



***Rayat Shikshan Sanstha's***

***Lead College of Karmaveer Bhaurao Patil University, Satara, Maharashtra***

**Yashavantrao Chavan Institute of Science, Satara (Autonomous)**

**Undergraduate Programme**

**B. Sc. I Data Science**

**Syllabi of the course**

**Choice based credit system syllabi.**

**(To be implemented w.e.f. from June 2023)**

## **General Objectives of the Course: -**

1. To create graduates with sound knowledge of Data Science, who can contribute towards recent advances in technology.
2. To provide advanced and in-depth knowledge of data science and specialization in one or two subjects of the new era of technology.
3. To prepare Graduates who will achieve peer-recognition, as an individual or in a team, through demonstration of good analytical, design, programming, and implementation skills.
4. To enable students, pursue a professional career in Data Science in related industry, business and research.
5. To impart industry knowledge and practical skills of current trends in IT field to the students.
6. To develop the ability among students to formulate, analyze and solve real life problems faced in Computer Science industry. To produce computer science professionals who can be directly employed or start his/her own work as
  - Data Scientist.
  - Business Analyst.
  - Data Analytics Manager.
  - Data Architect.
  - Data Administrator.
  - Business Intelligence Manager.
  - Entrepreneur in Computer Science industry.
7. To Develop designing, analyzing and critical thinking skill among students.

### **6. Duration:**

8. The course shall be a full-time course.
9. •The course shall be for three years, consisting of six semesters.

### **7. Fee Structure:**

- **Course Fee:** as prescribed by the Institute.

### **8. Eligibility for Admission:**

- As per Rule (2) for graduates of this Institute.

### **9. Medium of instruction: English**

### **10. OUTCOMES:**

After completing this course student shall be expert in following things:

1. Avail yourself of Current trends in IT Industries and new Technologies.
2. Apply knowledge of programming platforms in Data Science and AI in real life.
3. Students should avail detailed knowledge of Data Science, Artificial Intelligence, Machine Learning, and Big Data etc.
4. Demonstrate their ability of advanced programming to design and develop innovative applications.
5. Access, evaluate, understand, and compare digital information from various sources and apply it for scientific knowledge acquisition as well as scientific data analysis and presentation.
6. Critically evaluate, analyze, and comprehend a scientific problem. Think creatively, experiment and mic research into innovation and creatively design scientific solutions to problems.
7. Exemplify generate a solution independently, check and validate it and modify if necessary.
8. Translate project plans, use management skills, and lead a team for planning and execution of a task.
9. Can start his own business or start up.

## **11. SCOPE:**

After Successful completion of three years Degree in Data Science, we observed that the students have the ample opportunities in diversified areas such as:

1. Data Scientist
2. Data Analytics
3. Machine learning Engineer
4. Business Intelligence Analyst
5. Data Engineer.
6. Research Scientist.
7. Data Consultant

**Department of Data Science**  
**B. Sc. I SEM - I Data Science**

Sr.no	Course Category		Name of Course
1	Major -I	BDST 111	Fundamental of Data Science
2	Major-II	BDST 112	Computer Programming-I
3	Lab I	BDSP 113	Lab, I Based on BDST 111 and BDST 112
4	Minor-I	BDST 114	Fundamentals of Computer
5	Minor-II	BDST 115 Or Music Science	Computational Mathematics Style of Indian Music I
6	Lab II	BDSP 116	Lab II Based on BDST 114 and BDST 115
7	Open Elective	BDSTOE 117	Indian Educational Thinkers and Educational Policies
8		BDSTOE 118	Education for development of science education
9		BDSTOE 119	Democracy, Election and Good Governance
10	IKS	BDSTIKS 1	History of Computers in India
11	CC	BDSTCC 1	Yoga Education

**B. Sc. I SEM -II Data Science**

Sr.no	Course Category		Name of Course
1	Major -I	BDST 211	Programming Concepts
2	Major-II	BDST 212	Computer Programming-II
3	Lab I	BDSP 213	Lab I Based on BDST 121 and BDST 122
4	Minor-I	BDST 214	Database Management System
5	Minor-II	BDST 215	Computational Statistics
6	Lab II	BDSP 216	Lab II Based on BDST 124 and BDST 125
7	GE/OE program for others	BDST 217	Learning techniques
8		BDST 218	Contribution of Eminent Scientist
9		BDSP 219	Indian Constitution
10	SEC	BDSTSEC 1	Data Analytic Skills for Data Scientist
11	VEC	BDSTVEC 1	Role of values and ethics in Data Science

---

**B.Sc. Part I: Data Science**

---

**BDST 111: Fundamental of Data Science**

---

**Course Objectives:** - Student should be able to learn...

1. Fundamental concepts of Data Science.
2. Study basic principles of Data Science.
3. Develop skills for Data Management.
4. Think through the ethics surrounding privacy, data sharing.

<b>Credits=2</b>	<b>SEMESTER-I</b> <b>BDST 111: Fundamental of Data Science</b>	<b>No. of hours per unit/ credits</b>
<b>UNIT I</b>	<b>Introduction to Data Science</b>	<b>(7)</b>
	Defining data science and big data, Recognizing the different types of data, Gaining insight into the data science process, Data Science Process: Overview, Different steps, Machine Learning Definition and Relation with Data Science.	
<b>UNIT II</b>	<b>Data management And Analysis</b>	<b>(9)</b>
	Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources. Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes	
<b>UNIT III</b>	<b>Data visualization</b>	<b>(7)</b>
	Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.	
<b>UNIT IV</b>	<b>Applications of Data Science</b>	<b>(7)</b>
	Technologies for visualization, Bokeh (Python), recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.	

**Course Outcomes:** - Student will be able to ...

1. Explore the fundamental concepts of data science.
2. Understand data analysis techniques for applications handling large data.
3. Understand various machine learning algorithms used in data science process.
4. Visualize and present the inference using various tools.
5. Learn to think through the ethics surrounding privacy, data sharing and algorithmic decision-making.

**Reference Books:** –

1. Mittal Gautam, Data Science Simplified: A Hands-on Guide for Beginners, Notion Press,2021
- 2.Raghunathan, Foundations of Data Science, CRC Press,2020
3. Patil Prashant, Big Data Analytics: A Comprehensive Guide, McGraw-Hill Education,2019
4. Ian H. Witten, Frank, Eibe, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann,2016
- 5.Grus Joel, O'Reilly, Data Science from Scratch: First Principles with Python, 1st edition, 2015.
6. Jeffrey David, Leskovec, Anand Rajaraman, Ullman, Cambridge, Mining of Massive Datasets, J20 University Press,

2nd edition, 2014.

7. Jure Leskovek, Anand Rajaraman, Jeffrey Ullman, Mining of Massive Datasets. v2.1, Cambridge University Press, 2014.

8. O'Neil Cathy, Schutt Rachel, O' Reilly, Doing Data Science, Straight Talk from the Frontline, 1st edition, New York, O'Reilly Media, 2013.

### B.Sc. I- Semester-I

#### BCST112: Computer Programming-I

**Course Objectives:** Student should be able to ...

1. Adequate knowledge on the need of programming languages.
2. Study the need of problem-solving techniques.
3. Understand programming skills using the fundamentals and basics of C Language.
4. Algorithms and flowchart of programs in C and to solve the problems.

