



M. C. E. Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to Savitribai Phule Pune University

NAAC accredited 'A' Grade

M.C.E Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Pune

(Autonomous)

Syllabus For

**Bachelor of Vocational (Data Science and
Data Analytics)**

(2021-22 Course)

(w. e. f. 2021-22)

1. Preamble:

Bachelor of Vocational Data Science and Data Analytics is a 3-year full-time undergraduate program designed to prepare graduates who can conduct data-driven investigations and visual and advanced analytics by acquiring and managing data of all types. Through this program, students will develop an in-depth understanding of data science and the techniques for analysis of quantitative and qualitative data to arrive at solutions. They will be able to identify patterns in order to predict trends from analyzing data of various sectors such as manufacturing, banking and finance, retail and healthcare.

The B.Voc. (Data Science & Data Analytics) Degree Course (2021 pattern) will be introduced in the following order:-

1. First Year B.Voc.(Data Science & Data Analytics)	2021-2022
2. Second Year B.Voc.(Data Science & Data Analytics)	2022-2023
3. Third Year B.Voc.(Data Science & Data Analytics)	2023-2024

2. Programme Objectives:

After completion of B.Voc. (Data Science and Data Analytics) Program students will be able to:

1. Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.
2. Recognize and analyze ethical issues in business related to intellectual property, data security, integrity, and privacy.
3. Apply ethical practices in everyday business activities and make well-reasoned ethical business and data management decisions.
4. Demonstrate knowledge of statistical data analysis techniques utilized in business decision making.
5. Apply principles of Data Science to the analysis of business problems.

3. Programme Outcomes:

On completion of B.Voc. (Data Science & Data Analytics) Degree, the students will be able to:

PO1: Students will develop the ability to build and assess data-based models.

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 analyze a problem. Solve the problems (programming networking database and Web design) in the Information Technology environment. Function effectively on teams to accomplish a common goal and demonstrate professional behavior.

Structure for First Year Semester-I

Course Code	Course Name	Teaching Scheme (Hours/Week)		Examination Scheme and Marks						Credits		
		TH	PR.	ISE	ESE	TW	PR	OR	Total	TH	PR	Total
21BVDSA111	Fundamental of Computers	03		40	60				100	03		03
21BVDSA112	Web Designing	03		40	60				100	03		03
21BVDSA113	Programming in C	03		40	60				100	03		03
21BVDSA114	Software Engineering	03		40	60				100	03		03
21BVDSA115	Lab Course-I : MS Excel & Web Designing		03	20			30	--	50		1.5	1.5
21BVDSA116	Lab Course-II : C Programming		03	20			30	--	50	--	1.5	1.5
21BVDSA117	On Job Training*		12	40			60	--	100		15	15
Total		12	18	240	240		120	--	600	12	18	30

*On Job Training should be carried out in any one subject per semester as per NSDC

Guide lines for following Skill Sets:

Semester I Skill Sets

1. Domestic IT helpdesk Attendant (SSC/Q0110)
2. Junior Software Developer (SSC/Q0508)
3. Domestic Biometric data operator (SSC/Q2213)
4. Web Developer (SSC/Q0503)
5. Test Engineer (SSC/Q7001)

Structure for First Year Semester-II

Course Code	Course Name	Teaching Scheme (Hours/Week)		Examination Scheme and Marks						Credits		
		TH	PR	ISE	ESE	TW	PR	OR	Total	TH	PR	Total
21BVDSA121	Data Structure using C	03		40	60				100	03		03
21BVDSA122	Database Management System	03		40	60				100	03		03
21BVDSA123	Operating Systems	03		40	60				100	03		03
21BVDSA124	Computer Networks	03		40	60				100	03		03
21BVDSA125	Lab Course-I : Data Structure using C		03	20			30	--	50		1.5	1.5
21BVDSA126	Lab Course-II: DBMS using MYSQL		03	20			30	--	50		1.5	1.5
21BVDSA127	On Job Training *		12	40			60	--	100		15	15
Total		12	18	240	240		120	--	600	12	18	30

*On Job Training should be carried out in any one subject per semester as per NSDC Guide lines for following Skill Sets:

Semester II Skill Sets

1. Engineer-Technical Support (Level 1)(SSC/Q0101)
2. Technical Writer (SSC/Q0505)
3. Junior Software Developer (SSC/Q0508)
4. Web Developer (SSC/Q0503)

Structure for Second Year Semester-III

Course Code	Course Name	Teaching Scheme (Hours/Week)		Examination Scheme and Marks						Credits		
		TH	PR	ISE	ESE	TW	PR	OR	Total	TH	PR	Total
21BVDSA231	Introduction to R Programming	03		40	60				100	03		03
21BVDSA232	Web Technology using PHP Frameworks	03		40	60				100	03		03
21BVDSA233	Applied Statistics - I	03		40	60				100	03		03
21BVDSA234	Data Mining and Data Warehousing	03		40	60				100	03		03
21BVDSA235	Lab Course-I : R Programming LAB		03	20			30	--	50		1.5	1.5
21BVDSA236	Lab Course-II : Web Technology		03	20			30	--	50	-	1.5	1.5
21BVDSA237	On Job Training*		12	40			60	--	100		15	15
Total		12	18	240	240		120	--	600	12	18	30

*On Job Training should be carried out in any one subject per semester as per NSDC Guide lines for following Skill Sets:
Semester III Skill Sets

1. UI Developer (SSC/Q0502)
2. Junior Data Associate (SSC/Q0401)
3. Web Developer (SSC/Q0503)
4. Junior Software Developer (SSC/Q0508)

