by the FCL. Writing methods. Recursion and overloading Scoping rules. Arrays and data representation. Class definitions. Properties, indexers, and access control. Inheritance and polymorphism. Delegates. Exception handling.	
<b>Unit 3:</b>	<b>10 Hours</b>
A review of classic ASP, ASP.net Web Application, Rendering HTML with Server Controls, Using ASP.NET to Deliver XML Web Services, ASP.net Web Pages introduction, Web Pages Layout, Forms, Database, Web Grid, Charts, Introduction to Web Forms Controls, Validation User Input with Validation Controls, Rich Server Control: Calender Control, AdRotator Control, Master Page Concept, Theme etc.	
<b>Unit 4:</b>	<b>10 Hours</b>
ADO.NET: Introduction To ADO .NET Technology, Connecting and Accessing database with ADO.net Classes, Connected Architecture, Disconnected Architecture, DataBinding With Controls, Grid View Server Control, Data List Server Control, Repeater Server Control, Managing State with ASP.net – Page Level State, Sessions, ASP.NET Ajax Control toolkit.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand the Microsoft .NET Framework and ASP.NET page structure. <b>CO2:</b> Design web application with variety of controls. <b>CO3:</b> Access the data using inbuilt data access tools. <b>CO4:</b> Implement Microsoft ADO.NET to access data in web Application <b>CO5:</b> Configure and deploy Web Application <b>CO6:</b> Develop secured web application	
<b>Text Books:</b>	
1. Beginning Visual C# 2008: Wrox (Wiley) 2. Programming with C#: Balagurusamy(TM) 3. Beginning ASP.NET 4.5 in C#: <a href="#">Matthew MacDonald</a> (Apress) 4. Teach Yourself ASP.NET in 24 Hours: Sams Teach 5. ASP.Net: The Complete Reference: <a href="#">Matthew MacDonald</a> (McGraw-Hill)	

<b>Lab on ASP.NET and C# (Practical Paper)</b>	
<b>BVNSD 3.2</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
ASP.net and c# is very simple and used in server side programming, most of the web application are developed using this module.	
<b>Course Objectives:</b>	
The main objective of this module is to learn web based application development.	
<b>Practical:</b>	<b>40 Hours</b>
<ol style="list-style-type: none"> <li>1. <u>C# program to convert a meter into kilo-meter and vice versa</u></li> <li>2. <u>C# program to convert a temperature from Celsius to Fahrenheit</u></li> <li>3. <u>C# program to convert a temperature from Fahrenheit into Celsius</u></li> <li>4. <u>C# program to find largest of two numbers</u></li> <li>5. <u>C# program to find largest of three numbers</u></li> <li>6. <u>C# program to find the greatest common divisor (GCD)</u></li> <li>7. <u>C# program to convert a binary number into a decimal number</u></li> <li>8. <u>C# program to convert a decimal number into a binary number</u></li> <li>9. <u>C# program to calculate the sum of two binary numbers</u></li> <li>10. Write a simple program to display Web Controls.</li> <li>11. Write a program that displays a button and changes it color when the mouse moves over it.</li> <li>12. Write a program to display images in a line and enlarge the selected image.</li> <li>13. Write a program to get the information from the user and display it in a message box.</li> <li>14. Write a program to receive user feedback using Form and stored it in a database.</li> <li>15. Develop a simple portfolio website for client.</li> </ol>	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand the Microsoft .NET Framework and ASP.NET page structure. <b>CO2:</b> Design web application with variety of controls. <b>CO3:</b> Access the data using inbuilt data access tools. <b>CO4:</b> Implement Microsoft ADO.NET to access data in web Application <b>CO5:</b> Configure and deploy Web Application <b>CO6:</b> Develop secured web application	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>6. Beginning Visual C# 2008: Wrox (Wiley)</li> <li>7. Programming with C#: Balagurusamy(TMh)</li> <li>8. Beginning ASP.NET 4.5 in C#: <a href="#">Matthew MacDonald</a> (Apress)</li> <li>9. Teach Yourself ASP.NET in 24 Hours: Sams Teach</li> <li>10. ASP.Net: The Complete Reference: <a href="#">Matthew MacDonald</a> (McGraw-Hill)</li> </ol>	

<b>Data Communication and Computer Networks</b>	
<b>BVNSD 3.3</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
<p>This course is to provide students with an overview of the concepts and fundamentals of computer networks and cryptography. Topics to be covered include: data communication concepts and techniques in layered network architecture This course describes the explosive growth in computer systems and their interconnections via networks, has increased the dependence of both organizations and individuals on the information stored and communicated using these systems. This, in turn, has led to a heightened awareness of the need to protect data and resources from disclosure, to guarantee the authenticity of data and messages, and to protect systems from network based attacks and the disciplines of cryptography and network security have matured, leading to the development of practical, readily available applications to enforce network security.</p>	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To learn about computer network organization and implementation</li> <li>2. To obtain a theoretical understanding of data communication and computer networks</li> <li>3. To describe how computer networks are organized with the concept of layered approach</li> <li>4. To understand network security threats, security services, and countermeasures.</li> <li>5. Will acquire background on well known network security protocols such as IPSec, SSL,</li> <li>6. To learn fundamentals of cryptography and its application to network security.</li> <li>7. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.</li> </ol>	
<b>Unit 1:</b>	<b>11 Hours</b>
Communication System, Concept and Terminology, Analog and Digital Transmission, Half-Duplex and Full-Duplex, Analog Modulation (AM, FM, PM), Modulation of Digital data (ASK, FSK, PSK), Signals, Attenuation, Delay Distortion and Noise, Synchronous and Asynchronous Transmission.	
<b>Unit 2:</b>	<b>10 Hours</b>
Guided and Unguided Media, Transmission Characteristics of Media, Channel Capacity, Switching, Multiplexing, FDM and TDM, Multiplexing, Topology (Ring, Star, Bus, Tree, Mesh). Types of network, Wireless Network, network devices switch, hub, repeater, brouter, router and gateway	
<b>Unit 3:</b>	<b>9 Hours</b>
Internet, Distributed Networking, Client-Server Architecture, WWW.Layered Architecture, Protocol Hierarchies, Interface and Services, OSI Reference Model, TCP/IP Reference Model. IP packet, IP address, and IPv6.	
<b>Unit 4:</b>	<b>10 Hours</b>
Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers, SSL,Digital Signature.	
<b>Course Outcomes(COs):</b>	
<p><b>CO1:</b>Understand basic computer network technology.  <b>CO2:</b>Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.  <b>CO3:</b>Analyse the different types of network devices and their functions within a network  <b>CO4:</b> Implement security of the data over the network.  <b>CO5:</b>Understand Cryptographic and various Cryptographic Techniques  <b>CO6:</b>Protect any network from the threats in the world.</p>	

**Text Books:**

1. Corel draw X6 The Official Guide: Gary Bouton (McGraw Hill)
2. Photoshop CS6 Professional : John Goldstein (Create Space)
3. Multimedia Systems: John F. Koegel Buford (Pearson)
4. Adobe Pagemaker 7.0: Adobe(Adobe Systems)
5. Flash Boys: Michael Lewis (Allen Lane: The Penguin Press)
6. Learning ActionScript 3.0: A Beginner's Guide by Rich Shupe (Author), Zevan Rosser (Author)

<b>Operating Systems</b>	
<b>BVNSD 3.4</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Operating system is the most important module, because with out operating system computer can not be operated. In this module various issue of operating system, architecture of os, memory management, disk management, security management and various algos are taught.	
<b>Course Objectives:</b>	
The objective of the course to give fundamental to advance knowledge about the operating system.	
<b>Unit 1:</b>	<b>10 Hours</b>
Definition and Types of Operating Systems; Batch Processing Systems, Multi programming, Time-Sharing, Parallel, Distributed and Real-Time Systems; Operating System Structure; Operating System Components and Services, System Calls, System Programs, Virtual Machines.	
<b>Unit 2:</b>	<b>10 Hours</b>
The Critical-Section Problem, Synchronization, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, Deadlocks-System Model, Characterization, Deadlock Prevention, Avoidance and Detection, Recovery from Deadlock, Combined Approach To Deadlock Handling.	
<b>Unit 3:</b>	<b>10 Hours</b>
Memory Management: Background, Logical versus Physical Address Space, Swapping, Contiguous allocation, Paging, Segmentation Virtual Memory: Demand Paging, Page Replacement, Page- replacement Algorithms, Performance of Demand Paging, Allocation of Frames, Thrashing. Concept of File System, General Model of a File System, Access Control Verification, Logical and Physical File System, Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free- Space Management	
<b>Unit 4:</b>	<b>10 Hours</b>
Techniques for Device Management, Shared Devices, Virtual Devices, Storage Devices, Buffering, Secondary Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap- Space Management, Disk Reliability	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Describe and explain the fundamental components of a computer operating system	
<b>CO2:</b> Define, restate, discuss, and explain the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems	
<b>CO3:</b> Analyse and extrapolate the interactions among the various components of computing systems.	
<b>CO4:</b> Design and construct the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Operating System Concepts: Silbersachatz and Galvin(Person)</li> <li>2. OperatingSystems: Madnick&amp; Donovan (Tata McGraw Hill)</li> <li>3. ModernOperating Systems: Tanenbaum (PHI)</li> <li>4. Operating Systems Design and Implementation: Tanenbaum and Woodhull (PHI)</li> <li>5. Operating Systems Principles: Silbersachatz , Galvin, and Gagne (John Wiley &amp; Sons)</li> <li>6. Operating Systems: A Modern Approach: Gary Nutt (Addison-Wesley)</li> </ol>	