Credits=2	SEMESTER-I Course II: BCST112: Computer Programming-I	No. of hours per unit/ credits
UNIT I	<b>Introduction to 'C' language</b>	(8)
	Problem Solving definition, Step involving in problem solving, Algorithm, Characteristics, Flowcharts, Definition, Symbol, features. History of 'C' language, Structure of 'C' programs, 'C' Tokens, Character set and keywords, Constant and its type, Variable and its type Data types, Operators and its types, Precedence rules, Input/output using standard functions.	
UNIT II	<b>Branching and looping</b>	(8)
	Conditional branching, if, if else, else if ladder, switch, Nested statements. Looping – for, while do-while statements. Unconditional control statements- go to, break and continue.	
UNIT III	<b>Functions in C</b>	(7)
	Definition, types & parts of functions, Local and global variable, Library functions and User defined functions, passing arguments to a function, return statement, recursion, Scope and lifetime of variables, Storage classes-Auto, Extern, Register, Static.	
UNIT IV	<b>Arrays in C</b>	(7)
	Array definition and declaration, initialization of arrays, types of arrays, String handling functions, Arrays and functions.	

**Course Outcomes:** students will be able to...

1. Develop algorithm writing and flowchart drawing.
2. Evaluate the compilation process and execution of any C Program.
3. Analyze the use of Functions and Arrays to solve in real life applications.
4. Apply the use of Arrays to solve in real life applications.

**Reference Books:**

1. Yashwant Kanetkar (2018) Let Us C, BPB Publications, Edition 18
2. Peter Prinz and Tony Crawford (2016) C in a Nutshell (2nd Ed.)
3. Jeri R. Hanly and Elliot B. Koffman (2009) Problem Solving and Program Design in C (6th Edition)
4. E. Balagurusamy (2008) Programming in ANSI C, McGraw Hill Education Edition 6
5. Peter van der Linden (1994) Expert C Programming: Deep C Secrets
6. Brian Kernighan and Dennis Ritchie (1988) The C Programming Language –, Pearson Education India, Edition 2
7. P. Kamal, Learn Arrays in c with example, Kindle edition, 2013

**BDSP 113: Lab I – Based on**

**(BDST 111: Fundamental of Data Science and BDST 112: Computer Programming-I)**

**Course Objectives:** - Student should be able to...

1. Learn Fundamental concepts of Data Science.
2. Understand Basic principles of Data Science.
3. Identify programming skills using the fundamentals and basics of C Language.
4. Understand Algorithms and flowchart of programs in C and to solve the problems.

<b>Credit :2</b> <b>Group A-</b>	<p style="text-align: center;"><b>Fundamental of Data Science</b></p> <p><b>1. Data Collection and Acquisition:</b></p> <ol style="list-style-type: none"><li>1. Identify relevant data sources and collect the required data.</li><li>2. Clean and pre-process the data to ensure its quality and integrity.</li><li>3. Convert the data into a suitable format for analysis, such as CSV, Excel, or a database format.</li></ol> <p><b>2. Bar Charts for visualization:</b></p> <ol style="list-style-type: none"><li>1. Create a bar chart to compare categorical variables or display counts or frequencies.</li><li>2. Customize the chart with labels, colors, and legends to enhance readability.</li></ol> <p><b>3. Histograms for visualization:</b></p> <ol style="list-style-type: none"><li>1. Construct a histogram to display the distribution of a single variable.</li><li>2. Adjust the bin sizes to reveal different levels of granularity in the data.</li></ol>	<b>No. of hours per unit (60)</b>
-------------------------------------	---	-----------------------------------

	<b>4. Case study on Applications of Data Science</b>	
<b>Group B: -</b>	<p><b>Computer Programming-I</b></p> <ol style="list-style-type: none"> <li>11. Write a program to accept 5 subject marks and calculate total marks, percentage, and grade of student.</li> <li>12. Write a program to perform arithmetic operations.</li> <li>13. Write a program to input n numbers and find the Odd and Even numbers.</li> <li>14. Write a program to find the age of a person (Input birth date and today date).</li> <li>15. Write a program to find the sum of first n natural numbers.</li> <li>16. Write a program to accept the range and generate Fibonacci Series.</li> <li>17. Write a program to calculate sum of numbers using simple function.</li> <li>18. Write a program to calculate factorial of number using Recursion.</li> <li>19. Write a program to enter array elements and perform arithmetic operations.</li> <li>20. Write a program to sort the numbers in ascending and descending order using array.</li> </ol>	

**Course Outcomes:** Student will be able to ...

1. Explore the fundamental concepts of data science.
2. Perform data analysis techniques for applications handling large data.
3. Perform various machine learning algorithms used in data science process.
4. Apply software's are available for C Programming and how to use the Editor for writing Program and how to execute it.
5. Improve to write algorithms, flowcharts and programs on operators, Conditional Branching, Looping, Functions and Arrays.

**Reference Books:**

1. Mittal Gautam, Data Science Simplified: A Hands-on Guide for Beginners, Notion Press, 2021
2. Raghunathan, Foundations of Data Science, CRC Press, 2020
3. Patil Prashant, Big Data Analytics: A Comprehensive Guide, McGraw-Hill Education, 2019
4. Ian H. Witten, Frank, Eibe, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufmann, 2016
5. Guy Hart-Davis (2023) "The ABCs of Microsoft Office 97 Professional edition", BPB Publications.
3. Yashwant Kanetkar (2018) Let Us C, BPB Publications, Edition 18
4. Peter Prinz and Tony Crawford (2016) C in a Nutshell (2nd Ed.)
3. Jeri R. Hanly and Elliot B. Koffman (2009) Problem Solving and Program Design in C (6th Edition)
4. E. Balagurusamy (2008) Programming in ANSI C, McGraw Hill Education Edition 6



## Departmental Minor

### Theory: Course I: BCST114: Fundamentals of Computer

**Course Objectives:** Student should be able to ...

1. Define basic concepts and terminology of computers.
2. Understand how to operate desktop computers to carry out computational tasks.
3. Learn working of Hardware and Software and the importance of operating systems.
4. Identify programming languages, number systems, peripheral devices, networking, multimedia, and internet concepts.

Credits=2	<b>SEMESTER-I</b> <b>Course I: BCST114: Fundamentals of Computer</b>	<b>No. of hours perunit/ credits</b>
<b>UNIT I</b>	<b>Introduction to Computers</b> Introduction, Definition, Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification of Computers, Applications of Computer, Capabilities and limitations of computer	(8)
<b>UNIT II</b>	<b>Basic Computer Organization</b> Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and its types. Printers: Impact Printers and its types. Non-Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	(8)
<b>UNIT III</b>	<b>Software's and Operating System</b> Software and its needs, types of S/W. System Software: Operating System, utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi-tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux	(7)
<b>UNIT IV</b>	<b>Computer Arithmetic and Data Communication</b> Binary, Binary Arithmetic, Number System: Positional & Non-Positional, Binary, Octal, Decimal, Hexadecimal, converting from one number system to another, converting from one number system to another, Converting from one number system to another, Communication Process, Data Transmission speed, Communication Types (modes), Data Transmission Medias, Modem and its working, characteristics, Types of Networks, LAN Topologies, Computer Protocols, Concepts relating to networking	(7)

**Course Outcomes:** Students will be able to...

1. Describe basic concepts and terminology of information technology.
2. Evaluate the fundamentals of personal computers and their operations.
3. Maintain their small account using the computers and enjoy in the world of InformationTechnology
4. Use the computer for basic purposes of preparing his personnel/business letters, viewing information on internet (the web), sending mails, preparing his business presentations, playinggames etc.