Structure for Second Year Semester-IV

Course Code	Course Name	Teaching Scheme (Hours/Week)		Examination Scheme and Marks						Credits		
		TH	PR	ISE	ESE	TW	PR	OR	Total	TH	PR	Total
21BVDSA241	Programming in Python	03		40	60				100	03		03
21BVDSA242	Object Oriented Programming Using Java	03		40	60				100	03		03
21BVDSA243	Applied Statistics – II	03		40	60				100	03		03
21BVDSA244	Cloud Computing	03		40	60				100	03		03
21BVDSA245	Lab Course-I : Programming in Python		03	20			30	--	50		1.5	1.5
21BVDSA246	Lab Course-II : Java Programming		03	20			30	--	50		1.5	1.5
21BVDSA247	On Job Training*		12	40			60	--	100		15	15
Total		12	18	240	40		120	--	600	12	18	30

*On Job Training should be carried out in any one subject per semester as per NSDC Guidelines for following Skill Sets:

Semester IV Skill Sets

1. Infrastructure Engineer (SSC/Q0801)
2. Software Developer (SSC/Q6702)
3. Cloud Application Developer (SSC/Q8303)
4. Cloud Infrastructure Analyst (SSC/Q8304)

Structure for Third Year Semester-V

Course Code	Course Name	Teaching Scheme (Hours/Week)		Examination Scheme and Marks						Credits		
		TH	PR	ISE	ESE	TW	PR	OR	Total	TH	PR	Total
21BVDSA351	Big Data Analytics	03		40	60				100	03		03
21BVDSA352	Android Programming	03		40	60				100	03		03
21BVDSA353	Introduction to data Science	03		40	60				100	03		03
21BVDSA354	Data Security	03		40	60				100	03		03
21BVDSA355	Lab Course –I : Big Data Analytics using Hadoop		03	20			30	--	50		1.5	1.5
21BVDSA356	Lab Course –II: Android Programming		03	20			30	--	50	-	1.5	1.5
21BVDSA357	On Job Training*		12	40			60	--	100		15	15
Total		12	18	240	240		120	--	600	12	18	30

*On Job Training should be carried out in any one subject per semester as per NSDC Guide lines for following Skill Sets:

Semester V Skill Sets

1. Application developer - Web & Mobile (SSC/Q8403)
2. User Experience Designer (SSC/Q8404)
3. Software Engineer (SSC/Q4501)
4. AI - Applied Scientist (SSC/Q8105)
5. AI - Data Engineer (SSC/Q8106)

Structure for Third Year Semester-VI

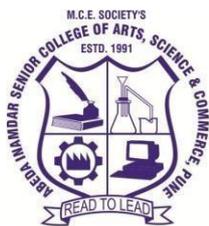
Course Code	Course Name	Teaching Scheme (Hours/Week)		Examination Scheme and Marks						Credits		
		TH	PR	ISE	ESE	TW	PR	OR	Total	TH	PR	Total
21BVDSA361	Machine Learning	03		40	60				100	03		03
21BVDSA362	Data Visualization using Power BI	03		40	60				100	03		03
21BVDSA363	Artificial Intelligence	03		40	60				100	03		03
21BVDSA364	Introduction to Soft Computing	03		40	60				100	03		03
21BVDSA365	Lab Course-I : Machine Learning		03	20			30	--	50		1.5	1.5
21BVDSA366	Lab Course-I I: Data Visualization using Power BI		03	20			30	--	50	- -	1.5	1.5
21BVDSA367	On Job Training*		12	40			60	--	100		15	15
Total		12	18	240	240		120	--	600	12	18	30

*On Job Training should be carried out in any one subject per semester as per NSDC Guide lines for following Skill Sets:

Semester VI Skill Sets

1. AI - Machine Learning Engineer (SSC/Q8113)
2. AI - Data Sciences Consultant (SSC/Q8117)
3. AI - Data Scientist (SSC/Q8104)
4. AI - Business Intelligence Analyst (SSC/Q8102)
5. AI - Visualization Specialist (SSC/Q8103)

Semester-I



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F.Y.B.Voc (DS&DA) Fundamental of Computers

2021-22 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Fundamental of Computers
Course Code	21BVDSA-111
Semester	I
No. of Credits	3(2 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr.No.	Objectives
1.	To study the basics of Computer System
2.	To learn how to configure computer devices
3.	To Learn Basic Commands of Operating system and application software
4.	To understand Open Source Software

Expected Course Specific Learning Outcomes

Sr.No.	Learning Outcome
1.	Define working of computers and peripherals, types of software and languages
2.	Troubleshoot the computer systems and use utility software
3.	Choose commands and features of operating systems and application software
4.	Use open source software

Syllabus

Unit No	Title with Contents	No. of Lectures
UNIT I	Introduction to Computer System	08
	1. Introduction	
	2. Characteristics of Computers	1
	3. Basic structure and operation of a computer	1
	4. Functional units and their interaction	1
	5. Types of computers and features	1
	i. Mini Computers	
	ii. Micro Computers	
	iii. Mainframe Computers	
	iv. Super Computers	
	v. Laptops and Tablets	
	6. Types of Programming Languages	1
	i. Machine Languages	
	ii. Assembly Languages	
	iii. High Level Languages	
	7. Translators	1
	i. Assembler	
	ii. Compiler	
	iii. Interpreter	
	8. Data Organization	
	i. Drives	1
	ii. Directories and Files	
	9. Number Systems	1
	i. Introduction to Binary	
	ii. Octal	
	iii. Hexadecimal system	
	iv. Conversion	
	v. Addition	
	vi. Subtraction	
	vii. Multiplication	