<b>Digital Electronics</b>	
<b>BVNSD 3.5</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Digital electronic is basically hardware based module in which basic concept of hardware component of hardware and digital logic boolean logic circuit design are taught.	
<b>Course Objectives:</b>	
The main objective of this module is to teach the student about internal architecture, circuit design and give the knowledge of electronic too.	
<b>Unit 1:</b>	<b>10 Hours</b>
<b>Basic of Digital Electronics:</b> Character Codes (BCD, ASCII, EBCDIC) and its arithmetic signed binary numbers, cyclic codes, error detecting code. Introduction to logic gates. Gate-level Minimization: algebra: definition, axioms, basic theorems, and properties, Boolean functions, Canonical and standard forms, NAND and NOR implementations, K- map method up to five variables, don't care conditions.	
<b>Unit 2:</b>	<b>10 Hours</b>
<b>Combinational Logic:</b> Combinational circuits, analysis and design procedures, binary adder-subtractor, introduction to decoders, encoders, multiplexers, de-multiplexers. Sequential logic: Sequential circuits, latches, flip flops, analysis of clocked sequential circuits. Registers and counter: shift registers, ripple counters, synchronous and asynchronous circuits: analysis of clocked sequential circuits, state reduction & assignments design procedure, analysis procedure of asynchronous sequential circuits, circuits with latches, design procedure.	
<b>Unit 3:</b>	<b>10 Hours</b>
<b>Basics of Computer Organization:</b> Functional units of digital computer and their interconnections, buses, register bus and memory transfer. Processor organization, general register organization, stack organization, and addressing modes. Arithmetic and logical unit: Fixed and floating point representation, IEEE standard for floating point representation, Booth's algorithm. Division and logic operations. Arithmetic & logical unit design.	
<b>Unit 4:</b>	<b>10 Hours</b>
<b>Control unit:</b> Instruction type, formats, instruction cycles and sub-cycles, micro- operations, execution of a complete instruction, Introduction to micro programmed control organization, Memory: Basic concept and hierarchy, semiconductor RAM memories. ROM memories. Cache memories: concept, design issues. Input/ Output: Peripheral devices, I/O interface, I/O ports, interrupts: Types of interrupts and exceptions, Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Analyse the structure of number systems and perform the conversion among different number systems.	
<b>CO2:</b> Implement logical expressions using Boolean algebra, k-map and tabulation method and implement the functions using logic gates.	
<b>CO3:</b> Realize combinational circuits for given application.	
<b>CO4:</b> Design and analyses synchronous and asynchronous sequential circuits using flip-flops.	
<b>CO5:</b> Implement combinational logic circuits using programmable logic devices.	

**Text Books:**

1. Computer Organization Vravice, Zaky & Hamacher (TMH Publication)
2. Structured Computer Organization, Tannenbaum (PH)
3. Computer Organization, John P.Hayes (Mcgraw Hill)
4. Digital Logical and Computer Design M. Morris, (Pearson Education India)
5. Digital Circuit and Design, DP Kothi and JS Dhillon (Pearson Education)
6. Computer Organization and Design, P Pal Chaudhary, (PH

<b>Python Programming</b>	
<b>BVNSD 4.1</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Python is a widely used general-purpose, high level programming language. It was created by Guido van Rossum in 1991 and further developed by the Python Software Foundation. It was designed with an emphasis on code readability, and its syntax allows programmers to express their concepts in fewer lines of code.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To learn Python structure and basic building block.</li> <li>2. To learn core Python scripting elements such as variables and flow control structures.</li> <li>3. To discover how to work with lists and sequence data.</li> <li>4. To learn Python Data Structure.</li> <li>5. To learn searching and sorting</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
<b>Introduction:</b> The Programming Cycle for Python, Python IDE, Interacting with Python Programs, Elements of Python, <b>Type Conversion Basics:</b> Expressions, Assignment Statement, Arithmetic Operators, Operator Precedence, Boolean Expression.	
<b>Unit 2:</b>	<b>7 Hours</b>
<b>Conditionals:</b> Conditional statement in Python (if-else statement, its working and execution), Nested-if statement and Elif statement in Python, Expression Evaluation & Float Representation. <b>Loops:</b> Purpose and working of loops , While loop including its working, For Loop , Nested Loops , Break and Continue	
<b>Unit 3:</b>	<b>7 Hours</b>
<b>Function:</b> Parts of A Function , Execution of A Function , Keyword and Default Arguments ,Scope Rules. Strings: Length of the string and perform Concatenation and Repeat operations in it. Indexing and Slicing of Strings. <b>Python Data Structure:</b> Tuples, Unpacking Sequences , Lists , Mutable Sequences , List Comprehension , Sets , Dictionaries Higher Order Functions: Treat functions as first class Objects , Lambda Expressions	
<b>Unit 4:</b>	<b>7 Hours</b>
<b>Iterators &amp; Recursion:</b> Recursive Fibonacci, Tower Of Hanoi Search: Simple Search and Estimating Search Time, Binary Search and Estimating Binary Search Time <b>Sorting &amp; Merging:</b> Selection Sort, Merge List, Merge Sort, Higher Order Sort	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. To write a python program to check given number is odd or even.</li> <li>2. To write a python program to find greater number among 3 numbers.</li> <li>3. To write a python program to find factorial of given number.</li> <li>4. To write a python program to print Fibonacci series.</li> <li>5. To write a python program to sum of digit of given integer</li> <li>6. To write a python program to check given integer is palindrome or not.</li> <li>7. To write a python program to check number is Armstrong or not.</li> <li>8. To write a python program to find factorial of given number using recursion.</li> <li>9. To write a python program to implement Tower of Hanoi.</li> <li>10. To write a python program to compute the GCD of two numbers.</li> <li>11. To write a python program exponentiation (power of a number).</li> </ol>	

12. To write a python program find the maximum of a list of numbers.
13. To write a python program to implement linear search.
14. To write a python program to implement Binary search.
15. To write a python program to implement Bubble Search
16. To write a python program selection sort.
17. To write a python program Insertion sort.
18. To write a python program first n prime numbers.

**Course Outcomes(COs):**

**CO1:** Implement simple Python programs.

**CO2:** Develop Python programs with conditionals and loops.

**CO3:** Apply Python functions and to use Python data structures - lists, tuples, dictionaries

**CO4:** Apply searching, sorting and merging in Python

**Text Books:**

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist``, 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/thinkpython/>)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. John V Guttag, —Introduction to Computation and Programming Using Python``, Revised and expanded Edition, MIT Press , 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

<b>Design And Analysis Of Algorithm</b>	
<b>BVNSD 4.2</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Design and analysis of algorithms is the process of finding the computational complexity of algorithms – the amount of time, storage, or other resources needed to execute them.	
<b>Course Objectives:</b>	
This course will cover basic concepts in the design and analysis of algorithms. Asymptotic complexity, $O()$ notation Sorting and search. Algorithms on graphs: exploration, connectivity, shortest paths, directed acyclic graphs, spanning trees. Design techniques: divide and conquer, greedy, dynamic programming. Data structures: heaps, union of disjoint sets, search trees Intractability.	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
<b>Introduction:</b> Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	
<b>Unit 2:</b>	<b>7 Hours</b>
<b>Advanced Data Structures:</b> Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List.	
<b>Unit 3:</b>	<b>7 Hours</b>
Divide and Conquer with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. Greedy Methods with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim’s and Kruskal’s Algorithms, Single Source Shortest Paths - Dijkstra’s and Bellman Ford Algorithms.	
<b>Unit 4:</b>	<b>7 Hours</b>
Dynamic Programming with Examples Such as Knapsack. All Pair Shortest Paths – Warshal’s and Floyd’s Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Program for Recursive Binary &amp; Linear Search.</li> <li>2. Program for Heap Sort.</li> <li>3. Program for Merge Sort.</li> <li>4. Program for Selection Sort.</li> <li>5. Program for Insertion Sort.</li> <li>6. Program for Quick Sort.</li> <li>7. Knapsack Problem using Greedy Solution</li> <li>8. Perform Travelling Salesman Problem</li> <li>9. Find Minimum Spanning Tree using Kruskal’s Algorithm</li> <li>10. Implement N Queen Problem using Backtracking</li> <li>11. Implement , the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.</li> <li>12. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.</li> <li>13. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.</li> </ol>	

14. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
15. Write programs to Implement All-Pairs Shortest Paths problem using Floyd's algorithm.
16. Write programs to Implement Travelling Sales Person problem using Dynamic programming.
17. Design and implement to find a subset of a given set  $S = \{S_1, S_2, \dots, S_n\}$  of  $n$  positive integers whose SUM is equal to a given positive integer  $d$ . For example, if  $S = \{1, 2, 5, 6, 8\}$  and  $d = 9$ , there are two solutions  $\{1, 2, 6\}$  and  $\{1, 8\}$ . Display a suitable message, if the given problem instance doesn't have a solution.
18. Design and implement to find all Hamiltonian Cycles in a connected undirected Graph  $G$  of  $n$  vertices using backtracking principle.

**Course Outcomes(COs):**

**CO1:** Implement new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.

**CO2:** Understand the Advanced Data Structures

**CO3:** Implement the Divide and Conquer, Greedy Methods and Trees.

**CO4:** Apply the Dynamic Programming with examples.

**Text Books:**

1. Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
4. LEE "Design & Analysis of Algorithms (POD)", McGraw Hill
4. Richard E. Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning
5. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.

<b>Software Engineering</b>	
<b>BVNSD 4.3</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Software Engineering (SE) comprises the core principles consistent in software construction and maintenance: fundamental software processes and life-cycles, mathematical foundations of software engineering, requirements analysis, software engineering methodologies and standard notations, principles of software architecture and re-use, software quality frameworks and validation, software development, and maintenance environments and tools. An introduction to object-oriented software development process and design. Topics include: iterative development, interpretation of requirements and use case documents into code; application of design notation in UML and use of commonly-used design patterns. Current industry-strength programming languages, technologies and systems feature highly in the practical components, electives and projects of the course, but they are also taught with a view to understanding and applying principles underlying their more ephemeral character.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To Know of basics of Software engineering methods and practices, and their appropriate application.</li> <li>2. To describe software engineering layered technology and Process frame work.</li> <li>3. To understand software requirements and the SRS documents.</li> <li>4. To describe data models, object models, context models and behavioral models.</li> <li>5. To understand software testing approaches such as unit testing and integration testing.</li> </ol>	
<b>Unit 1:</b>	<b>8 Hours</b>
Basics of Software Engineering; Software Estimation: Size, Effort, and Cost; Software Characteristics; Software Quality Attributes; Software Development Lifecycle; Models: Waterfall, Prototype and Spiral Model.	
<b>Unit 2:</b>	<b>10 Hours</b>
Statement of System Scope; Isolation of Top Level Processes and Entitles and their Allocation to Physical Elements; Refinement and Review, Analyzing a Problem; Creating a Software Specification Document; Review for Correctness, Consistency, and Completeness.	
<b>Unit 3:</b>	<b>12 Hours</b>
Basic Concept of Software Design; Application of Fundamental Design Concept for Data; Architectural and Procedural Designs; Object Oriented Design Paradigm; Top- down and Bottom-up Design; Coupling & Cohesion; Creating Design Document: Review of Conformance to Software Requirements and Quality. Relationship between Design and Implementation, Implementation Issues and Programming Support Environment, Coding the Procedural Design, Good Coding Style and Review of Correctness and Readability.	
<b>Unit 4:</b>	<b>10 Hours</b>
Testing Objectives; Types of Testing: Unit, Integration, Acceptance, and Structural Testing; Maintenance as Part of Software Evaluation; Reasons for Maintenance; Types of Maintenance (Perceptive, Adoptive, Corrective); Techniques for Maintenance; Overview of Case Tools.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand of the analysis and design of complex systems. <b>CO2:</b> Apply software engineering principles and techniques. <b>CO3:</b> Develop, maintain and evaluate large-scale software systems. <b>CO4:</b> Produce efficient, reliable, robust and cost-effective software solutions. <b>CO5:</b> Implement independent research and analysis. <b>CO6:</b> Understand and meet ethical standards and legal responsibilities.	