**Reference Books:**

1. Guy Hart-Davis (2023) "The ABCs of Microsoft Office 97 Professional edition", BPBPublications.
2. Karl Schwartz (1998), "Microsoft Windows 98 Training Guide" BPB Publications.
3. C.S. French (1998) "Data Processing and Information Technology", BPB Publications
4. P.K Sinha (1992) `Computer Fundamentals`, BPB Publications
5. Sinha P, Computer Fundamentals, BPB ,2004
6. Jain Satish, Computer Organization and operating System, BPB, 2021
7. Tanenbaum Andrew, Operating System Design and Implementation, Pearson,2006

## Departmental Minor

### BDST 115: Computational Mathematics

**Course Objectives:** - Student should be able to ...

1. Understand Fundamental properties of matrices and their applications.
2. Learn the concepts of vector space and linear mapping and apply them in related data science problems.
3. Understand the features of Differential Calculus in optimization problems.
4. Extend the concepts of integral calculus.

Credits=2	SEMESTER-I BDST 115: Computational Mathematics	No. of hours per unit/ credits
UNIT I	<b>Matrices</b>	(7)
	Definition and properties of determinants, Definition and types of matrices, Basic Operations of matrices, Inverse and Transpose of a matrix, Characteristic Polynomial, Definition and examples of Eigenvalues and Eigenvectors, Caley's-Hamilton theorem, Singular Value Decomposition.	
UNIT II	<b>Vector Spaces and Linear mapping</b>	(9)
	Definition and examples of vector spaces, Linear Combinations, Spanning sets, Linear span, Row space of matrix, Linear dependence and independence, Basis and dimensions, Linear mappings, Kernel and Image of linear mapping, Singular and non-singular linear mapping, Isomorphism, Operations with linear mapping, Matrix representation of linear mapping.	
UNIT III	<b>Differential Calculus</b>	(8)
	Methods of differentiation of functions, Product and Quotient rules, trigonometric and Inverse trigonometric functions, Implicit function, parametric form. Partial differentiation, Total differentiation, Taylor's series, Maxima, and minima of functions.	
UNIT IV	<b>Integral Calculus</b>	(6)
	Integration, Methods of integration-Substitution method, Integration by parts, Integration using partial fraction -Bernoulli's formula. Applications of Integral Calculus.	

**Course Outcomes:** Student will be able to ...

1. Apply understanding of fundamental properties of matrices and their applications.
2. Analyse properties of vectors and linear mappings.
3. Demonstrate the features of Differential Calculus in optimization problems.
- iv. Apply concepts of integral calculus.

#### Reference Books:

1. Agarwal P.R., Computational Mathematics I: Boundary Value Problems, Springer, 2020
2. T. Veerarajan, Rao, Computational Mathematics I: Numerical Analysis, Tata McGraw-Hill Education, 2012
3. Sastri S.S., Computational Mathematics I: Linear Algebra, Universities Press, 2010
4. Goyal, A.K. Computational Mathematics I: Numerical Methods, S. Chand Publishing, 2009
5. Michael Spivak, Calculus, Publish or Perish, 2008
6. Strang Gilbert, Linear Algebra and Its Applications, Thomson/Brooks Cole, 2006
7. M. Apostol. Thomas, Calculus, 2nd Edition, 1991

## Practical-I

### Lab Course I: BCSP116: based on (BCST114 and BCST115)

**Course Objectives:** Student should be able to ...

1. Learn the basic concepts of computer systems.
2. Understand the uses of computers in various fields
3. Learn the fundamental properties of matrices and their applications.
4. Explain the concepts of vector space and linear mapping and apply them in related data science problems.

Credits=2	SEMESTER-I BCSP116: Lab Course I	No. of hours per unit (60)
<b>Part A:</b>	<b>Fundamentals of Computer</b>	
	<ol style="list-style-type: none"> <li>1. Identification of the peripherals of a computer, components in a CPU and their functions.</li> <li>2. Assembling and disassembling the system hardware components of personal computer.</li> <li>3. Basic Computer Hardware Trouble shooting.</li> <li>4. Study of LAN and Wi-Fi Basics.</li> <li>5. Basic Computer Proficiency-               <ol style="list-style-type: none"> <li>1. Familiarization of Computer Hardware Parts</li> <li>2. Basic Computer Operations and Maintenance.</li> <li>3. Dos and Don'ts, Safety Guidelines in Computer Lab</li> </ol> </li> <li>6. Familiarization of Basic Software – Operating System, Word Processors, Internet Browsers, Integrated Development Environment (IDE) with Examples.</li> <li>7. Verify the components of a typical computer system.</li> <li>8. Explore, maintain files, and customize the Windows operating system.</li> <li>9. Integrate Word, Excel, and PowerPoint to prepare business documents.</li> <li>10. Study of basics of computer networks</li> </ol>	
<b>Part B:</b>	<b>Computational Mathematics</b>	
	<ol style="list-style-type: none"> <li>1. Eigenvalues and Eigen vectors of matrix.</li> <li>2. Cayley's-Hamilton theorem</li> <li>3. Linear dependence and independence of vectors.</li> <li>4. Linear mappings</li> <li>5. Matrix representation of linear mapping.</li> <li>6. Maxima and minima of functions</li> <li>7. Integration by Substitution method and Integration by parts.</li> <li>8. Applications of Integration: Area, Surface and Volume.</li> </ol>	

**Course Outcomes:** - Students will be able to ...

1. Evaluate the fundamentals of personal computers and their operations.
2. Maintain their small account using the computers and enjoy in the world of information technology
3. Apply Knowledge of fundamental properties of matrices and their applications.
4. Analyse properties of vectors and linear mappings.
5. Demonstrate the features of Differential Calculus in optimization problems. iv. Apply concepts of integral calculus.

**Reference Books:**

1. Guy Hart-Davis (1998), "The ABCs of Microsoft Office 97 Professional edition", BPB Publications,
2. Karl Schwartz (1998), "Microsoft Windows 98 Training Guide"
3. C.S. French (1998), "Data Processing and Information Technology", BPB Publications
4. P.K Sinha (1992), `Computer Fundamentals`, BPB Publications
5. Yashwant Kanetkar (2018), Let Us C, BPB Publications, Edition 18
6. Peter Prinz and Tony Crawford (2016), C in a Nutshell (2nd Ed.)
7. Jeri R. Hanly and Elliot B. Koffman (2009), Problem Solving and Program Design in C (6th Edition)
8. E. Balagurusamy (2008), Programming in ANSI C, McGraw Hill Education Edition 6

**Semester I – Open Elective**

**Science Education**

**BDSTOE 117: Indian Educational Thinkers and Educational Policies**

**Course Objectives-** Students should be able to ...

1. Learn about the contributions of some of the pioneers in education.
2. Study information in terms of educational policies and distinguish between its recommendations.
3. Gain knowledge of the contribution of educational thinkers understand the changes that occur during educational policies.