	<ul style="list-style-type: none"> ii. File and Directory structure iii. Menu Items iv. Control Panel v. File and Directory Search <p>4. Utility programs</p> <ul style="list-style-type: none"> i. Anti-plagiarism software ii. Anti-virus iii. Disk Cleaning iv. Defragmentation v. Compression/Decompression of files <p>5. Application software</p> <ul style="list-style-type: none"> i. Examples of commercial software with brief introduction 	<p>1</p> <p>1</p>
Unit IV	Word, Spreadsheets & Presentation Tools	13
	<p>1. Editors- editors like notepad++ and word</p> <p>2. Spreadsheets (Excel): (Features and functionalities in detail, Spreadsheet Applications.)</p> <ul style="list-style-type: none"> I. Reading data into Excel using various formats II. Basic functions in Excel, arithmetic as well as various logical functions III. Formatting rows and columns IV. Using formulas in Excel and their copy and paste using absolute and relative referencing V. IF and the nested IF functions VI. VLOOKUP and HLOOKUP II. The RANDBETWEEN function III. VLOOKUP across worksheets IX. Data filtering in Excel X. Use of Pivot tables with categorical as well as numerical data XI. Introduction to the charting capability of Excel <ul style="list-style-type: none"> II. Line, Bar and Pie charts III. Pivot charts IV. Scatter plots V. Histograms 	<p>1</p>
	<ul style="list-style-type: none"> VI. Presentation Tools: Design Slides (using Text, images, charts, clipart), Slide Animation, Template and theme creation 	1
Unit V	Open Source Software	07
	<p>1. Introduction</p> <p>2. Open Source</p> <ul style="list-style-type: none"> i. Free Software, 	<p>1</p> <p>3</p>

	ii. Free Software vs. Open Source software iii. Public Domain Software 3. Open Source Operating Systems i. GNU/Linux, Android ii. Technologies, Development tools iii. IDEs 4. Open Source Projects: github & git, 5. Open Office	3
UNIT VI	PC Hardware & Trouble Shooting	05
	1. Introduction to Computer Hardware i. Motherboard ii. CPU iii. Basic Input and Output Setting (BIOS) iv. Network Interface Card (NIC) v. Graphics card vi. Logical Fault Isolation – ADJUST method vii. Common Networking Problems viii. Tools for gathering information ix. Troubleshooting PC hardware	1 1 1 1 1

References:

1. P.K. Sinha & Priti Sinha, "Computer Fundamentals", (3rd edition).
2. Ajit Mittal "Mastering PC and Hardware and Networking", BPB Publication,
3. Harjit Suman Excel Formulas and Functions: "The Complete Excel Guide for Beginners" Pearson.

Website Reference Link:

1. Open Source Software (UNIT V): <https://www.openoffice.org/>
2. MS OFFICE, PERIPHERALS (UNIT II, III, IV): <https://www.Tutorialpoint.com/>



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F.Y.B.Voc (DS&DA) -Web Designing

2021-22 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Web Designing
Course Code	21BVDSA112
Semester	I
No. of Credits	3

Aims & Objectives of the Course

Sr.No.	Objectives
1.	To understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
2.	To become familiar with graphic design principles that relates to web design and learn how to implement theories into practice.
3.	To Develop skills in analyzing the usability of a web site.
4.	To understand how to plan and conduct user research related to web usability.
5.	To learn the language of the web: HTML and CSS.

Expected Course Specific Learning Outcomes

Sr.No.	Learning Outcome
1.	Design simple and impressive techniques, from basics till advanced to focus on goal oriented and user centric designs.
2.	Plan for website & actually build excellent web sites.
3.	Create web elements like buttons, banners & Bars and of course complete UI designs.
4.	Validation of Forms website.
5.	Setting up page layout, color schemes, contract, and typography in the designs.

Syllabus

Unit No	Title with Contents	No. of Lectures
UNIT I	Web Design Principles and Introduction to HTML	08
	1. Basic principles involved in developing web site <ol style="list-style-type: none"> i. Planning process, rules of web designing ii. designing a navigation bar iii. Page design, Home Page Layout iv. Design Concept v. Brief History of Internet vi. what is World Wide Web vii. Why create a website and web standards 	03
	2. What is HTML <ol style="list-style-type: none"> i. HTML Documents ii. Basic structure of an Tags iii. Heading-Paragraphs iv. Line Breaks 	02
	3. Introduction to elements of HTML <ol style="list-style-type: none"> i. Working with Text ii. Working with Lists iii. Tables and Frames iv. Working with Hyperlinks v. Images and Multimedia vi. Working with Forms and controls 	03
Unit II	Introduction to CSS	08
	1. Introduction to Style Sheets <ol style="list-style-type: none"> i. Types of CSS ii. CSS Border and margin iii. CSS Positioning ,padding and background iv. color, text, link, list, table, image, display properties v. Use of Id & classes in CSS Use of & 	04
	2. Introduction of CSS3 <ol style="list-style-type: none"> i. Gradients ii. Transitions iii. Animations iv. multiple columns 	04
Unit III	Introduction to Bootstrap	09
	1. Introduction to Bootstrap <ol style="list-style-type: none"> i. Environment Setup History ii. Fundamentals Of Bootstrap 	04

	vi. Math and date objects with examples vii. String objects with examples, and related functions 4. DOM in JavaScript i. DOM types ii. Validations in JavaScript with examples.	02
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References:

1. Steven M. Schafer “HTML, XHTML, and CSS Bible”, (5th Edition), Wiley India
2. John Duckett “Beginning HTML, XHTML, CSS, and JavaScript”, Wiley India
3. Ian Pouncey, Richard York “Beginning CSS: Cascading Style Sheets for Web Design”, Wiley India

Website Reference Link:

1. CSS (UNIT I, II): <https://www.w3schools.com>
2. BOOTSTRAP (UNIT III, IV): <https://www.getbootstrap.com>
3. JAVASCRIPT (UNIT V, VI): <https://www.tutotialspoint.com>

IDE TOOLS

Sr. No.	Tool	Version
1	Notepad++	7.1.1
2	Visual Studio Code.	1.57.0



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F.Y.B.Voc (DS&DA) Programming in C

2021-22 (CBCS – Autonomy 21

Pattern)

Course/ Paper Title	Programming in C
Course Code	21BVDSA-113
Semester	I
No. of Credits	3 (2 Unit equivalent to 1 Credit)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To learn basic concepts of programming language
2.	To study different control structure
3.	To learn C language constructs and pointers in depth
4.	To write a code, compile and test C programs.
5.	To develop the logical ability for solving the real world problems.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	Student will be able to apply appropriate constructs of C language, coding standards for application development
2.	Students will be able to use different control structures.
3.	Students will be to use dynamic memory allocation concepts in various application developments
4.	Students will be to file handling in various application developments
5.	Demonstrate ability to use top-down program design

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit – I	Programming Fundamentals and Introduction to C	13
	1. Types of Problems, Problem solving using computer	1
	2. Definition & Characteristics of algorithm	1
	3. Examples of algorithms	2
	4. Flow charts with examples.	2
	5. Introduction to C, Features of C, Structure of C Program	1
	6. C Character Set, Identifiers and Keywords	1
	7. Variables and constants Data types- Basic data types	1
	8. Enumerated types, Type casting	1
	9. Declarations, Expressions.	1
	10. Operator and Its Types	2
Unit – II	Data I/O and Control Structure	05
	1. Formatted and Unformatted Input and Output	1

	2. Conditional branching - if, switch statement	1
	3. Iterative loops – while	1
	4. do while and for statement	1
	5. Break and continue statement, goto statement.	1
Unit – III	Functions	06
	1. Introduction to Functions,	2
	2. Function Arguments, Library & User defined functions	2
	3. Methods for parameter passing,	1
	4. Recursion	1
Unit – IV	Arrays ,Structure and Union	08
	1. Arrays	
	i. Introduction, Declaration and Initialization	1
	ii. Accessing Array elements, Memory, representation of Array	1
	iii. One dimensional Arrays, Two dimensional Arrays(matrix)	1
	iv. Character Arrays and Strings (Operations on String)	1
	2. Structure & Union	
	1. Arrays & Function Defining Structure, Declaration,	1
	2. Initialization, Array of Structures, Structure and Functions,	1
	3. Nested Structures, Unions , Enumerated data type, typedef	1
Unit-V	Pointers	07
	1. Introduction to Pointers, dynamic memory allocation,	1
	2. Pointer Arithmetic, Multiple indirection,	2
	3. parameter passing – call by value and call by reference	1
	4. Arrays & Pointers - Pointer to array, Array of pointers,	1
	5. Functions & pointers - Passing pointer to function,	1
	6. Returning pointer from function, Function pointer, Pointers & const	2
Unit-VI	File Handling	06
	1. Concept of streams, need, Types of files,	2
	2. Operations on text & binary files, Random access file,	2

	3. Library functions for file handling – fopen, fclose, fgetc, fseek, fgets, fputc etc, File names through command line argument.	2
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References:

1. Cormen, Leiserson, Rivest, Stein “Introduction to algorithms PHI Learning” Pvt. Ltd.
2. Y S Kanetkar “Let Us C”, “BPB Publications “
3. Maureen Spankle “Problem Solving and Programming Concepts”, Tata Mc-Graw Hill Publishing Co Ltd
4. E. Balaguruswamy “Programming in ANSI C”, McGraw Hill Education

Website links:

1. (UNIT I,II) : <http://www.cprogramming.com/tutorial/c-tutorial.html>
2. (UNIT III,IV) : <http://nptel.ac.in/courses/106104128/>
3. (UNIT V,VI) : <http://nptel.ac.in/courses/106105085/1>

IDE TOOLS

Sr. No.	Tool	Version
1	Netbeans for C/C++ Development	12.3
2	Visual Studio Code.	1.57.0
3	CodeLite.	15.0.0



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F.Y.B.Voc (DS&DA)- Software Engineering
(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Software Engineering
Course Code	21BVDSA114
Semester	I
No. of Credits	3 (2 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To learn and understand about System concepts.
2.	To learn and understand to know software engineering.
3.	To know the process model in software engineering.
4.	To understand different techniques used in software engineering.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	To know actual how process model works in industry.
2.	To know about decision making techniques.
3.	To know the difference types of Diagrams

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	Introduction to Software Engineering	08
	1. Define system and its types	1
	2. Elements of system	1
	3. characteristics of system	1
	4. What is Software,	1
	5. Types of Software,	1
	6. Need for software Engineering Software Characteristics	1
	7. SoftwareQualities (McCall’s Quality Factors)	1
Unit II	Requirement Analysis	08
	1. Definition of System Analysis	2
	2. Requirement Anticipation	
	3. Knowledge and Qualities of System Analyst	1
	4. Role of a System Analyst	
	5. Feasibility Study And It’s Types	2
	6. Fact Gathering techniques	2
	7. User Transaction Requirement	2
	8. User design Requirements	
	9. SRS(System Requirement Specification)	1
Unit III	Process models	08
	1. SDLC (System Development Life Cycle)	3
	2. Waterfall Model	
	3. Spiral Model	
	4. Prototyping Model,	3
	5. Incremental development	
	6. RAD model	2
	7. Agile Model	
Unit IV	Analysis and Design Tools	10