**Text Books:**

1. Software Engineering: K.K.Agarwal&Yogesh Singh(New Age International)
2. Software Engineering: I.Sommerville(Addison Wesley)
3. Software Engineering-An Engineering Approach: James Peter, W. Pedrycz (John Wiley & Sons)
4. Essentials of Software Engineering: Tsui, Karam, and Bernal (Jones and Bartlett Learning)
5. An Integrated Approach to Software Engineering: PankajJalote (Springer)

<b>E-Commerce &amp; M-Commerce</b>	
<b>BVNSD 4.4</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
This course emphasizes the major concepts and activities of E-Commerce & M-Commerce. It covers definition of e-commerce, technology and software requirements, security issues, electronic payment and marketing strategies. It focuses on what to expect when creating a dot com as well as usage of e-commerce & m-commerce.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To analyse the impact of E-commerce &amp; M-commerce on business models and strategy.</li> <li>2. To gain a comprehensive understanding of the E-commerce &amp; M-commerce landscape..</li> <li>3. To develop an understanding on how internet can help business grow.</li> <li>4. To gain an understanding on the importance of security, privacy, and ethical issues as they relate to E-commerce &amp; M-commerce.</li> </ol>	
<b>Unit 1:</b>	<b>8 Hours</b>
Meaning and concept of E-Commerce; History of E-Commerce; Traditional Commerce and E-Commerce; Different Types of E-Commerce – B2B, B2C, C2C, B2E, G2C; Need and Role of E-Commerce; Advantages and Disadvantages of Ecommerce, Impact of E-commerce on Business.	
<b>Unit 2:</b>	<b>14 Hours</b>
Introduction to payment system; Online Payment System – prepaid e-payment service, postpaid e-Payment system; SET protocol; Operational, Credit & legal risk of repayment system. Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. Electronic Data Interchange, EDI and Paperless trading, EDI architecture, EDI standards. E-Commerce Threats; Security of Clients and sever; Security Issues on Web; Importance of Firewall; Components of Firewall; Security Threats; Transaction Security; Network Security.	
<b>Unit 3:</b>	<b>10 Hours</b>
Growth of Mobile Commerce, Infrastructure of M-Commerce , Types of Mobile Commerce Services, Technologies of Wireless Business, Technologies for Mobile Commerce, Mobile Marketing & Advertisement, Wireless Applications , Wireless Devices For Mobile Commerce, Wireless Personal and Local Area Networks.	
<b>Unit 4:</b>	<b>8 Hours</b>
Wireless Application Protocol, WAP technology, Wireless Spectrum, WAP, Origins of WAP, WAP Architecture, Wireless Datagram Protocol (WDP), Short Message Services, General Packet Radio Service (GPRS), 3G & 4 G Wireless Technology.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Analyse the impact of E-commerce & M-commerce on business models and strategy.	
<b>CO2:</b> Understand the major types of E-commerce & M-commerce.	
<b>CO3:</b> Apply the process that should be followed in building an E-commerce & M-commerce presence.	
<b>CO4:</b> Understand the key security threats in the E-commerce & M-commerce environment.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Electronic Commerce – Framework Technologies and Applications: Bharat Bhasker(TMh)</li> <li>2. Doing Business on the Internet E-Commerce- Electronic Communication for Business: S. Jaiswal (Galgotia Publications)</li> <li>3. Frontiers of Electronic Commerce: Kalakota et al (Addison Wesley)</li> <li>4. E-Business and Commerce- Strategic Thinking and Practice: BrahmCanzer (Biztantra)</li> <li>5. Frontiers of Electronic Commerce: Ravi Kalakota and Andrew Winston (Addison Wesley)</li> </ol>	

<b>Cyber Security</b>	
<b>BVNSD 4.5</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Cyber Security course helps learners to develop a deeper understanding of modern information and system protection technology and methods. The learning outcome is simple: We hope learners will develop a lifelong passion and appreciation for cyber security, which we are certain will help in future endeavors. Students, developers, managers, engineers, and even private citizens will benefit from this learning experience. Special customized interviews with industry partners were included to help connect the cyber security concepts to live business experiences.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To learn foundations of Cyber Security.</li> <li>2. To learn various types of algorithms and its applications of Cyber Security and Ethical Hacking using forensic detection.</li> <li>3. To learn python toolkit required for programming Cyber Security, Ethical Hacking concepts.</li> <li>4. To understand the concepts of Cyber Security, Ethical Hacking, Forensic detection.</li> <li>5. To identify insights on how to apply Cyber Security, Ethical Hacking to solve a interdisciplinary problems.</li> </ol>	
<b>Unit 1: Foundations of. Cyber Security Concepts</b>	<b>10 Hours</b>
Essential Terminologies: CIA, Risks, Breaches, Threats, Attacks, Exploits. Information Gathering (Social Engineering, Foot Printing & Scanning).Open Source/ Free/ Trial Tools: nmap, zenmap, Port Scanners, Network scanners	
<b>Unit 2: Cryptography and Cryptanalysis</b>	<b>10 Hours</b>
Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security, Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPsec.	
<b>Unit 3: Infrastructure and Network Security.</b>	<b>10 Hours</b>
Python programming environment Overview. Introduction to System Security, Server Security, OS Security, Physical Security, Introduction to Networks, Network packet Sniffing, Network Design Simulation. DOS/ DDOS attacks. Asset Management and Audits, Vulnerabilities and Attacks. Intrusion detection and Prevention Techniques, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.	
<b>Unit 4: Cyber Security Vulnerabilities&amp; Safe Guards</b>	<b>10 Hours</b>
Internet Security, Cloud Computing & Security, Social Network sites security, Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Authorization, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, IT Audit, Authentication. Open Web Application Security Project (OWASP), Web Site Audit and Vulnerabilities assessment. Open Source/ Free/ Trial Tools: WinAudit, Zap proxy (OWASP), burp suite, DVWA kit.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.	
<b>CO2:</b> Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios	
<b>CO3:</b> Analyse common trade-offs and compromises that are made in the design and development process of Information Systems.	

**Text Books:**

1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI,2006.
2. V.K. Jain, "Cryptography and Network Security", Khanna PublishingHouse.
3. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House,Delhi.
4. AtulKahate, "Cryptography and Network Security", McGrawHill.
5. V.K. Pachghare, "Cryptography and Information Security", PHILearning
6. Nina Godbole, "Information System Security",Wiley
7. Bothra Harsh, "Hacking", Khanna Publishing House,Delhi

<b>Java Programming</b>	
<b>BVNSD 5.1</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
In this module the concept of object oriented programming are given. Class object base programming is the core programming concept of this module.	
<b>Course Objectives:</b>	
The objective of this module is to give fundamental knowledge of java programming.	
<b>Note:</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
Introduction, Operator, type conversion, tokens, precedence of operators, associativity of operators, Data type, Variable, Arrays, Control Statements, Looping statements.	
<b>Unit 2:</b>	<b>7 Hours</b>
Class, Objects Methods, Method Overloading, Method Overriding, Constructors Inheritance. String Handling, Package and Interface, Exception Handling, Multithread Programming, File Handling, Java Applet.	
<b>Unit 3:</b>	<b>7 Hours</b>
Event Handling, Adapter Classes, Introduction to AWT, AWT Controls, Layout Managers, Menus, Images, Graphics, Networking(Datagram Socket and TCP/IP Based Server Socket), Java.util Package: Collections and Maps	
<b>Unit 4:</b>	<b>7 Hours</b>
Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Check boxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Tool bars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame, JTable.	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Write a program in java which prints your name using command line arguments.</li> <li>2. Write a program in java which enters three number using command line arguments and print sum and average of the number</li> <li>3. Write a program to swap the value of 2 variables without using 3rd variable</li> <li>4. Write a program to calculate the sum of digits of a given integer no.</li> <li>5. Write a program to compute the sum of the first and last digit of a given number.</li> <li>6. Write a program in java which enter the number using Data Input Stream and check whether the entered number is even or odd.</li> <li>7. Write an application that reads a string and determines whether it is a palindrome.</li> <li>8. Write a program to enter a sentence form keyboard and also find all the words in that sentence with starting character as vowel.</li> <li>9. Write a Program in java which creates the array of size 5; find the sum and average of the five numbers.</li> <li>10. Create a java program that has three version of add method which can add two, three, and four integers.</li> <li>11. Program illustrating Classes and Objects.</li> <li>12. Program illustrating Method Overloading and Method Overriding.</li> <li>13. Program illustrating concept of Interface.</li> <li>14. Program illustrating use of Final and Super keyword.</li> <li>15. Program that illustrates the Creation of simple package.</li> <li>16. Program that illustrates the Accessing of a package.</li> <li>17. Program that illustrates the Handling of predefined exceptions.</li> <li>18. Program that illustrates the Handling of user defined exceptions.</li> </ol>	