<b>Credits=2</b>	<b>SEMESTER-I</b> <b>BDST 117: Indian Educational Thinkers and Educational Policies</b>	<b>No. of hours per unit/ credits</b>
<b>UNIT I</b>	<b>Indian educational thinkers</b>	<b>(8)</b>
	1.1 Mahatma Gandhi, 1.2 Karmveer Bhaurao Patil, 1.3 Dr.A.P. J Abdul Kalam	
<b>UNIT II</b>	<b>Western educational Thinkers</b>	<b>(8)</b>
	2.1. Plato 2.2. John Dewey, 2.3. Rousseau	
<b>UNIT III</b>	<b>Educational policies</b>	<b>(8)</b>
	Highlights and Recommendations of 3.1 University Education Commission. - 3.2 Mudaliar Commission, 3.3 Kothari Commission, An analysis of the Science Curricular Policies	

<b>UNIT IV</b>	<b>NEP 1986 and NEP 2020</b>	<b>(8)</b>
	1.1. NEP 1986, 1.2. National Curriculum Framework 2005 NEP200 Highlights and implementation,	

**Course Outcomes-** Students will be able to:

1. Discuss the educational contribution of thinkers.
2. Explain educational contribution of educational thinkers.
3. Identify recommendations of educational policies and relate the same.

**Reference Books:**

1. B.N. Ghosh, Scientific method, and social research.

**BDSTOE 118: Education for development of science education**

**Course Objectives** Student should be able to...

1. Study the importance of science education.
2. Know about science institutes in India.
3. Gain knowledge about empowerment of science education.
4. Study science education for rural development.

<b>Credits=2</b>	<b>Education for development of science education</b>	<b>No. of hours per unit/ credits</b>
<b>UNIT I</b>	<b>Science education</b>	<b>(8)</b>
	1.1. Definition of Science Education, 1.2. Purpose of Science Education, 1.3. Aims of Science Education, Students attitude towards science education	
<b>UNIT II</b>	<b>Role of higher education in empowerment of science education</b>	<b>(8)</b>
	2.1. scientific skills and concept learning, 2.2. science challenges for students, 2.3. science education and research for women empowerment,	
<b>UNIT III</b>	<b>Science institutes in India</b>	<b>(7)</b>
	3.1. Introduction to science institutes in India, 3.2. History, organization, and administration of science institutes in India, 3.3. Five Major science institutes- IIS, ISRO, CSIR, IISER, IUCAA, BARC,	
<b>UNIT IV</b>	<b>Industry Case Studies and Project Work</b>	<b>(7)</b>
	4.1. Community Science -An Approach for rural development, 4.2. Technology for rural development,	

**Course Outcomes:** -Student will be able to ...

1. Explain importance of science education
2. Map the scientific institutes distribution.
3. Discuss about science and rural development.
4. Study the importance of science education.
5. Know about science institutes in India.
6. Gain knowledge about empowerment of science education.

**Reference Books:**

1. Choksi, B., Chunawala ,C & Natarajan,C(2010),Science Education for Diversity-India Country Report. Homi Bhabha Centre forScience Education,Mumbai,India
2. Sarukkai,S (2012).What is Science?New Delhi:National Book Trust

**BDSTOE 119: Democracy, Election and Good Governance**

**Learning Objective**

Students should be able to...

1. Introduce the meaning of democracy and it's important.
2. Study the various approaches of democracy and governance.
3. Understand the election procedure in India.
4. Learn the role of the good Governance and its initiatives in India.

Credits=2	<b>SEMESTER-I</b> <b>Name of Course: Democracy, Election and Good Governance (DEGG)</b>	No. of hours per unit/ credits
<b>Unit I</b>	Democracy in India Introduction	8
	Meaning, Definition of democracy & Classification: Direct democracy and representative democracy, features of direct and representative democracy	
<b>Unit II</b>	Democracy and Decentralization	8
	Development of the first indigenous electronic computer: HEC-2M, Role of F.C. Kohli in setting up the first computer manufacturing company in India, Computers and Culture in the 1960s, Early Computer Languages and Software	
<b>Unit III</b>	Election	8
	73rd and 74th Constitutional Amendment Acts: Institutions at the local level and Role of State Election commission – Local Body Elections: Urban & Rural – Duties of an Individual towards electoral process	
<b>Unit IV</b>	Good Governance	6
	Meaning and concept – Government and Governance – Good Governance initiatives in India	

**Course Outcomes:** - Student will be able to ...

1. Explain the meaning of democracy and its important.
2. Describe the various approaches of democracy and governance.
3. Examine critically election process in the country.
4. Define the role of the good Governance and its initiatives in India.

**Reference Book:** -

1. Banerjee-Dube, I, A history of modern India, Cambridge University Press, (2014).
2. Basu, D. D., Introduction to the Constitution of India, Delhi: Prentice Hall of India, (1982).
3. Bhargava, R, Political theory: An introduction. Chennai: Pearson Education India, (2008).
4. Bhargava, R., &Vanaik, A, Understanding Contemporary India: Critical Perspective. New Delhi: Orient Blackswan, (2010).
5. Chandhoke, N., &Proyadardhi,P. (Ed.), Contemporary India: Economy, Society, Politics. Chennai: Pearson Education India, (2009).
6. Chandra, B, Essays on contemporary India, New Delhi: Har-Anand Publications Pvt Ltd, (1999)
7. .Chaterjee, P, State and Politics in India. New Delhi: Oxford university Press. (1997).
8. Dasgupta. S., (Ed.). Political Sociology. Chennai: Pearson Education India, (2011).

## Semester I – IKS

### IKS- 101: History of Computers in India

**Course Objectives:** Student should be able to...

1. Understand the historical development of computers in India
2. Examine the socio-economic impact of computers in India
3. Explore indigenous developments and innovations
4. Learn about policy and governance in the context of computers

Credits=2	SEMESTER-I IKS- 101: History of Computers in India	No. of hours per unit/ credits
<b>Unit I</b>	<b>Pre-Independence Era of Computers</b>	7
	Introduction: Computing in the Pre-industrial World, Establishment of the Tata Institute of Fundamental Research, Analog Computing in the 19th and early 20th, Introduction of electronic computers in India, Information Technology before 1945	
<b>Unit II</b>	<b>Early Computing Initiatives</b>	7
	Development of the first indigenous electronic computer: HEC-2M, Role of F.C. Kohli in setting up the first computer manufacturing company in India, Computers and Culture in the 1960s, Early Computer Languages and Software	
<b>Unit III</b>	<b>Era of Mainframes and Minicomputers</b>	8
	Introduction of mainframe and minicomputer technologies in India, Role of the Department of Electronics (DoE) in promoting computerization, Evolution of Indian programming languages (FORTRAN, COBOL).	
<b>Unit IV</b>	<b>Modern Computing</b>	8
	Emergence of Indian IT companies and software exports, Role of NRIs in the growth of the Indian IT industry, Internet and Digital Revolution, Mobile computing and smartphone revolution in India, Artificial Intelligence (AI) and Machine Learning (ML) in	



**Course Outcomes:** - Student will be able to ...

1. Explain the historical development of computers in India
2. Enumerate the significant contributions by Indian scientists and institutions
3. Discuss the socio-economic impact of computers in India
4. Critically analyze challenges and opportunities in the Indian computing landscape

**Required books:**

1. Fred Turner, From Counterculture to Cyberculture University of Chicago Press, 2006
2. Martin Campbell-Kelly, From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry, MIT Press, 2003
3. Janet Abbate, Inventing the Internet, MIT Press, 1999
4. Martin Campbell-Kelly, Shouldiam Aspray, Computer: A History of the Information Machine Basic Books, 2004