	1. Entity-Relationship Diagrams 2. Decision Tree and Decision Table 3. Data FlowDiagrams (DFD) 4. Data Dictionary i Elements of DD ii Advantage of DD 5. Pseudo code 6. Input And Output Design 7. CASE STUDIES (Based on AboveTopic) (At least 3 case Studies)	1 1 1 2 1 1 3
Unit V	Software Testing	07
	1. Definition 2. Verification And Validation 3. Black box and White-Box Testing 4. Unit Testing 5. Integration Testing 6. System Testing 7. Performance Testing 8. StressTesting 9. Smoke Testing 10. User Acceptance Testing	1 2 2 2
Unit VI	Maintenance and Reengineering	04
	1. Maintenance definition and types 2. Software reengineering 3. Reverse Engineering 4. Restructuring and forward Engineering	1 1 1 1

Books References:

1. Roger S. Pressman, McGraw hill International Editions 2010(Seventh Edition) “Software Engineering”, Global Publisher
2. Rajib Mall, “Fundamentals of Software Engineering” , (Fourth Edition) ,PHI Publication,
3. Prof. Khalkar and Prof. Parthasarathy, ”System Analysis And Design “,(First Edition) Vikas Publishing house

Website Links:

1. Wikipedia: https://en.wikipedia.org/wiki/Software_engineering
2. Open Source: <https://www.javatpoint.com/software-engineering-tutorial>
3. Open Source: https://www.tutorialspoint.com/software_engineering/index.htm



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F.Y.B.Voc (DS&DA) - Lab Course-I: MS Excel & Web Designing

2021-22 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Lab Course-I : MS Excel & Web Designing
Course Code	21BVDSA115
Semester	I
No. of Credits	1.5

Aims & Objectives of the Course

Sr.No.	Objectives
1.	To understand the principles of creating an effective web page, including an in-depth consideration of information architecture.
2.	To become familiar with graphic design principles that relates to web design and learn how to implement theories into practice.
3.	To Develop skills in analyzing the usability of a web site.
4.	To understand how to plan and conduct user research related to web usability.
5.	To learn the language of the web: HTML and CSS.

Expected Course Specific Learning Outcomes

Sr.No.	Learning Outcome
1.	Design simple and impressive techniques, from basics till advanced to focus on goal oriented and user centric designs.
2.	Plan for website & actually build excellent web sites.

Assignment No	Topics for the Assignments	Number of sessions
1	Word, Spreadsheets & Presentation Tools	02
2	Web Design Principles and Introduction to HTML	03
3	Introduction to CSS	03
4	Introduction to Bootstrap	03
5	Advance Concept In Bootstrap	03

IDE TOOLS

Sr. No.	Tool	Version
1	Notepad++	7.1.1
2	Visual Studio Code.	1.57.0



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F.Y.B.Voc (DS&DA) - Lab Course-II: C Programming

2021-22 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Lab Course-II : C Programming
Course Code	21BVDSA116
Semester	I
No. of Credits	1.5

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To learn basic concepts of programming language
2.	To study different control structure
3.	To learn C language constructs and pointers in depth
4.	To write a code, compile and test C programs.
5.	To develop the logical ability for solving the real world problems.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	Student will be able to apply appropriate constructs of C language, coding standards for application development
2.	Students will be able to use different control structures.
3.	Students will be to use dynamic memory allocation concepts in various application developments
4.	Students will be to file handling in various application developments
5.	Demonstrate ability to use top-down program design

Assignment No	Topics for the Assignments	Number of sessions
1	Programming Fundamentals and Introduction to C	02
2	Data I/O and Control Structure	02
3	Functions	02
4	Arrays ,Structure and Union	02
5	Introduction to Pointers	03
6	File Handling	03

IDE TOOLS:

Sr. No.	Tool	Version
1	Netbeans for C/C++ Development	12.3
2	Visual Studio Code.	1.57.0
3	CodeLite.	15.0.0

SEMESTER- II



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F.Y.B.Voc (DS&DA) - Data Structure using C

Programming 2021-22 (CBCS – Autonomy 21

Pattern)

Course/ Paper Title	Data Structure using C Programming
Course Code	21BVDSA121
Semester	II
No. of Credits	3 (2 Unit equivalent to 1 Credit)

Objectives of the Course

Sr. No.	Objectives
1.	To provide the knowledge of basic data structures and their implementations.
2.	To develop skills to apply appropriate data structures in problem solving.
3.	To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures
4.	To be able to implement the abstract data type list as a linked list using the node and reference pattern.
5.	To learn static and dynamic data structures and also to understand analysis of algorithm.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	Use the appropriate data structure in context of solution of given problem.
2.	Develop programming skills which require solving given problem
3.	Develop effective software engineering practice, emphasizing such principles as decomposition, procedural abstraction, and software reuse.
4.	Know the strength and weakness of different data structures.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit – I	Introduction to data structures	09
	1. Introduction and definition of Algorithm and data structures	1
	2. Data types and data objects	1
	3. Abstract Data Types (ADT)	1
	4. Algorithm analysis:	1
	i. Frequency counts	
	ii. Space and Time complexity (Best , Average & Worst Case)	
	5. Asymptotic notation	
	i. Big O	
	ii. Omega (Ω)	
	6. Matrix representation using arrays	1
	i. Row and column major	
	ii. Basic operations on matrices	
	iii. Sparse Matrix	1
	7. Sorting techniques	1
	i. Bubble sort	
	ii. Insertion sort	
	iii. Selection sort	