**Course Outcomes(COs):**

**CO1:** Understand Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.

**CO2:** Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.

**CO3:** Implement the principles of inheritance, packages and interfaces.

**Text Books:**

1. The Complete Reference JAVA2: Naughton, Schildt(TMh)
2. Programming in JAVA: Balagurusamy (TMh)
3. Java2 Black Book: Steven Holzner (Dreamtech)
4. Java Programming by Example: Sharma and Sharma (Cambridge University Press)
5. Java Programming-A Practical Approach : C.Xavier (TMh)

<b>Data Warehousing and Mining</b>	
<b>BVNSD 5.2</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Data warehousing refers to the process of collecting and organizing data into one common database, whereas data mining refers to the process of extracting useful data from the databases. The data mining process depends on the data compiled in the data warehousing phase to recognize meaningful patterns. A data warehouse is created to support management systems.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To understand data warehouse concepts, architecture, business analysis and tools</li> <li>2. To understand data pre-processing and data visualization techniques</li> <li>3. To study algorithms for finding hidden and interesting patterns in data</li> <li>4. To understand and apply various classification and clustering techniques using tools.</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1: Introduction to Data warehousing and Mining</b>	<b>7 Hours</b>
Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.	
<b>Unit 2: Multidimensional Data Model and Architecture</b>	<b>7 Hours</b>
Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data warehousing to Data Mining. Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept Hierarchy Generation. Data Mining Primitives, DMQL, Architectures of Data Mining Systems.	
<b>Unit 3: Association Rule Mining</b>	<b>7 Hours</b>
Association Rule Mining, Single – Dimensional Boolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi-Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis, Constraint – Based Association Mining.	
<b>Unit 4: Classification and Clustering</b>	<b>7 Hours</b>
Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster Analysis-Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Demonstration of preprocessing on dataset.</li> <li>2. Demonstration of Association rule process on dataset usingapriori algorithm.</li> <li>3. Demonstration of classification rule process on dataset student.arff using j48 Algorithm</li> <li>4. Demonstration of classification rule process on dataset employee.arff using j48 algorithm</li> <li>5. Demonstration of classification rule process on dataset employee.arff using id3 algorithm</li> <li>6. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm</li> <li>7. Demonstration of clustering rule process on dataset iris.arff using simple k-means</li> <li>8. Demonstration of clustering rule process on dataset student.arff using simple k-means.</li> </ol>	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Design a Data warehouse system and perform business analysis with OLAP tools. <b>CO2:</b> Apply suitable pre-processing and visualization techniques for data analysis <b>CO3:</b> Apply frequent pattern and association rule mining techniques for data analysis <b>CO4:</b> Apply appropriate classification and clustering techniques for data analysis	

**Text Books:**

1. Jiawei Han & Micheline Kamber - Data Mining Concepts & Techniques Publisher Harcourt India. Private Limited.
2. G.K. Gupta – Introduction to Data Mining with case Studies, PHI, New Delhi –2006.
- A. Berson & S.J. Smith – Data Warehousing Data Mining, COLAP, TMH, New Delhi – 2004
3. H.M. Dunham & S. Sridhar – Data Mining, Pearson Education, New Delhi, 2006.

<b>Software Testing</b>	
<b>BVNSD 5.3</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Software testing course teaches basic concepts of software testing. Software testing is widely used technology because it is compulsory to test each and every software before deployment. Software testing course includes all topics of Software testing such as Black Box Testing, White Box Testing. Levels such as Unit Testing, Integration Testing, Regression Testing, Functional Testing. System Testing, Acceptance Testing, Alpha Testing, Beta Testing, Non-Functional testing, Security Testing, Portability Testing.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To understand Testing levels and testing methods</li> <li>2. To study Static testing – how to carry out testing without executing the code</li> <li>3. To learn about dynamic testing and Test case design techniques. How to do the testing after executing the program and how to design test cases with examples</li> <li>4. To know the details of Managing the testing Process</li> <li>5. To know the need for testing tools and how to select a tool.</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
Need of SoftwareTesting;Basic Concepts – Errors, Faults, Defects, Failures, Test Bed; Levels of Testing; Top-Down versus Bottom-Up Testing; Types of Testing – Black Box, White Box, Gorilla, Beta, Field, Performance, Stress and Acceptance Testing.	
<b>Unit 2:</b>	<b>7 Hours</b>
Boundary Value Testing, Equivalence Class Testing, Decision Table based Testing, Retrospection.Path Testing, Data Flow Testing, Retrospection	
<b>Unit 3:</b>	<b>7 Hours</b>
Issues, Class Testing, Object Oriented Integration Testing, Object Oriented System Testing.	
<b>Unit 4:</b>	<b>7 Hours</b>
Introduction to Software Quality, Quality Attributes, Quality Assurance, Quality Control and Assurance; Methods of Quality Management; Cost of Quality;Quality Factor; Quality Management & Project Management; Software Quality Metrics-TQM, Six Sigma, ISO, SQA Model.	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Take any system (e.g. ATM system) and study its system specifications and report the variousbugs.</li> <li>2. Write the test cases for any known application (e.g. Bankingapplication)</li> <li>3. Create a test plan document for any application (e.g. Library ManagementSystem)</li> <li>4. Study of any testing tool (e.g. Winrunner)</li> <li>5. Study of any web testing tool (e.g.Selenium)</li> <li>6. Study of any bug tracking tool (e.g. Bugzilla,bugbit)</li> <li>7. Study of any test management tool (e.g. TestDirector)</li> <li>8. Study of any open source-testing tool (e.g. TestLink)</li> </ol>	

**Course Outcomes(COs):**

**CO1:** Understand the challenges and problems faced, what is testing, types of testing and the models.

**CO2:** Understand the different types of testing with their workings.

**CO3:** Describe the techniques used in static testing

**CO4:** Visualize the methods used to perform dynamic testing and case studies on it.

**CO5:** Understand how to manage the testing process by developing the related documents.

**CO6:** Analyze why tools are required, how to use them and understand the ethics required.

**Text Books:**

1. Introducing Software Testing: Louise Tamres (Pearson Education)
2. Software Testing Techniques: Borris Beizer (Dreamtech Press)
3. Practical Software Testing: Burnstein (Springer Publication)
4. Software Testing- A Craftman's Approach: Paul C. Jorgensen (CRC Press)
5. Effective Methods for Software Testing: William Perry (Wiley Publication)
6. Software Testing: Ron Patton (Pearson Education)

<b>Network and Information Security</b>	
<b>BVNSD 5.4</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
<p>The rise in the widespread use of technology paves a way to rise in cybercrime. For hackers, the possibilities increased exponentially, along with the potential rewards like ransomware. Hence being cautious about the situation, the internet experts paying attention by investing a lot of time and money in predicting Network and Information security trends. This program aims to provide a foundational platform for Network Security Aspirants by providing Cyber Security Awareness and Training that heighten the chances of catching a scam or attack before it is fully enacted, minimizing damage to the resources and ensuring the protection of information technology assets. The program focuses to cover all network security landscapes theoretically and practically. This course provides a range of career opportunities in network Security Sectors as Network/Application Security Analyst, Cyber Security Analyst, Cyber Security Analyst (Soc) Security Automation, Cyber Security Practitioner, Cyber Defense Analyst, Penetration Tester, Information Security Engineer in leading IT Industries and to act as Network Security Experts in Governmental Organizations.</p>	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To learn security from multiple perspectives</li> <li>2. To describe how computer networks are organized with the concept of layered approach</li> <li>3. To learn different types of network devices and their functions within a network.</li> </ol>	
<b>Unit 1:</b>	<b>12 Hours</b>
Computer Security, Threats to Security, Computer System Security, Vulnerability and Threats: Viruses, Worms, Trojan Horse, Bombs, Trap Doors, Spoofs, Email Virus, Macro Viruses, Remedies, Intruders, Malicious Software, Firewalls, Network Denial of Service Attack.	
<b>Unit 2:</b>	<b>10 Hours</b>
Network Topologies, Internet, Network Architectures, Performance Issues, Scalability, Bridging and Routing, Cabling Infrastructure, Hubs, Traffic Management, WAN Structures, Packet Switching, Circuit Switching, Development of SMDS/ATM.	
<b>Unit 3:</b>	<b>8 Hours</b>
Distributed Processing Systems, Distributed Applications and Distributed Data, Client/Server Architecture, Advantages and Disadvantages of Distributed Processing Systems.	
<b>Unit 4:</b>	<b>10 Hours</b>
Introduction, Concept of Backup, User Access, Control, Encryption, and Security Certificates, Digital Signatures, Electronic Payment Systems. Traffic Modeling and Congestion Control, Examples of Tools/Protocols for Network Management, Response and other Performance Issues.	
<b>Course Outcomes(COs):</b>	
<p><b>CO1:</b>Identify some of the factors driving the need for network security  <b>CO2:</b>Identify and classify particular examples of attacks  <b>CO3:</b>Understand Distributed Computing techniques, Synchronous and Processes.  <b>CO4:</b>Apply Shared Data access and Files concepts  <b>CO5:</b>Develop basic understanding of security, cryptography, system attacks and defenses against them.  <b>CO6:</b>Analyse message passing, client- server and peer -to-peer models to understand distributed computing paradigms.</p>	

**Text Books:**

1. Cryptography and Network Security: AtulKahate (McGraw Hill)
2. Cryptography and Network Security: Principles and Practice: Stallings (Prentice Hall)
3. Cryptography and Network Security: Behrouz A Forouzan (McGraw Hill)
4. Computer Networks: Andrew Tanenbaum (Pearson Publications)