**BDSTCC 1: Yoga Education**

**Course Objectives:** Students should be able to...

1. Guide the students about body Anatomy and how it works.
2. Understand relationship between fitness and wellness
3. Assess health related fitness to make lifestyle changes

<b>Credits (Total Credits 1 )</b>	<b>SEMESTER– I CC Paper – I Yoga Education</b>	<b>No. of hours per unit</b>
<b>Unit - I</b>	<b>Introduction to Yoga Education</b> History, Definition, Importance, , types of yoga	<b>(08)</b>
<b>Unit – II</b>	<b>Diet and Yoga</b> Diet- concepts, Misunderstandings about diet, Balanced diet, essential and non-essential food in yoga practice.	<b>(07)</b>
<b>Unit - III</b>	<b>Data science and Stress Management using Yoga.</b> Role of Data science in yoga, Introduction to stress, Causes of stress, Role of yoga to prevention of stress, Co-ordinations of data science, Yoga and Stress, <b>Emotion and Stress Analysis.</b>	<b>(08)</b>
<b>Unit-IV</b>	<b>Data Science and Yoga</b> Co-ordinations of data science, Yoga and Stress, Data science application for stress management, Wearable technology for yoga partitions, <b>Yoga and Health studies co-ordinate with data science.</b>	<b>(07)</b>

**Course Outcomes:** Students will be able to...

1. Gain knowledge about the human body and the importance of yoga in physical fitness
2. Maintain the body and mind by following a better lifestyle.
3. Make a career option and a source of income due to increasing demand for health and fit body and stable mental health among all groups.

**Reference Book: -**

1. B.K.S. Iyengar Yoga for Beginners Publisher Dorling Kindersley Publishers Ltd Edition First Printing Thus Publication Date August 3, 2006
2. Rath, S.S. Physical Fitness and Wellness Sports Publication (January 1, 2019)
3. Gore, M. M. Anatomy & Physiology of Yogic Practices 1 January 2017
4. Yatendra, A. Yoga & Stress management Publisher Fingerprint! Publishing Publication Date 1 June 2019
5. International Day of YOGA, common protocol: Ministry of Ayurveda, Yoga & Naturopathy, Unani, Siddhaand Homeopathy (AYUSH) 4 Revised Edition, May 2019

## Semester-II

### Major

### BDST 121: Programming Concepts

**Course Objectives: -** Student should be able to ...

1. Learn various steps in Program development.
2. Understand the basic concepts in C Programming Language.
3. Understand the basic concepts in Python Programming Language.

Credits=2	BDST 121: Programming Concepts	No. of hours per unit/ credits
<b>UNIT I</b>	<b>Introduction to Python</b>	<b>(7)</b>
	Overview of Python, History of Python, Features of Python, Structure of Python Program, Software's for python programming, Advantages of Python, Application of python	
<b>UNIT II</b>	<b>Basic Concepts in Python</b>	<b>(7)</b>
	Character Set, Python Tokens-Keywords, Identifiers, Constants, Variables, Data types, Operators, understanding variables and their role in Python, Different data types in Python (e.g., integers, floats, strings, lists), Variable declaration, assignment, and basic operations, operators	
<b>UNIT III</b>	<b>Statements-Selection statements (Decision Making)</b>	<b>(8)</b>
	Statements-Selection statements (Decision Making)- if and switch statements with examples, Repetition statements (loops)- while, for, do-while statements with examples, Unconditional statements- break, continue, go to statements with examples.	
<b>UNIT IV</b>	<b>Object Oriented Programming</b>	<b>(8)</b>
	Introduction to Object Oriented Programming, Constructor, types of Constructors, class, object, Methods, Inheritance, Polymorphism, Abstraction, Encapsulation with example	

**Course Outcomes:** Student will be able to...

1. Explain the fundamental principles of programming languages:
2. Explain the basic syntax and semantics of a programming language.
3. Demonstrate knowledge of variables, data types, and control structures in C
4. Demonstrate knowledge of variables, data types, and control structures in Python

### Reference Books

1. Matthes Eric, "Python Crash Course" ,2023
2. Wes McKinney ,Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter,2022
3. Yashwant Kanetkar, Let Us C BPB Publications,2021
4. Balaguruswamy, Programming in Ansi C,2019
5. John Zelle, "Python Programming: An Introduction to Computer Science" ,2016
6. W. Kernighan Brian , C Programming Language, 2nd Edition 2nd Edition,1988
7. Schildt Herbert, C: The Complete Reference, 1987
8. Brian Kernighan, Dennis Ritchie, The C Programming Language, 1978

### Major BCST122: Computer Programming-II

**Course Objectives:** - Student should be able to ...

1. Understand advanced concepts of C language.
2. Identify skills for writing complex programs using C.
3. Study and develop well-structured programs using C language.

Credits=2	<b>SEMESTER-II BCST122: Course III: Computer Programming-II</b>	<b>No. of hours per unit/ credits</b>
<b>UNIT I</b>	<b>Pointers</b>	(8)
	Understanding the pointers, Definition and declaration, Operations on pointer, Pointer initialization, Pointer and function, Pointer and array, Call by value and Call by reference, Pointer and Character Strings, Dynamic memory allocation and deallocation.	
<b>UNIT II</b>	<b>Structure and Union</b>	(8)
	Definition and declaration, Structure initialization, Difference between structure and union, Array of structures, Arrays within Structures, structure and function, Nested structure, Pointer to structure, self-referential structure.	
<b>UNIT III</b>	<b>C Preprocessor</b>	(6)
	Preprocessor directives – file inclusion, macro substitution – simple, nested, arguments	
<b>UNIT IV</b>	<b>File Handling</b>	(8)
	Defining and opening a file, File opening modes- read, write, append, Closing a file, Input/Output Operations on file, Random access to files, command line arguments.	

**Course Outcomes:** - Students will be able to...

1. Interpret the concept of pointers, declarations, initialization, operations on pointers and their usage.
2. Define union and enumeration user defined data types.

3. Explore functional hierarchical code organization.
4. Evaluate file handling mechanism, functions and create files at runtime.

**Reference Books:**

1. Yashwant Kanetkar (2018), Let Us C, BPB Publications, Edition 18
2. Peter Prinz and Tony Crawford (2016), C in a Nutshell (2nd Ed.)
3. Jeri R. Hanly and Elliot B. Koffman (2009), Problem Solving and Program Design in C (6th Edition)
4. E. Balagurusamy (2008), Programming in ANSI C, McGraw Hill Education Edition 6  
Peter van der Linden (1994)Expert C Programming: Deep C Secrets
5. Kanetkar Yashvant, Let us C: Authentic guide to C programming language, BPB publication, 2022

**BDST 123: Lab IV- Based on BDST 121 and BDST 122**

**(Programming Concepts and Computational Statistics)**

**Course Objectives:** - Student should be able to...

1. Understand the basic concepts in C Programming Language.
2. Understand the basic concepts in Python Programming Language.
3. Identify skills for writing complex programs using 'C'.
4. Study and develop well-structured programs using C language.