	<ul style="list-style-type: none"> iv. Merge sort v. Quick sort 8. Searching techniques <ul style="list-style-type: none"> i. Linear search ii. Binary search 9. Algorithms and its complexity using simple example 	<p>1</p> <p>1</p>
Unit – II	Linked Lists	07
	<ul style="list-style-type: none"> 1. Introduction and Definition 2. Representation <ul style="list-style-type: none"> i. Static ii. Dynamic 3. Types of linked lists <ul style="list-style-type: none"> i. Singly ii. Doubly iii. Circular 4. Operations on link list: create, display, insert, delete, reverse, search, sort, concatenation, Merge 5. Applications of Linked List – polynomial representation, Addition of two polynomials 	<p>1</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p>
Unit – III	Stack	07
	<ul style="list-style-type: none"> 1. Definition, 2. Representations <ul style="list-style-type: none"> i. Static ii. Dynamic 3. Operations on stack <ul style="list-style-type: none"> i. push (isFull()) ii. pop(isEmpty()) iii. Peek (traverse) 4. Applications of stack: <ul style="list-style-type: none"> i. Function : Recursion ii. Polish notation: Infix to postfix, infix to prefix, Postfix Evaluation. 	<p>1</p> <p>2</p> <p>2</p>

		2
Unit – IV	Queue	08
	<ol style="list-style-type: none"> 1. Introduction 2. Operations <ol style="list-style-type: none"> i. init() ii. enqueue() iii. dequeue() iv. isEmpty() v. isFull() vi. peek() 3. Implementation <ol style="list-style-type: none"> i. Static ii. Dynamic 4. Types of Queue (with implementation) <ol style="list-style-type: none"> i. Linear Queue ii. Circular Queue iii. Priority Queue iv. Double Ended Queue 	<p>1</p> <p>2</p> <p>2</p> <p>3</p>
Unit – V	5. Tree	08
	<ol style="list-style-type: none"> 1. Introduction and Tree terminologies 2. Definitions <ol style="list-style-type: none"> i. Tree, root, child, leaf, level, height, depth 3. Binary Tree and its Types <ol style="list-style-type: none"> i. Rooted, full, complete and skewed. 4. Representation of Trees <ol style="list-style-type: none"> i. Using arrays and Linked Lists 5. Types of Traversal <ol style="list-style-type: none"> i. Preorder, Inorder, Postorder, 6. Applications of Binary trees <ol style="list-style-type: none"> i. Binary Search Tree (BST)- 	<p>1</p> <p>1</p> <p>2</p> <p>1</p>

	Introduction and definition	2
		1
Unit – VI	6.Graph	06
	1. Introduction and Basic concepts	1
	2. Representations of Graphs:	2
	i. Adjacency list	
	ii. Adjacency matrix	
	3. Graph Traversals:	2
	i. BFS	
	ii. DFS	
	4. Applications: Dijkstra’s algorithm for shortest path	1

Books References:

- 1.E. Horowitz & Sahni, "Fundamental Data Structure" Galgotia Book Source, 1983.
- 2.A. Tannenbaum, "Data Structure Using C" Pearson Education, 2003.
- 3.N. Wirth, "Algorithms Data Structure Program", Prentice Hall of India, 1979.

Website Links:

1. (UNIT I,II):Data Structure Using C – By Balagurusamy
https://books.google.co.in/books?id=nB_ZAgAAQBAJ&printsec=frontcover&dq=data+structures+ebook&hl=en&sa=X&ved=0ahUKEwjNwd_Ki6LpAhXVH7cAHfbrAgkQ6AEIJzAA#v=onepage&q&f=false
2. (UNIT III,IV):E Pathashala : <https://epgp.inflibnet.ac.in/>
3. (UNIT V,VI): PDF Drive Books: <https://www.pdfdrive.com/data-structure-books.html>

IDE TOOLS

Sr. No.	Tool	Version
1	Netbeans for C/C++ Development	12.3
2	Visual Studio Code.	1.57.0
3	CodeLite.	15.0.0



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F.Y BVOC DATABASE MANAGEMENT

SYSTEM 2021-22 (CBCS – Autonomy 21

Pattern)

Course/ Paper Title	Database Management System
Course Code	21BVDSA-122
Semester	II
No. of Credits	3 (2 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr.No.	Objectives
1	To learn design of E-R diagrams
2	To prepare and execute database queries
3	To understand advanced SQL features (Function, Cursor and Trigger)
4	To study concurrency control and crash recovery techniques.