<b>Cryptography</b>	
<b>BVNSD 5.5A</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Cryptography is the study and practice of techniques for secure communication in the presence of third parties called adversaries. It deals with developing and analyzing protocols which prevents malicious third parties from retrieving information being shared between two entities thereby following the various aspects of information security.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To understand basics of Cryptography and Network Security.</li> <li>2. To be able to secure a message over insecure channel by various means.</li> <li>3. To learn about how to maintain the Confidentiality, Integrity and Availability of data.</li> <li>4. To understand various protocols for network security to protect against the threats in the networks.</li> </ol>	
<b>Unit 1: Introduction to Cryptography and Block Ciphers</b>	<b>10 Hours</b>
Introduction to security attacks - services and mechanism - introduction to cryptography - Conventional Encryption: Conventional encryption model - classical encryption techniques - substitution ciphers and transposition ciphers – cryptanalysis – steganography - stream and block ciphers - Modern Block Ciphers: Block ciphers principals - Shannon’s theory of confusion and diffusion - fiestal structure - data encryption standard(DES) - strength of DES - differential and linear cryptanalysis of DES - block cipher modes of operations - triple DES – AES.	
<b>Unit 2: Confidentiality and Modular Arithmetic</b>	<b>10 Hours</b>
Confidentiality using conventional encryption - traffic confidentiality - key distribution - random number generation - Introduction to graph - ring and field - prime and relative prime numbers - modular arithmetic - Fermat’s and Euler’s theorem - primality testing - Euclid’s Algorithm - Chinese Remainder theorem - discrete algorithms.	
<b>Unit 3: Public key cryptography</b>	<b>10 Hours</b>
Principles of public key crypto systems - RSA algorithm - security of RSA - key management – Diffie-Hellman key exchange algorithm - introductory idea of Elliptic curve cryptography – Elgamel encryption - Message Authentication and Hash Function: Authentication requirements - authentication functions - message authentication code - hash functions - birthday attacks – security of hash functions and MACS	
<b>Unit 4: Integrity checks and Authentication algorithms</b>	<b>10 Hours</b>
MD5 message digest algorithm - Secure hash algorithm (SHA) Digital Signatures: Digital Signatures - authentication protocols - digital signature standards (DSS) - proof of digital signature algorithm - Authentication Applications: Kerberos and X.509 - directory authentication service - electronic mail security-pretty good privacy (PGP) - S/MIME.	
<b>Course Outcomes(COs):</b>	
<p><b>CO1:</b> Understand security of the data over the network.</p> <p><b>CO2:</b> Do research in the emerging areas of cryptography and network security.</p> <p><b>CO3:</b> Implement various networking protocols.</p> <p><b>CO4:</b> Protect any network from the threats in the world.</p>	

**Text Books:**

1. William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
2. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", Pearson.
3. W.Mao, "Modern Cryptography–Theory and Practice", Pearson Education.
4. Charles P.P fleeger, Shari Lawrence Pfleeger–Security in computing– Prentice Hall of India.

<b>Relational Database Management System using Oracle</b>	
<b>BVNSD 5.5B</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
<p>This introductory application-oriented course covers the relational database systems RDBMS - the predominant system for business, scientific and engineering applications at present. It includes Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL and PL/SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.</p>	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To understand basic concepts of Relational Database Management System.</li> <li>2. To Demonstrate the use of functional dependencies and normalization in Database Design.</li> <li>3. To Describe the basics of SQL and PL/SQL and construct queries using SQL.</li> <li>4. To Emphasize the importance of normalization in databases.</li> <li>5. To Demonstrate the basic concepts of transaction processing and concurrency control.</li> </ol>	
<b>Unit 1:</b>	<b>10 Hours</b>
An overview of Relational database management system, Advantages of RDBMS, DBMS vs. RDBMS, Relational Database System Architecture, Codd Rules.	
<b>Unit 2:</b>	<b>10 Hours</b>
Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	
<b>Unit 3:</b>	<b>10 Hours</b>
PL/SQL: Variables, Data types, composite data types, Array, Flow control, PL Block structure, function, procedures, parameter types, Exception Handling, Cursor & their types: implicit & explicit, Packages, Creating & Managing Triggers, Locking, Managing Subprograms, Row Level/ Table level Locking, BLOB, CLOB etc, Records, Execute, Cursor.	
<b>Unit 4:</b>	<b>10 Hours</b>
Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log-based recovery, checkpoints, deadlock handling, Concurrency control, locking Techniques for concurrency control	
<b>Course Outcomes(COs):</b>	
<p><b>CO1:</b> Implement basic concepts of Database Systems in Database design  <b>CO2:</b> Apply SQL queries to interact with Database  <b>CO3:</b> Design a Database using normalization.  <b>CO4:</b> Apply normalization on database design to eliminate anomalies  <b>CO5:</b> Analyze database transactions and can control them by applying ACID properties.</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. An Introduction To Database System: Date C. J. (AddisionWesley)</li> <li>2. Database Concepts: Korth, Silbertz, Sudarshan (TataMcgraw-Hill)</li> <li>3. Fundamentals Of Database Systems: Elmasri, Navathe ( PearsonEducation)</li> <li>4. Teach Yourself SQL/PL SQL Using Oracle: Ivan Bayross (BPBPub)</li> <li>5. An introduction to Database Systems: Bipin Desai (GalgotiaPublication)</li> </ol>	

<b>Artificial Intelligence</b>	
<b>BVNSD 6.1</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, and speech recognition and machine vision.	
<b>Course Objectives:</b>	
This course introduces a variety of concepts in the field of artificial intelligence. It describes a variety of models such as search, logic, Bayes, which can be used to model a new problem.	
<b>Unit 1:</b>	<b>10 Hours</b>
Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.	
<b>Unit 2:</b>	<b>10 Hours</b>
Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning. Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.	
<b>Unit 3:</b>	<b>10 Hours</b>
Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning	
<b>Unit 4:</b>	<b>10 Hours</b>
Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand the basic of Artificial Intelligence.	
<b>CO2:</b> Implement the searching techniques of AI and Knowledge Representation & Reasoning.	
<b>CO3:</b> Analyse the Machine Learning and techniques.	
<b>CO4:</b> Analyse the Pattern Recognition and Classification Techniques.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education</li> <li>2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill</li> <li>3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education</li> <li>4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,</li> </ol>	

<b>Internet of Things</b>	
<b>BVNSD 6.2</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
<p><b>Internet of Things (IoT)</b> is a network of physical objects or people called "things" that are embedded with software, electronics, network, and sensors that allows these objects to collect and exchange data. The goal of IoT is to extend to internet connectivity from standard devices like computer, mobile, tablet to relatively dumb devices like a toaster.</p>	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. This course focuses on the latest microcontrollers with application development, product design and prototyping.</li> <li>2. To understand the application areas of IOT</li> <li>3. To realize the revolution of Internet in Mobile Devices, Cloud &amp; Sensor Networks</li> <li>4. To understand building blocks of Internet of Things and characteristics.</li> <li>5. To develop project on IoT using sensors, motors and microcontroller.</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
<p><b>Introduction to IOT:</b> Understanding IoT fundamentals, IoT Architecture and protocols, Various Platforms for IoT, Real time Examples of IoT, Overview of IoT components and IoT Communication Technologies, Challenges in IoT</p> <p><b>Arduino Simulation Environment:</b> Arduino Uno Architecture, Setup the IDE, Writing Arduino Software, Arduino Libraries, Basics of Embedded C programming for Arduino, Interfacing LED, push button and buzzer with Arduino, Interfacing Arduino with LCD</p>	
<b>Unit 2:</b>	<b>7 Hours</b>
<p><b>Sensor, Actuators and Motors with Arduino:</b> Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Infrared, Ultrasonic, Flame, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino, Relay module, Interfacing of Relay Switch, Servo Motor with Arduino, Motor Driver with DC motor, Working of Stepper Motor.</p>	
<b>Unit 3:</b>	<b>7 Hours</b>
<p><b>Basic Networking with ESP8266 Wi-Fi module:</b> Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library; Web server- introduction, installation, configuration; Posting sensor(s) data to web server</p> <p><b>IoT Protocols:</b> M2M vs. IOT, Communication Protocols</p>	
<b>Unit 4:</b>	<b>7 Hours</b>
<p><b>Cloud Platforms for IOT:</b> Virtualization concepts and Cloud Architecture; Cloud computing, benefits, Cloud services -- SaaS, PaaS, IaaS; Cloud providers &amp; offerings, Study of IOT Cloud platforms, ThingSpeak API and MQTT, Interfacing ESP8266 with Web services</p>	
<b>Project: (any one)</b>	<b>12 Hours</b>
<p><b>1. Home automation System (Wi-Fi enabled):</b> Use LCD, buzzer, LED, Relay and any 5 sensors given below.</p> <ol style="list-style-type: none"> <li>i. Temperature Sensor</li> <li>ii. Humidity Sensor</li> <li>iii. Motion Sensor</li> </ol>	

- iv. Gas Sensor
- v. Ultrasonic Sensor
- vi. Infrared Sensor
- vii. Vibration Sensor
- viii. Flame Sensor
- ix. Sound Sensor

**2. Obstacle Avoidance Robotic Vehicle:** Use Arduino, Infrared Sensor and Ultrasonic Sensor.

**3. Wi-Fi Enabled Car Controlled by Smartphone:** use NodeMCU or Arduino with Wi-Fi module.

**Course Outcomes(COs):**

**CO1:** Understand the Components that form part of IoT Architecture.

**CO2:** Determine the most appropriate IoT Devices and Sensors based on Case Studies.

**CO3:** Setup the connections between the Devices and Sensors.

**CO4:** Evaluate the appropriate protocol for communication between IoT.

**CO5:** Analyze the communication protocols for IoT.

**CO6:** Design some IOT based project.

**Text Books:**

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743)
2. Srinivasa K G, "Internet of Things", CENGAGE Learning India, 2017
3. Vijay Madiseti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1 stEdition, VPT, 2014. (ISBN: 978-8173719547)