Credit: 2  Group A:	1. Practical's on programming	No. of hours per unit (60)
	1. Identifiers, 2. Constants, 3. Variables, Data types, Operators. <b>2. Practical's on Statements-Selection statements (Decision Making)</b> 1. If and switch statements with examples, 2. Repetition statements (loops)- while, 3. for, do-while statements with examples, 4. Unconditional statements- break, continue, 5. goto statements with examples. <b>3. Practical's on –</b> 1. Python variables 2. Different data types in Python (e.g., integers, floats, strings, lists), 3. Variable declaration, 4. assignment, and basic operations, 5. Conditional statements (e.g., if, if-else, elif) 6. Looping constructs (e.g., for, while), 7. Control flow statements (e.g., break, continue)	
<b>Group B:</b>	<b>Computer Programming II</b>	
	1. Write a program to create, initialize and access a pointer variable. 2. Write a program to swap two numbers using pointers. 3. Write a program to calculate Fibonacci series using pointers.	

- |  |  |  |
|--|--|--|
|  | <ol style="list-style-type: none"> <li>4. Create a structure program to input employee info (empno, name, salary) and display it on the screen.</li> <li>5. Create a structure which stores item information and calculate the amount using formula amount = price *quantity.</li> <li>6. Write a program to create a structure of marks of 3 subjects and total for three students. Find the total of each student.</li> <li>7. Write a program to create union to input student info and display it.</li> <li>8. Write a program to create union to input student info and display it.</li> <li>9. Write a program to create union to input Employee info and display it.</li> <li>10. Write a C program to find current time using predefined macros.</li> <li>11. Write a C program to Calculate area of circle using #define pre-processor.</li> <li>12. Write a program to read a file and count the number of lines, number of characters and number of words in a given file.</li> <li>13. Write a program which writes book information into disk file and display book information on the screen.</li> </ol> |  |
|--|--|--|

**Course Outcomes:** - Students will be able to ...

1. Explain the fundamental principles of programming languages:
2. Explain the basic syntax and semantics of a programming language.
3. Demonstrate knowledge of variables, data types, and control structures in C
4. Interpret the concept of pointers, declarations, initialization, operations on pointers and their usage.
5. Define union and enumeration user defined data types.
6. Explore functional hierarchical code organization.

**Reference Books:** –

1. Matthes Eric, "Python Crash Course" ,2023
2. Wes McKinney ,Python for Data Analysis: Data Wrangling with pandas, NumPy, and Jupyter,2022
3. Yashwant Kanetkar, Let Us C BPB Publications,2021
4. Balaguruswamy, Programming in Ansi C,2019
5. Yashwant Kanetkar (2018), Let Us C, BPB Publications, Edition 18
6. Peter Prinz and Tony Crawford (2016), C in a Nutshell (2nd Ed.)
7. Jeri R. Hanly and Elliot B. Koffman (2009), Problem Solving and Program Design in C (6th Edition)

## Departmental Minor

### B.Sc. I- Semester-II

#### Theory: Course IV: BCST124: Database Management Systems

**Course Objectives:** Student should be able to ...

1. Understand the fundamental concepts of data.
2. Understand principles of databases.
3. Identify the database management operation.
4. Discuss the concept of procedure oriented, object-oriented programming languages, Database Management.

Credits=2	SEMESTER-II Course IV: BCST124: Database Management Systems	No. of hours perunit/ credits
UNIT I	<b>Introduction to Database Management Systems</b>	(8)
	Definition of Database, Characteristics of database approach, data models, Importance of data models, ER Model, Relational Model, Network Model, Hierarchical Model, Object Oriented Model, Concept of DBMS, DBMS architecture and data independence.	
UNIT II	<b>Entity Relationship Modeling and Relational Data Model</b>	(7)
	Entities, Attributes and Entity Sets, Relation and Relationships sets, Features of E-R Model Relational Model - Basic concepts, Types of constraints (relational constraints), DFD and its Types, ERD, and types. of relationship	
UNIT III	<b>Relational Algebra and (Relational) Calculus</b>	(7)
	Preliminaries, Relational algebra operators, Operations on RelationalAlgebra Select, Project, Union, set different, Cartesian product, Rename, Operations on Relational Calculus: - Tuple Relational Calculus, Domain Relational Calculus	
UNIT IV	<b>Basics of Structured Query Language</b>	(8)
	Basic SQL Queries – DDL (Create, Alter, Drop) Commands and DML(Insert, Update, Delete) Commands, Select Statement, Constraints (Primary Key, Foreign Key, Unique Key, Null, Check, Default, Super Key, Candidate Key), Datatypes, Operators, Functions.	

**Course Outcomes:** - Students will be able to...

1. Apply the basics of data, information, system and Database.
2. Evaluate basics of different database models for software development.
3. Design the basics of Relational algebra operations and Relational Calculus.
4. Demonstrate SQL basics and write queries to perform different operations on real world data.

**Reference Books:**

- 1.R. Elmasri, S.B. Navathe, (2010), Fundamentals of Database Systems 6th Edition, Pearson Education
- 2.R. Ramakrishanan, J. Gehrke, (2002), Database Management Systems 3rd Edition, McGraw-Hill,
- 3.Silberschatz, H.F. Korth, S. Sudarshan, (2010), Database System Concepts 6th Edition, McGraw Hill
- 4.Silberschatz Abraham, Database System Concepts, Mc Graw Hill, 2021
- 5.Chan Ben, SQL Programming: Learn the Ultimate Coding, Basic Rules of the Structure Query Language, Notion Press, 2020
- 6.Teorey Toby, Database Modeling and Design: Logical Design, Morgan Kaufmann, 2010
- 7.SQL, PL/SQL The Programming Language of ORACLE – Ivan Bayross. BPB publication ,2021

**Departmental Minor****BDST 125: Computational Statistics****Course Objectives:** - Student should be able to...

1. Understand the basic concepts of statistics.
2. Perform Frequency distribution and data presentation.
3. Compute various measures of central tendency, dispersion, correlation, and regression.
4. Analyze the data and interpret the results.

<b>Credits=2</b>	<b>SEMESTER-II BDST 125: Computational Statistics</b>	<b>No. of hours per unit/ credits</b>
<b>UNIT I</b>	<b>Data Condensation and Measures of Central Tendency</b>	<b>(8)</b>
	Definition, importance, scope and limitations of statistics, Data Condensation: Qualitative & Quantitative. Scales of measurement: Nominal, Ordinal, Interval and Ratio, Raw data, Attributes and variables, discrete and continuous variables, Organization of data, Collection of data, classification and construction of frequency distribution, Graphical Representation: Histogram, Frequency polygon, Frequency curve, Ogive Curves, Boxplot, Examples. Measures of Central tendency: Concept of central tendency, Criteria for good measures of central tendency, Types: Arithmetic mean, G.M., H.M., Median, Mode, Quantiles, Combined Mean, Weighted Mean, Corrected Mean, Examples	
<b>UNIT II</b>	<b>Measures of Dispersion and Moments</b>	<b>(8)</b>
	Concept of dispersion and measures of dispersion, absolute and relative measures of dispersion' Types: Range, Quartile Deviation, Mean Deviation, S.D. and Variance, Combined S.D., Numerical problems. Moments: Concept of moments, Types: Raw moment, Central moment, and moment about any arbitrary point "a" for ungrouped and grouped data (only first four moments), relation between central and raw moments (statement only), Sheppard's Correction, Measures of skewness: Types of skewness, Pearson's and Bowley's coefficient of skewness, Measures of skewness based on moments, Measures of Kurtosis: Types of kurtoses, Measures of kurtosis based on moments, Numerical problems.	
<b>UNIT III</b>	<b>Correlation (for ungrouped data)</b>	<b>(7)</b>
	Concept of bivariate data, scatter diagram. Concept of correlation, positive correlation, negative correlation, cause and effect relation, Karl Pearson's	

	coefficient of correlation, Properties of correlation coefficient, interpretation of correlation coefficient, Spearman's Rank Correlation coefficient (formula with and without ties), Multiple and Partial Correlation: Concept, definition, formulae and properties, Examples.	
<b>UNIT IV</b>	<b>Regression (for ungrouped data)</b>	<b>(7)</b>
	Concept of regression. Derivation of lines of regression by method of least squares, Regression Coefficients, and their significance. Properties of regression coefficients, Point of intersection and acute angle between regression lines, Multiple regression: Concept of multiple regressions. Yule's Notations, Fitting of multiple regression planes. Partial regression coefficients, interpretations, Logistic regression, Numerical problems.	