Expected Course Specific Learning Outcomes

Sr.No.	Learning Outcome
1	Prepare E-R Diagram for the given problem statement
2	Formulate appropriate SQL DDL & DML Queries
3	Formulate SQL queries using advanced SQL features.
4	Compare and contrast different concurrency control and recovery techniques

Syllabus

Unit No	Title with Contents	No. of Lectures
UNIT I	Introduction of DBMS	07
	1. Introduction of DBMS 2. Introduction Structure of DBMS 3. Users of DBMS, Advantages of DBMS, 4. ER data model (entities, attributes, entity sets, relations, relationship sets), 5. Additional constraints (key constraints, participation constraints, weak entities), 6. Case studies.	01 01 01 01 02 01
UNIT II	Structure of Relational Databases	07
	1. Concepts of a table, a row, a relation, a tuple and a key in a relational Database 2. Conversion of ER to Relational model 3. Integrity constraints (primary key, referential integrity, Null constraint, Unique constraint, check constraint)	03 02 02
UNIT III	Structured Query Language	07
	6. Basic structure of SQL query 7. DDL commands (create, drop, alter) with examples 8. DML command with example (insert, delete, update) 9. Aggregate functions, Nested Sub-queries, 10. Examples on SQL (case studies)	01 02 02 01 01
UNIT IV	Relational Database Design	08

	<ol style="list-style-type: none"> 1. SQL mechanisms for joining relations (inner joins, outer joins and their types) 2. Functional dependencies (Basic concepts, Closure of set of functional dependencies, Closure of an Attribute set) 3. Concept of Decomposition, 4. Desirable Properties of Decomposition (Lossless join and Dependency preservation) 5. Concept of Normalization - Normal forms (only definitions) 6. 1NF, 2NF, 3NF, BCNF Examples on Normalization 	<p>02</p> <p>02</p> <p>01</p> <p>01</p> <p>02</p>
UNIT V	Relational Database Design	08
	<ol style="list-style-type: none"> 1. PL/PostgreSQL: Language structure 2. Controlling the program flow, conditional statements, loops 3. Views 4. Functions 5. Handling errors and exceptions 6. Cursors 7. Triggers 	<p>02</p> <p>01</p> <p>01</p> <p>01</p> <p>01</p> <p>01</p> <p>01</p>
UNIT VI	Transaction Concepts and Database Security	08
	<ol style="list-style-type: none"> 1. Transaction, properties of transaction, conflicting operations 2. Schedules, types of schedules, concept of serializability, precedence graph for serializability 3. Concept of rollback, checkpoint and system log 4. Deadlock handling methods - 5. Detection and Recovery (Wait for graph). 6. Prevention algorithms (Wound-wait, Wait-die) 	<p>02</p> <p>02</p> <p>01</p> <p>01</p> <p>01</p> <p>01</p>

References:

1. By Henry korth ,”Database System”, 6th edition Silberschatz,
2. Ivan Bayross “SQL, PL/SQL The Programming Language Oracle”, (4th edition), BPB Publication,
3. Shio Kumar Singh “Database Systems Concepts”,(3rd edition), Pearson,
4. Reck F. van der Lans “Introduction to SQL”, (4th edition), Pearson
5. Jeffery A Hoffer Modern “Database Management”, (5th edition) V.Ramesh, HeikkiTopi ,Pearson

Website Reference Link:

1. Units (I, II, III,): https://docs.oracle.com/cd/E11882_01/server.112/e40540/intro.htm
2. Units(III,IV):https://docs.oracle.com/cd/E11882_01/server.112/e40540/tablecls.htm#CNC
[P T010](#)

IDE TOOLS:

SR No	Name of IDE or Tool	Latest Version
1.	Oracle	10g
2.	Eclipse	10



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F.Y.B.Voc (DS&DA) Operating System

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Operating System
Course Code	21BVDSA-123
Semester	II
No. of Credits	3 (2 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To introduce basic concepts and functions of modern operating systems.
2.	To study Architecture, File systems and basic operating system commands
3.	To study the Use of editors and Networking commands
4.	To learn Shell Programming and shell scripts.
5.	To understand the concept of a process and thread 6.To understand the concept of network and security
6.	To introduce basic concepts and functions of modern operating systems.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Explain basic concepts of operating system
2.	Use basic Linux commands and Linux documentation
3.	Writing shell scripts

	<p>commands.</p> <p>3. Vi Editor - Introduction to the Vi editor</p> <p>4. Different ways of invoking and quitting vi</p> <p>5. Different modes of vi</p> <p>6. Input mode commands</p> <p>7. Command mode commands</p> <p>8. The ex- mode commands</p> <p>Illustrative examples Navigation commands</p>	<p>1</p> <p>1</p> <p>2</p> <p>2</p>
Unit IV	Shell Scripts	10
	<p>1. Shell programming</p> <p>i. Ordinary and environment variables</p> <p>ii. The .profile. Read and read only commands</p> <p>iii. Command line arguments</p> <p>iv. Exit and exitstatus of a command</p> <p>v. Logical operators for conditional execution</p> <p>vi. The test command and its shortcut.</p> <p>2. The if, while, for and case control statements</p> <p>3. The set and shift commands and handling positional parameters</p> <p>4. The here (<<) document and trap command, Simpleshell program examples.</p> <p>5. File inodes and the inode structure</p> <p>i. File links – hard and soft links.</p> <p>ii. Filters, Head and tail commands</p> <p>iii. Cut and paste commands</p> <p>iv. The sort command and its usage with different options</p>	<p>4</p> <p>1</p> <p>1</p> <p>1</p> <p>3</p>
Unit V	Security & Networking	8
	<p>1. Security Understanding Linux Security</p> <p>i. Uses of root</p> <p>ii. pseudo command</p> <p>iii. workingwith passwords</p> <p>iv. Bypassing user authentication</p> <p>v. Understanding ssh protocol</p> <p>2. Networking Basic introduction to Networking</p> <p>3. Network protocols: http, ftp etc., IPaddress, DNS</p>	<p>4</p> <p>2</p> <p>2</p>

References:

1. Siberchatz, Galvin, Gagne “Operating System Concepts” , (8th Edition) ,Wiley India Private Limited
2. Behrouz A. Forouzan, Richard F. Gilberg : Cengage Learning – India Edition. 2009
“UNIX and Shell Programming” Cengage Learning
3. Dhanjay Dhamdhare, “Operating System –A Concept-Based Approach”, McGraw Hill Education

Website Links:

Open Source: <https://www.geeksforgeeks.org/introduction-to-linux-operating-system>

Wikipedia: <https://en.wikipedia.org/wiki/Linux>

Open Source: <https://www.linux.com/what-is-linux>



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B.Voc. (DS&DA) Computer Networks

2021-22 (CBCS – Autonomy 21

Pattern)

Course/ Paper Title	Computer Networks
Course Code	21BVDSA-124
Semester	II
No. of Credits	3 (2 Units equivalent to 1 Credit)

Aims & Objectives of the Course

Sr.No.	Objectives
1.	To learn and understand basic concept of Networking
2.	To learn and understand to know Network models
3.	To know in details of the Transmission media

Expected Course Specific Learning Outcomes

Sr.No.	Learning Outcome
1.	To know how connect networks
2.	To know how to connect network devices
3.	To know the difference types of Diagrams
4.	To know how to draw Input and output form of software

Syllabus

Unit No	Title with Contents	No. of Lectures
UNIT I	Introduction to Computer Networks	07
	1. Introduction to Computer Networks i. Computer Network ii. Definition iii. Goals iv. Applications v. Structure vi. Components vii. Topology viii. Types of Topology	02
	2. Types of Networks i. (LAN, MAN, WAN, Internet) ii. Broadcast & Point-To-Point Networks	02
	3. Communications Types i. (Synchronous ,Asynchronous)	01
	4. Modes of Communication : i. Simplex ii. Half Duplex iii. Full Duplex	01
	5. Protocols and Standards	01
Unit II	Network Models	07
	1. Network Models	03
	i. Introduction to OSI Model with all layers	04
	2. TCP/IP Protocol Suite i	
	i. Addressing-Physical ii. Logical and Port addresses	
Unit III	Transmission Media	07
	1. Introduction to Guided Transmission Media	02
	i. Twisted pair cable–UTP Vs STP ii. Categories connectors & applications iii. Coaxial cable – standards iv. Connectors & applications v. Fiber Optic cable–propagation modes vi. connectors & applications	
	2. Unguided Media	03
	i. Wireless- Radio Waves ii. – Microwaves	

Reference:

1. Andrew Tanenbaum, “Computer Networks”, [4th Edition], Pearson Education
2. Behrouz Forouzan, “Data Communication and Networking “[4th Edition],TATA McGraw Hill

Website Reference Link:

1. Geeksforgeeks: <https://www.geeksforgeeks.org/>
2. e-PGPathshala : <https://epgp.inflibnet.ac.in>
3. Java points (UNIT I, II, III, V, and VI): <https://www.javatpoint.com/computer-network-tutorial>



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F.Y.B. Voc (DS&DA) - Lab Course-I: Database Management System

2021-22 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Lab Course-I : Database Management System
Course Code	21BVDSA122
Semester	II
No. of Credits	1.5

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To provide the knowledge of basic DBMS structures and their implementations.
2.	To develop skills to apply appropriate DBMS in problem solving.
3.	To understanding about writing Tables and step by step approach in solving problems with the help of fundamental table and row.
4.	To be able to implement the data type in.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	Design an efficient understanding for the given problem and implement it using DBMS.
2.	Develop database skills which require solving given problem
3.	Develop effective software engineering practice, emphasizing such principles like software reuse database.
4.	Apply appropriate data types for the data base given problem.

Assignment No	Topics for the Assignments	Number of sessions
1	Introduction Structure of DBMS File Handling	03
2	design of E-R diagrams	03
3	Keys, Referential integrity Constraints	03
4	DDL commands	02
5	DML command	03
	TOTAL	14

IDE TOOLS:

SR No	Name of IDE or Tool	Latest Version
1.	Oracle	10g
2.	Eclipse	10



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F.Y.B.Voc. (DS&DA) - Lab Course-II: Data Structure using

C 2021-22 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Lab Course-II : Data Structure using C
Course Code	21BVDSA125
Semester	II
No. of Credits	1.5

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To provide the knowledge of basic data structures and their implementations.
2.	To develop skills to apply appropriate data structures in problem solving.
3.	To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures
4.	To be able to implement the abstract data type list as a linked list using the node and reference pattern.
5.	To learn static and dynamic data structures and also to understand analysis of algorithm.

Expected Course Specific Learning Outcomes

Sr.No.	Learning Outcome
1.	Design an efficient algorithm for the given problem and implement it using C Programming.
2.	Develop programming skills which require solving given problem
3.	Develop effective software engineering practice, emphasizing such principles as decomposition, procedural abstraction, and software reuse.
4.	Apply appropriate data structures for the given problem.

Assignment No	Topics for the Assignments	Number of sessions
1	Non-Recursive Sorting Techniques	03
2	Linked List and Types of Linked List	03
3	Stack-Static Stack Implementation, Dynamic Stack Implementation	03
4	Queue -Static Queue Implementation, Dynamic Queue Implementation	02
5	Tree Binary Search Tree (Dynamic)	02
6	Graph, Adjacency Matrix Representation	01
	TOTAL	14

IDE TOOLS:

Sr. No.	Tool	Version
1	Netbeans for C/C++ Development	12.3
2	Visual Studio Code.	1.57.0
3	CodeLite.	15.0.0