<b>Mobile Application Development using Android</b>	
<b>BVNSD 6.3</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
<p>This course is concerned with the development of mobile applications. Android will be used as a basis for teaching programming techniques and design patterns related to the development of standalone applications and mobile portals to enterprise and M-commerce systems. Emphasis is placed on the processes, tools and frameworks required to develop applications for current and emerging mobile computing devices. Students will work at all stages of the software development life-cycle from inception through to implementation and testing. In doing so, students will be required to consider the impact of user characteristics, device capabilities, networking infrastructure and deployment environment, in order to develop software capable of meeting the requirements of stakeholders.</p>	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To facilitate students to understand android SDK</li> <li>2. To help students to gain a basic understanding of Android application development</li> <li>3. To inculcate working knowledge of Android Studio development tool</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
Introduction to Eclipse, IDEs and ADT plug-in; Using the Emulator; Android Stack; Different Android Versions; Installing Android SDK and Updating SDK Components; Android vs. Other Mobile Platforms.	
<b>Unit 2:</b>	<b>7 Hours</b>
Application Development Life Cycle, Application Components, Activity life cycle, Manifest File, Layout XML Code, Java based layout vs. XML based layout.	
<b>Unit 3:</b>	<b>7 Hours</b>
Using Different Layouts – Linear Layout and Table Layout etc., Drawable Resources, Resolution and Density Independence, Working with Common Widgets, Working with ListView and Adapters, Creating and using Option Menu, Working with Preferences, Working with Dialogs and Toasts, Working with Graphics and Animation. Introducing Intents: Intents, Intent filters, invoking activities by class name and URI, working with Tabs and Fragments.	
<b>Unit 4:</b>	<b>7 Hours</b>
Using File System, Introducing SQLite on Android, Database Connectivity, Cursors and Content Values, Using ContentProvider to Share Data, Using Location based Services, Telephony and SMS services, Bluetooth, Network and Wi-Fi, Multimedia and Camera, Accessing Internet and Web Services from Android App.	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Develop an application that uses GUI components, Font and Colors.</li> <li>2. Develop an application that uses Layout Managers and event listeners.</li> <li>3. Develop a native calculator application.</li> <li>4. Write an application that draws basic graphical primitives on the screen.</li> <li>5. Develop an application that makes use of database.</li> <li>6. Develop an application that makes use of RSS Feed.</li> <li>7. Implement an application that implements multi-threading.</li> <li>8. Develop a native application that uses GPS location information.</li> <li>9. Implement an application that writes data to the SD card.</li> <li>10. Implement an application that creates an alert upon receiving a message.</li> <li>11. Write a mobile application that creates alarm clock.</li> </ol>	

**Course Outcomes(COs):**

**CO1:** Understand various concepts of mobile programming that make it unique from programming for other platforms,

**CO2:** Visualize mobile applications on their design pros and cons,

**CO3:** Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,

**CO4:** Program mobile applications for the Android operating system that use basic and advanced phone features, and

**CO5:** Deploy applications to the Android marketplace for distribution.

**Text Books:**

1. Android Developer Tools Essentials: MikeWolfson(Oreilly)
2. Learn Android app Development: Wallace Jackson(Apress)
3. Head First Android Development: Jonathan Simon(Oreilly)
4. SamsTeach Yourself Android Development: Darcey&Conder(SAMS)

<b>Digital Marketing</b>	
<b>BVNSD 6.4</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
In simple terms, digital marketing is the promotion of products or brands via one or more forms of electronic media. Digital marketing is often referred to as online marketing, internet marketing or web marketing. This course aims to provide focused and applied knowledge of digital marketing to the students.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To help students understand digital and social media marketing practices.</li> <li>2. To provide understanding of the concept of social media platforms</li> <li>3. To impart learning on various digital channels and how to acquire and engage consumers online.</li> <li>4. To provide insights on building organizational competency by way of digital marketing practices and cost considerations.</li> <li>5. To develop understanding of the latest digital practices for marketing and promotion</li> </ol>	
<b>Unit 1:</b>	<b>11 Hours</b>
Introduction to Digital Marketing & Website and Blog Development: Introduction to Digital Marketing and its Significance; Traditional Marketing Vs Digital Marketing; Digital Marketing Process; The contemporary digital revolution, digital transformation framework. Types of websites, Keywords, Understanding Domain and Webhosting, Building Website/Blog using Word Press	
<b>Unit 2:</b>	<b>9 Hours</b>
SEO& Email-Marketing: Introduction to SEO; SEO Keyword Planner Tools; On Page SEO Techniques: Indexing and Key Word Placement, Content Planning & Optimization, Display Advertising, Various SEO Plug-in, Off –Page SEO Techniques; Email Marketing- Introduction and Significance	
<b>Unit 3:</b>	<b>10 Hours</b>
SEM & Social Media Marketing: Introduction to SEM, Mobile Marketing, Video Marketing on YouTube. Introduction to Social Media Marketing: Facebook, Instagram, Linked-in, Twitter, Google G Suit and online marketing campaigns on these Social Media platforms.	
<b>Unit 4:</b>	<b>10 Hours</b>
Using Marketing Strategies & Analytics Tools: Understanding Digital marketing Strategies, Using Marketing analytics tools to segment, target, position; Online PR and reputation management, Digital Marketing Strategies and its ROI. Using Google Analytics and other social media analytics tools. Using Apps and Gamification	
<b>Course Outcomes(COs):</b>	
<p><b>CO1:</b> Understand the concept of Digital Marketing &amp; E-commerce in today’s scenario.</p> <p><b>CO2:</b> Create and maintain a good website and blog posts.</p> <p><b>CO3:</b> Understand and apply SEO and Email Marketing in today’s modern world</p> <p><b>CO4:</b> Apply Social Media Marketing techniques via various platforms</p> <p><b>CO5:</b> Implement various Analytics tools of online marketing</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).</li> <li>2. Seema Gupta; Digital Marketing, McGraw Hill Education; First edition (November 2017)</li> <li>3. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digitalgeneration; Kogan Page (3rd Edition, 2014).</li> <li>4. Tracy L. Tuten &amp; Michael R. Solomon : Social Media Marketing (Sage Publication)</li> </ol>	

<b>Cryptography Lab (Practical Paper)</b>	
<b>BVNSD 6.5A</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
In Cryptography Lab course learners will understand and implement various cryptographic algorithms using C/Java Programming language.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To understand various cryptographic algorithms.</li> <li>2. To describe public-key cryptosystem.</li> <li>3. To understand Intrusions and intrusion detection</li> <li>4. To discuss the fundamental ideas of public-key cryptography.</li> </ol>	
<b>Unit 1:</b>	<b>10 Hours</b>
Encryption and Decryption Algorithms, Caesar cipher, Substitution cipher, Hill Cipher.	
<b>Unit 2:</b>	<b>10 Hours</b>
DES algorithm, Blowfish algorithm, Rijndael algorithm, RC4 Algorithm	
<b>Unit 3:</b>	<b>10 Hours</b>
RSA Algorithm, Diffie -Hellman key exchange Algorithm	
<b>Unit 4:</b>	<b>10 Hours</b>
Message digest, SHA-1 and MD5 Algorithm	
<b>Practical:</b>	
<ol style="list-style-type: none"> <li>1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and display the result.</li> <li>2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.</li> <li>3. Write a Java program to perform encryption and decryption using the following algorithms <ol style="list-style-type: none"> <li>a. Caesar cipher</li> <li>b. Substitution cipher</li> <li>c. Hill Cipher</li> </ol> </li> <li>4. Write a C/JAVA program to implement the DES algorithm.</li> <li>5. Write a C/JAVA program to implement the Blowfish algorithm.</li> <li>6. Write a C/JAVA program to implement the Rijndael algorithm.</li> <li>7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.</li> <li>8. Write a Java program to implement RSA algorithm.</li> <li>9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.</li> <li>10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.</li> <li>11. Calculate the message digest of a text using the MD5 algorithm in JAVA.</li> </ol>	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand basic cryptographic algorithms, message and web authentication and security issues.	
<b>CO2:</b> Understand information system requirements for both of them such as client and server.	
<b>CO3:</b> Apply the current legal issues towards information security.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Cryptography and Network Security: AtulKahate (McGrawHill)</li> <li>2. Cryptography and Network Security: Principles and Practice: Stallings (PrenticeHall)</li> <li>3. Cryptography and Network Security: Behrouz A Forouzan (McGrawHill)</li> <li>4. Computer Networks: Andrew Tanenbaum (PearsonPublications)</li> </ol>	

<b>RDBMS Lab (Practical Paper)</b>	
<b>BVNSD 6.5B</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
RDBMS lab is designed to provide a strong formal foundation in database concepts, technology and practice to the participants to groom them into well-informed database application developers.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To present SQL and procedural interfaces to SQL comprehensively</li> <li>2. To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design.</li> <li>3. To give a good formal foundation on the relational model of data.</li> </ol>	
<b>Note:</b>	
<b>Unit 1:</b>	<b>10 Hours</b>
Introduction to SQL, Data retrieval techniques, working with DDL commands, working with DML commands, integrity constraints, built in functions, Data aggregation, importance of join, set operators and pseudo columns, subqueries, database transaction and security, design of schema objects.	
<b>Unit 2:</b>	<b>10 Hours</b>
Introduction to PL/SQL: Datatypes in PL/SQL, program structure of PL/SQL, using conditional statements and loops., creating and using cursors, understanding exception handling.	
<b>Unit 3: Stored Procedure and Functions</b>	<b>10 Hours</b>
Creating procedures in PL/SQL, Working with procedure parameters, IN parameter, OUT parameter INOUT parameter, creating procedures with cursor, creating and using functions,	
<b>Unit 4: Packages, Triggers and Collections</b>	<b>10 Hours</b>
Creating package, package specification, package body, creating triggers, using DML trigger and DDL trigger, Collections in PL/SQL.	
<b>Practical:</b>	
<ol style="list-style-type: none"> <li>I. Simple queries: selection, projection, sorting on a simple table <ol style="list-style-type: none"> <li>i. Small-large number of attributes</li> <li>ii. Distinct output values</li> <li>iii. Renaming attributes</li> <li>iv. Computed attributes</li> <li>v. Simple-complex conditions (AND, OR, NOT)</li> <li>vi. Partial Matching operators (LIKE, %, _, *, ?)</li> <li>vii. ASC-DESC ordering combinations</li> <li>viii. Checking for Nulls</li> </ol> </li> <li>II. Multi-table queries(JOIN OPERATIONS) <ol style="list-style-type: none"> <li>i. Simple joins (no INNER JOIN)</li> <li>ii. Aliasing tables – Full/Partial name qualification</li> <li>iii. Inner-joins (two and more (different) tables)</li> <li>iv. Inner-recursive-joins (joining to itself)</li> <li>v. Outer-joins (restrictions as part of the WHERE and ON clauses)</li> <li>vi. Using where &amp; having clauses</li> </ol> </li> <li>III. Nested queries <ol style="list-style-type: none"> <li>i. In, Not In</li> <li>ii. Exists, Not Exists</li> <li>iii. Dynamic relations (as part of SELECT, FROM, and WHERE clauses)</li> </ol> </li> </ol>	