**Course Outcomes:** - Students will be able to ...

1. Apply various types of sampling methods to data collection.
2. Create and interpret frequency tables.
3. Display data graphically and interpret graphs.
4. Recognize, describe, and calculate the measures of central tendency and dispersion.
5. Measure the correlation between two variables and estimate the value.

**Reference Books:** –

- 1) S.C.Gupta and V.K.Kapoor, Fundamental of Mathematical Statistics (12th Edition), Delhi, Sultan Chand and Sons, 2020
- 2) T.C. Gupta. Fundamental of Statistics (7th Edition), Mumbai, Himalaya Publishing House, 2018.
- 3) Gentle, E. James, Numerical Linear Algebra for Applications in Statistics. Springer, 2018.
- 5) Efron, Bradley, Hastie Trevor, Computer Age Statistical Inference: Algorithms, Evidence, and Data Science. Cambridge University Press, 2016.
- 6) S. P. Gupta, Sultan Chand, Statistical Methods, Delhi, 2014
- 7) B. L. Agarwal Basic Statistics (6th Edition), New Age International Private Ltd, Delhi, 2013.
- 8) Christian P. Robert, and Casella, George. Carlo Monte Statistical Methods. Springer, 2004.
1. A. M. Goon, M. K. Gupta, B. Das Gupta. Fundamentals of Statistics, The World Press Private Ltd., Calcutta ,1968.

### **Lab Course II: BCSP126: Lab (based on BCST124 and BCST125)**

**Course Objectives:** Student should be able to...

1. Understand fundamental concepts of data.
2. Understand principles of databases.
3. Compute various measures of central tendency, dispersion, correlation, and regression.
4. Analyze the data and interpret the results.

<b>Credits=2</b>	<b>SEMESTER-II</b> <b>BCSP126: Lab Course II</b>	<b>No. of hours per unit (60)</b>
<b>Part A:</b>	<b>Database Management Systems</b>	



	<ol style="list-style-type: none"> <li>1. Create table Student, Teacher, Book_dtls, Product and perform all DDL and DML Commands.</li> <li>2. Perform calculations on above created tables Condition specification using Boolean and comparison operators (and, or, not, =, &lt;&gt;, &gt;, &lt;,&gt;=, &lt;=)</li> <li>3. Use Aggregate functions</li> <li>4. Use String handling functions.</li> <li>5. Create table and apply all constraints. <ol style="list-style-type: none"> <li>a. Create tables with relevant foreign key constraints.</li> <li>b. Populate the tables with data.</li> </ol> </li> <li>6. Display all the details of all employees working in the company and solve the following queries. <ol style="list-style-type: none"> <li>a. Display ssn, lname, fname, address of employees who work in department no 7.</li> <li>b. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong.'</li> <li>c. Retrieve the name and salary of every employee.</li> <li>d. Retrieve all distinct salary values.</li> <li>e. Retrieve all employee names whose address is in 'Bellaire.'</li> <li>f. Retrieve all employees who were born during the 1950s.</li> <li>g. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)</li> </ol> </li> </ol>	
<b>Part B:</b>	<b>Computational Statistics</b>	
	<ol style="list-style-type: none"> <li>1. Construction of Discrete frequency distribution</li> <li>2. Construction of continuous Frequency distribution</li> <li>3. Graphical representation</li> <li>4. Diagrammatic representation</li> <li>5. Compute Mean, Median, Mode and quartile for Individual data</li> <li>6. Compute Mean, Median, Mode and quartile for Discrete frequency distribution</li> <li>7. Compute Mean, Median, Mode and quartile for continuous frequency distribution</li> <li>8. Compute Range, G.D., S.D variance and its relative measures for Individual data.</li> <li>9. Compute Range, G.D., S.D variance and its relative measures for Discrete frequency distribution</li> <li>10. Compute Range, G.D, S.D variance and relative measures for Continuous frequency distribution</li> </ol>	

**Course Outcomes:** - Students will be able to...

1. Apply basics of pointer, Structure and Union, File Handling, C Preprocessor.
2. Evaluate how to implement theoretical knowledge of SQL into SQL queries.
3. Create and write queries for any application software and able to handle database.
4. Acquire the Relational Database Management skill, Concurrency Control mechanism.

**Reference Books:**

- 1.R. Elmasri, S.B. Navathe, (2010), Fundamentals of Database Systems 6th Edition, Pearson Education
- 2.R. Ramakrishanan, J. Gehrke, (2002), Database Management Systems 3rd Edition, McGraw-Hill,
- 3.Silberschatz, H.F. Korth, S. Sudarshan, (2010), Database System Concepts 6th Edition, McGraw Hill
- 4.Silberschatz Abraham, Database System Concepts, Mc Graw Hill, 2021
- 4) S.C. Gupta and V.K. Kapoor, Fundamental of Mathematical Statistics (12th Edition), Delhi, Sultan Chand and Sons, 2020
- 5) T.C. Gupta. Fundamental of Statistics (7th Edition), Mumbai, Himalaya Publishing House, 2018.
- 6) Gentle, E. James, Numerical Linear Algebra for Applications in Statistics. Springer, 2018.
- 5) Efron, Bradley, Hastie Trevor, Computer Age Statistical Inference: Algorithms, Evidence, and Data Science. Cambridge University Press, 2016.

**SEMESTER-II**  
**Open Elective I**  
**Learning Techniques**

**Learning Objectives**

Student should be able to...

1. Study Project based learning.
2. Know about activity-based learning.
3. Understand constructivism.

<b>Credits=2</b>	<b>SEMESTER-II Learning techniques</b>	<b>No. of hours per unit/credits</b>
<b>UNIT I</b>	<b>Project based learning</b>	<b>(8)</b>
	2.1. Introduction to PBL, 2.2. Importance and features, Benefits, examples,	
<b>UNIT II</b>	<b>Constructivist learning</b>	<b>(8)</b>
	2.1. Introductions, 2.2. Importance and features, 2.3 Benefits and examples	
<b>UNIT III</b>	<b>Activity based learning</b>	<b>(8)</b>
	3.1. Introduction, 3.2 Importance and features, 3.3 Benefits and examples	
<b>UNIT IV</b>	<b>Cooperative learning</b>	<b>(6)</b>
	4.1. Introduction 4.2 Importance and features, 4.3 Benefits and examples	

**Learning Outcomes:** - Student will be able to ...

1. Describe project-based learning.
2. Explain constructivism.
3. Involve in activity-based learning.

**Reference Books:**

1. John Lok, Learning new technology strategies
2. John Gamberini, Accelerated Learning: Techniques to Get a Photographic Memory, Learn Faster, Remember Anything & Increase Productivity, El-Gorr International Consulting Limited, 29 October 2019
3. Kevin Garnett QC, Accelerated Learning, Semsoli, 15 June 2020

**Open Elective II**  
**Contribution of Eminent Scientist**

**Course Objectives:** - Student should be able to...

1. Study about the contribution of eminent scientists.
2. Learn Scientific inventions in social life.
3. Develop Scientific attitude.
4. Develop experimental skills.

Credits=2	SEMESTER II Contribution of Eminent Scientists	No. of hours per unit/ credits
<b>UNIT I</b>	<b>Sir CV Raman</b>	<b>(8)</b>
	1.1.Introduction, 1.2.Brief Life History, 1.3 Scientific Contribution	
<b>UNIT II</b>	<b>APJ Abdul Kalam</b>	<b>(8)</b>
	2.1. Introduction, 2.2. Brief Life History, 2.3. Scientific Contribution,	
<b>UNIT III</b>	<b>Homi Bhabha</b>	<b>(8)</b>
	3.1. Introduction, 3.2. Brief Life History, 3.3. Scientific Contribution,	
<b>UNIT IV</b>	<b>Jayant Naralika</b>	<b>(6)</b>
	4.1. Introduction, 4.2. Brief Life History, 4.3. Scientific Contribution ,	

**Course Outcomes:** - Student will be able to ...

1. Describe Scientific contribution of eminent scientists.
2. Utilize innovations in social life.

3. Develop Scientific attitude.
4. Discuss about social contribution of eminent scientist.

**Reference Books:**

1. Chunawala ,S.&Ladge,S(1998).Students ideas about Science and Scientists,Technical Report No.38 HBCSE
2. Eminent Indians scientists and Technology, M.L. Ahuja
3. the great Indian scientists, CENGAGE

**BDSP 129: Lab III- Lab VI Based on BDST 128 and BDST 129**

**Course Objectives:** -Student should be able to...

1. Study Project based learning.
2. Know about activity-based learning.
3. Understand constructivism.
4. Develop scientific attitude.
5. Develop experimental skills.

<b>Credit: 2</b>	<b>Applications of data science for social sciences</b>	<b>No of Hours per Unit (60)</b>
<b>Group A:</b>		
	<p><b>Course Objectives: Students will be able to,</b></p> <ol style="list-style-type: none"> <li>1. Understand</li> <li>2. Learn</li> <li>3. Know</li> <li>4. Study</li> </ol>	
	1 Collect information and make a report on contribution of any scientist	

**Course Outcomes:** -Students will be able to ...

1. Explain the contribution of scientists.
2. Discuss the applications of data science.

**Reference Books:**

1. Great scientists, Shah Suresh (2005)
2. Indian scientist, Pathak Sarita

## SEMESTER-II

### SEC 103 Data Analytics Skills for a Data Scientist

**Course Objective:** - Student should be able to ...

- 1.Learn Statistical Analysis
- 2.Learn Data Visualization.

<b>Credits=2</b>	<b>SEC 103 Data Analytics Skills for a Data Scientist</b>	<b>No. of hours per unit/ credits</b>
<b>UNIT I</b>	<b>Introduction to Data Analytics and Data Science</b>	<b>(8)</b>
	Overview of data analytics and its role in data science, Understanding the data science workflow, Introduction to common data analysis tasks and challenges	
<b>UNIT II</b>	<b>Statistics and probability Skills</b>	<b>(8)</b>
	Probability distributions, Over and under sampling, Bayesian (or frequency) statistics, Dimension reduction	
<b>UNIT III</b>	<b>Data wrangling and database management</b>	<b>(7)</b>
	Useful tools for data wrangling include Altair, Talend, Alteryx and database management tools include MySQL, MongoDB, Oracle.	
<b>UNIT IV</b>	<b>Machine learning and deep learning</b>	<b>(7)</b>
	Linear regression, Logistic regression, Naive Bayes, Decision tree, Random Forest algorithm, K-nearest neighbor (KNN), K means algorithm	

**Course outcomes:** - Student will be able to ...

1. Conduct effective data Exploration.
2. Perform Data Cleaning and Preparation
3. Perform data exploration and analysis.

**Reference Books:**

1. David Stephenson, Business Skills for Data Scientists, Data Science Innovation, 2021
2. Vincent Granville, Developing Analytic Talent: Becoming a Data Scientist, Wiley, 2014
3. Dr. Briit, The Data Science Mindset, 2021
4. Jones Herbert, Data Science: What the Best Data Scientists Know About Data Analytics, Data, 2019
5. Mining, Statistics, Machine Learning, and Big Data, 2018

**Value Education Course****VES 104: Environmental Sociology**

**Course objectives:** Student should be able to...

1. Have a sound conceptual, theoretical, and empirical background to the issues of environment
2. Understand the concept of sustainable development and resource management
3. Prepare for further research in the area.

<b>Credits (2)</b>	<b>Theory Paper (Course code)</b>	<b>No. of hours per unit</b>
<b>Credit – Unit I:</b>	<b>VES 104: Environment and Sociology</b>	<b>(6)</b>
	1.1 Introduction to Sociology and Environment 1.2 Environment in Classical Sociological Tradition 1.3 Sociology's response to environmental issues	
<b>Credit – Unit II</b>	<b>Environmental Sociology in India</b>	<b>(8)</b>
	2.1 Environmental Sociology in India. 2.2 Environmentalism and Environmental Movement in India 2.3 Ideological Trends in Indian Environmentalism 2.4 Environmental movements in local perspective	
<b>Credit – Unit III</b>	<b>Environmental Sociology around the world</b>	<b>(8)</b>
	3.1 Environmentalism around the world: Past and Present 3.2 Contemporary Environmental Movements 3.3 Environmental Movements in Global Perspectives	

<b>Credit – Unit IV</b>	<b>Sustainable Development and Sociology</b>	<b>(8)</b>
	4.1 The Concept of Sustainability 4.2 Environment and Sustainable Development 4.3 Resource, Property and Resource Governance Regimes 4.4 Environmental Democracy and Climate Change	

**Course Outcomes:** students will be able to...

- 1.Explain the main concepts, theories, debates, and empirical practices on the interactionbetween environment and society.
- 2.. Describe current theoretical and empirical debate on environmental movements and sustainable resource management practices.
- 3.Evaluate policies and practices concerning environmental governance and sustainable development.
- 4.Appropriately apply different theories and methodologies of research in different contexts relevant to environment and sustainable development

**References:**

- 1.John Hanningan, Environmental Sociology: A Social,2006
- 2.Bell, Michael Mayerfeld, An Invitation to Environmental Sociology. ThousandOaks, California: Pine Forge Press.,2004
- 3.R. Dunlap, Frederick.H. Buttel, Peter Dickens and August Gijswijt. Sociological Theory and the Environment: Classical Foundations, ContemporaryInsights.2004
- 4.John Barry, Environment and Social Theory. Oxan: Routledge,1999
- 5.John.Hanningan, Environmental Sociology. Oxan: Routledge, ConstructionistPerspective. Oxan: Routledge,1996