- IV. Set Oriented Operations
  - i. Union
  - ii. Difference
  - iii. Intersection
  - iv. Division
- V. DDL & TCL Commands.
  - i. Creating objects: tables, views, users, sequences, Collections etc.
  - ii. Privilege management through the Grant/Revoke commands
  - iii. Transaction processing using Commit/Rollback
  - iv. Save points.
- VI. PL/SQL Programming I
  - i. Programs using named and unnamed blocks
  - ii. Programs using Cursors, Cursor loops and records
- VII. PL/SQL Programming II
  - i. Creating stored procedures, functions and packages
  - ii. Error handling and Exception
  - iii. Triggers and auditing triggers
- VIII. User Defined Types
  - i. Creating Objects
  - ii. Creating User Defined Operators

**Course Outcomes(COs):**

**CO1:**Understand, appreciate and effectively explain the underlying concepts of database technologies.

**CO2:**Design and implement a database schema for a given problem-domain.

**CO3:**Normalize a database.

**CO4:**Populate and query a database using SQL DML/DDDL commands.

**CO5:**Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.

**CO6:** Implement programming PL/SQL including stored procedures, stored functions, cursors, packages.

**Text Books:**

1. An Introduction To Database System: Date C. J. (AddisionWesley)
2. Database Concepts: Korth, Silbertz, Sudarshan (TataMcgraw-Hill)
3. Fundamentals Of Database Systems: Elmasri, Navathe ( PearsonEducation)
4. Teach Yourself SQL/PL SQL Using Oracle: Ivan Bayross (BPBPub)
5. An introduction to Database Systems: Bipin Desai (GalgotiaPublication)

<b>Advanced Java Programming</b>	
<b>BVNSD 7.1</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
It is a part of Java programming language. It is an advanced technology or advance version of Java specially designed to develop web-based, network-centric or enterprise applications. It includes the concepts like Servlet, JSP, JDBC, EJB and RMI. Most of the applications developed using advance Java uses tow-tier architecture i.e. Client and Server. All the applications that run on Server can be considered as advance Java applications.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. Will learn to design and develop Web applications</li> <li>2. To design handle database using server side language.</li> <li>3. To understand client and server application.</li> <li>4. To develop website using JSP, Servlet and JDBC.</li> </ol>	
<b>Note: 3 Credits for Theory and 1Credit for Practical</b>	
<b>Unit 1:</b>	<b>7 Hours</b>
<b>Servlets:</b> Servlet Structure, Servlet packaging, HTML building utilities, Lifecycle, Single Thread model interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking.	
<b>Unit 2:</b>	<b>7 Hours</b>
<b>JSP:</b> Overview of JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax, Invoking java code with JSP scripting elements, Invoking java code from JSP, using jsp expressions, comparing servlets and jsp, writing scriptlets; Controlling the Structure of generated servlets: the JSP page directive, import attribute, session attribute, isEignore attribute, buffer and auto flush attributes, info attribute ,errorPage and is errorPage attributes, is Thread safe Attribute, extends attribute, language attribute, using java beans components in JSP documents	
<b>Unit 3:</b>	<b>7 Hours</b>
<b>JDBC:</b> Talking to Database, Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action Result sets, Batch updates; Creating, Inserting, Updating and Deleting from Database using JSP	
<b>Unit 4:</b>	<b>7 Hours</b>
Introduction to EJB: The Problem domain, Breakup responsibilities, Code Smart not hard, the Enterprise java bean specification; Components Types; Server Side Component Types, Session Beans, Message Driven Beans, Entity Beans, RMI (Remote Method Invocation) Introduction, Simple Client-Server Application using RMI.	
<b>Practical:</b>	<b>12 Hours</b>
<ol style="list-style-type: none"> <li>1. Design login page with session.</li> <li>2. Design Registration page using JDBC.</li> <li>3. Search a particular record from database and display on webpage.</li> <li>4. Show all record of all database table in webpage.</li> <li>5. Delete a particular record from Database.</li> <li>6. Update a particular record in Database.</li> <li>7. Design Simple Blogging or News Portal Website.</li> </ol>	

**Course Outcomes(COs):**

**CO1:** Understand graphical User Interface (GUI) networking, and database manipulation.

**CO2:** Apply advanced technology in Java such as Internationalization, and Remote method Invocation

**CO3:** Understand how to work with JavaBeans.

**CO4:** Apply web application using Java Servlet and Java Server Pages technology.

**Text Books:**

1. Java 6 Programming, Black Book, Dreamtech

2. Java Server Programming, Java EE6 (J2EE 1.6), Black Book, Dreamtech

3. Advanced Java Technology, By M.T. Savaliya, Dreamtech

<b>Machine Learning</b>	
<b>BVNSD 7.2</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.	
<b>Course Objectives:</b>	
This course covers the different machine learning paradigms and some of the more popular algorithms and architectures used in each of these paradigms.	
<b>Unit 1:</b>	<b>10 Hours</b>
Learning, Types of Learning, Well defined learning problems, Designing a Learning System, History of ML, Introduction of Machine Learning Approaches – (Artificial Neural Network, Clustering, Reinforcement Learning, Decision Tree Learning, Bayesian networks, Support Vector Machine, Genetic Algorithm), Issues in Machine Learning and Data Science Vs Machine Learning;	
<b>Unit 2:</b>	<b>10 Hours</b>
<b>Regression:</b> Linear Regression and Logistic Regression Bayesian Learning - Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm. Support Vector Machine: Introduction, Types of support vector kernel – (Linear kernel, polynomial kernel, and Gaussian kernel), Hyperplane – (Decision surface), Properties of SVM, and Issues in SVM.	
<b>Unit 3:</b>	<b>10 Hours</b>
<b>Decision Tree Learning</b> - Decision tree learning algorithm, Inductive bias, Inductive inference with decision trees, Entropy and information theory, Information gain, ID-3 Algorithm, Issues in Decision tree learning. Instance-Based Learning – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.	
<b>Unit 4:</b>	<b>10 Hours</b>
<b>Reinforcement Learning</b> – Introduction to Reinforcement Learning , Learning Task, Example of Reinforcement Learning in Practice, Learning Models for Reinforcement – (Markov Decision process , Q Learning - Q Learning function, Q Learning Algorithm ), Application of Reinforcement Learning, Introduction to Deep Q Learning. Genetic Algorithms: Introduction, Components, GA cycle of reproduction, Crossover, Mutation, Genetic Programming, Models of Evolution and Learning, Applications.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand the Machine Learning and Approaches.	
<b>CO2:</b> Understand the Regression and Support Vector Machine.	
<b>CO3:</b> Understand the Decision Tree Learning and Instance-Based Learning.	
<b>CO4:</b> Apply the Reinforcement Learning and Genetic Algorithms	
<b>Text Books:</b>	
1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.	
2. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.	
3. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.	
4. Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.	

<b>Data Science</b>	
<b>BVNSD 7.3</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
This course takes you one step closer to becoming a data scientist by offering a subset of the topics covered in this course of Data Science. It will cover the core concepts and technologies like preprocessing of data, statistical inference and exploratory data analysis. It will also cover the introductory concepts of R language.	
<b>Course Objectives:</b>	
The Data Science course enables you to gain knowledge of the entire life cycle of Data Science, analyze and visualize different data sets, learning of tools and technologies needed for data science.	
<b>Unit 1:</b>	<b>10 Hours</b>
Data Science , Fundamentals of Data Science, Tools of Data Science ,Fundamentals of Artificial Intelligence, Introduction to Machine Learning, Introduction to Big Data and Hadoop, need and applications of Data Science,	
<b>Unit 2:</b>	<b>10 Hours</b>
Data Pre-processing: Pre-processing Techniques- Mean Removal, Scaling, Normalization, Binarization, One Hot Encoding, Label encoding, Data Analyses: Loading and summarizing the dataset, Data Visualization:Univariate Plots, Multivariate Plots, Training Data, Test Data, Performance Measures. Introduction to R and python	
<b>Unit 3:</b>	<b>10 Hours</b>
Terminologies of Statistics, Populations and samples, Types of Statistical modelling, Types of probability distributions. Parametric and Non-Parametric Methods, Distance Metrics , Measures of Centers - Measures of Spread	
<b>Unit 4:</b>	<b>10 Hours</b>
Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand the basics of Data Science.	
<b>CO2:</b> Implement data analysis using R.	
<b>CO3:</b> Understand statistical foundation for data science.	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. E-books/e-tools/relevant software to be used as recommended by AICTE/UGC</li> <li>2. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi</li> <li>3. Hadley Wickham , Garrett Grolemond (2017) R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 1st Edition. O'Reilly Publication</li> <li>4. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I &amp; II, 8th Edn. The World Press, Kolkata</li> </ol>	

<b>Cloud Computing</b>	
<b>BVNSD 7.4A</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet. Large clouds, predominant today, often have functions distributed over multiple locations from central servers. If the connection to the user is relatively close, it may be designated an edge server.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To identify the technical foundations of cloud systems architectures</li> <li>2. To learn the problems and solutions to cloud application problems</li> <li>3. To learn principles of best practice in cloud application design and management.</li> <li>4. To identify and define technical challenges for cloud applications and assess their importance.</li> </ol>	
<b>Unit 1:</b>	<b>10 Hours</b>
<b>Introduction:</b> History of Centralized and Distributed Computing – Overview of Distributed Computing, Cluster computing, Grid computing. Technologies for Network-based systems- System models for Distributed and cloud computing- Software environments for distributed systems and clouds.	
<b>Unit 2:</b>	<b>10 Hours</b>
<b>Virtualization:</b> Introduction to Cloud Computing- Cloud issues and challenges – Properties – Characteristics – Service models, Deployment models. Cloud resources: Network and API – Virtual and Physical computational resources – Data-storage. Virtualization concepts – Types of Virtualization	
<b>Unit 3:</b>	<b>10 Hours</b>
<b>Service Models:</b> Infrastructure as a Service (IaaS) – Resource Virtualization: Server, Storage, Network – Case studies. Platform as a Service (PaaS) – Cloud platform & Management: Computation, Storage – Case studies. Software as a Service (SaaS) – Web services – Web 2.0 – Web OS – Case studies – Anything as a service (XaaS) – Microservices.	
<b>Unit 4:</b>	<b>10 Hours</b>
<b>Cloud Access:</b> authentication, authorization and accounting – Cloud Provenance and meta-data – Cloud Reliability and fault-tolerance – Cloud Security, privacy, policy and compliance- Cloud federation, interoperability and standards.	
<b>Course Outcomes(COs):</b>	
<p><b>CO1:</b> Understand the fundamental principles of distributed computing.</p> <p><b>CO2:</b> Understand how the distributed computing environments known as Grids can be built from lower level services.</p> <p><b>CO3:</b> Analyse the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing.</p> <p><b>CO4:</b> Analyze the performance of Cloud Computing.</p> <p><b>CO5:</b> Apply the concept of Cloud Security.</p> <p><b>CO6:</b> Understand the Concept of Cloud Infrastructure Model</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. “Cloud Computing: Concepts, Technology &amp; Architecture” by Thomas Erl</li> <li>2. “The Little Book of Cloud Computing” by Lars Nielsen</li> <li>3. “Cloud Computing Explained” by John Rhoton</li> <li>4. “Cloud Computing (The MIT Press Essential Knowledge series)” by Nayan B Ruparelia</li> </ol>	

<b>Linux Server Administration</b>	
<b>BVNSD 7.4B</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Linux is a powerful operating system. It is portable and secure. Therefore used in servers. This syllabus will develop the skills in the student of Linux administration. This course covers the different management aspects of Linux operating system. It covers installing and configuring DNS server and Apache Web Server.	
<b>Course Objectives:</b>	
To impart knowledge and skills on various aspects of Linux operating system (OS) basics and Linux OS based server configuration, management and administration.	
<b>Unit 1:</b>	<b>10 Hours</b>
Management of File using Command Line: Introduction to BASH, Command-line shortcuts, File Types, Ownership and Permissions, File management and manipulation, Moving users & its directories, Miscellaneous Tools, Editors	
<b>Managing Users and Groups:</b> Creating and managing user/s and group commands, User management Tools, Users and Access Permissions, Updating users and group attributes.	
<b>Unit 2:</b>	<b>10 Hours</b>
<b>Booting and Shutting down:</b> Boot Loaders, The init process, rc scripts, enabling and disabling services, Booting in recovery mode	
<b>File Systems:</b> Makeup of file systems, managing file systems, adding a new disk, Volume Management, Creating file systems.	
<b>Unit 3:</b>	<b>10 Hours</b>
<b>Core System Services:</b> The init Daemon, xinetd and inetd, The Logging Daemon, Configuring Logging Daemon, The CRON program	
<b>Compiling the Linux Kernel:</b> Kernel concepts, Finding Kernel Source Code, Building the Kernel, Patching the Kernel.	
<b>Unit 4:</b>	<b>10 Hours</b>
<b>DNS:</b> Installing DNS Server, Configuring DNS server, DNS records types, setting up BIND database file, The DNS Toolbox, Configuring DNS clients.	
<b>Apache Web Server:</b> HTTP Protocol, Installing Apache HTTP Server, Starting up and shutting down apache, Testing Apache Installation, Configuring Apache, Troubleshooting Apache.	
<b>Course Outcomes(COs):</b>	
<b>CO1:</b> Understand concepts of Linux OS basics	
<b>CO2:</b> Apply various Linux based administration tasks	
<b>CO3:</b> Implement Linux OS based server configuration, management and administration	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Unleashed Linux by Tech Media Publishers, New Delhi</li> <li>2. Steve Shah and Wale Soyinka “ Linux Administration: A Begineer’s Guide”, 4th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, ISBN: 978-0072262599</li> <li>3. Susan Lauber, Philip Sweany, Rudolf Kastl and George Hacker, “REDHAT System Administration-1 Student Work book”, REDHAT Inc. 2014</li> </ol>	

<b>Theory of Computation</b>	
<b>BVNSD 7.5A</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Automata theory is the study of abstract machines and automata, as well as the computational problems that can be solved using them. It is a theory in theoretical computer science. Automata theory is closely related to formal language theory.	
<b>Course Objectives:</b>	
The objective of this course is to explore the theoretical foundations of computer science from the perspective of formal languages and classify machines by their power to recognize languages.	
<b>Note:</b>	
<b>Unit 1:</b>	<b>10 Hours</b>
Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem	
<b>Unit 2:</b>	<b>10 Hours</b>
Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.	
<b>Unit 3:</b>	<b>10 Hours</b>
Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs. Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA	
<b>Unit 4:</b>	<b>10 Hours</b>
Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undesirability, Undividable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory	

**Course Outcomes(COs):**

**CO1:** Understand the Automata and Grammars.

**CO2:** Understand the Regular Languages, Regular expression Applications and Limitation of Finite Automata.

**CO3:** Analyse the Context free grammar, Context Free Languages Ambiguity in Grammar and Push down automata.

**CO4:** Understand the Turing machines, Recursive and recursively enumerable languages.

**Text Books:**

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education .
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y.N.Singh "Mathematical Foundation of Computer Science", New Age International.
5. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI Learning Private Limited, Delhi India.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.

<b>Compiler Design</b>	
<b>BVNSD 7.5B</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
<p>Compiler design principles provide an in-depth view of translation and optimization process. Compiler design covers basic translation mechanism and error detection &amp; recovery. It includes lexical, syntax, and semantic analysis as front end, and code generation and optimization as back-end.</p>	
<b>Course Objectives:</b>	
<p>The objective the compiler Design is to understand relations between computer architecture and how its understanding is useful in design of a compiler and construct efficient algorithms for compilers.</p>	
<b>Unit 1:</b>	<b>10 Hours</b>
<p>Introduction to Compiler: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.</p>	
<b>Unit 2:</b>	<b>10 Hours</b>
<p><b>Basic Parsing Techniques:</b> Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR (0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, and implementation of LR parsing tables.</p>	
<b>Unit 3:</b>	<b>10 Hours</b>
<p><b>Syntax-directed Translation:</b> Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees &amp; syntax trees, three address code, quadruple &amp; triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.</p>	
<b>Unit 4:</b>	<b>10 Hours</b>
<p><b>Symbol Tables:</b> Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection &amp; Recovery: Lexical Phase errors, syntactic phase errors semantic errors.</p> <p>Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.</p>	

**Course Outcomes(COs):**

**CO1:** Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers.

**CO2:** Understand the parser and its types i.e. Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table.

**CO3:** Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.

**CO4:** Understand about run time data structure like symbol table organization and different techniques used in that.

**Text Books:**

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. K. Muneeswaran, Compiler Design, First Edition, Oxford University Press
3. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, McGraw-Hill, 2003.
4. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
5. V Raghvan, "Principles of Compiler Design", McGraw-Hill,
6. Kenneth Loudon, "Compiler Construction", Cengage Learning.
7. Charles Fischer and Ricard LeBlanc, "Crafting a Compiler with C", Pearson Education

<b>Research Methodology</b>	
<b>BVNSD 7.6</b>	
<b>Credits:4</b>	<b>40 Hours</b>
<b>Introduction:</b>	
Research methodology course is designed to teach students about a variety of research topics. The course's goal is to acquaint the students with an adequate research design and a variety of research procedures in order to enable them to conduct their own research.	
<b>Course Objectives:</b>	
<ol style="list-style-type: none"> <li>1. To develop understanding of the basic framework of research process.</li> <li>2. To develop an understanding of various research designs and techniques.</li> <li>3. To identify various sources of information for literature review and data collection</li> <li>4. To impart knowledge for enabling students to develop data analytics skills and meaningful interpretation to the data sets so as to solve the Research problem.</li> </ol>	
<b>Unit 1:</b>	<b>8 Hours</b>
Introduction to Research Methodology: Definition, Nature, Scope and Significance of Research, Types of Research, Characteristics of a goods research, Ethical issues in conducting research Research Process: Defining Research Problem, Title Formulation; Formation of Hypothesis, Research Design – Exploratory, Descriptive and Experimental Research Designs	
<b>Unit 2:</b>	<b>12 Hours</b>
Methods and Techniques of data collection: Introduction, Sources of Data, Primary Data Collection Techniques, Secondary Data Collection Techniques, Secondary Data – Advantages and Disadvantages, Qualitative vs. Quantitative Data Measurement & Scaling: Primary scales of Measurement-Nominal, Ordinal, and Interval & Ratio. Scaling techniques paired comparison, rank order, constant sum, semantic differential, itemized ratings, Likert Scale; Questionnaire-form & design.	
<b>Unit 3:</b>	<b>9 Hours</b>
Sampling concepts- Sample vs Census, Sampling vs Non Sampling error; Sampling Design- Probability and Non Probability Sampling design; Determination of Sample size- Sample size for estimating population mean, Determination of sample size for estimating the population proportion.	
<b>Unit 4:</b>	<b>11 Hours</b>
Data Processing & Analysis: Data Editing, Coding, Classification and Tabulation of Data. Selection of Appropriate Statistical Techniques - Univariate and Bivariate Analysis of Data, Graphical Representation of Data, Testing of Hypothesis, One way and Two way ANOVA, Chi Square Test, Introduction and concept of Non Parametric Tests Report writing & presentation: Writing & formatting of Reports, Formulation rules for writing the report: Guidelines for presenting tabular data, Guidelines for visual Representations.	
<b>Course Outcomes(COs):</b>	
<p><b>CO1:</b>Develop understanding on various kinds of research, objectives of doing research, research process, research designs and sampling.</p> <p><b>CO2:</b>Understand the qualitative research techniques</p> <p><b>CO3:</b>Apply measurement &amp; scaling techniques as well as the quantitative data analysis</p> <p><b>CO4:</b>Understand data analysis-and hypothesis testing procedures</p>	

**Suggested Readings**

- Research Methodology, by C R Kothari, Vishwa Prakashan
- Business Research Methods, by William G Zikmund, Thomson.
- Research Methods, by William M C Trochim, Biztantra.
- Marketing Research, by A Parasuraman, Dhruv Grewal, Biztantra
- Methodology of Research in Social Sciences, by O R Krishnaswami, M Ranganatham, HPH. Publishing House