Estd. 1962
"A++" Accredited by
NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004,
MAHARASHTRA
PHONE:EPABX-2609000, www.unishivaji.ac.in, bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्याससमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४

Ref./SU/BOS/Com & Mgt./ 261 **Date : 03/05/2025**

To,

The Principal
All Affiliated (Commerce & Management) Colleges/ Institutions,
Shivaji University, Kolhapur

Subject :Regarding syllabi of B.C.A. Part-II (Sem. III & IV) degree programme under the Faculty of Commerce & Management as per National Education Policy, 2020 (NEP 2.0)

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the University authorities have accepted and granted approval to the syllabi of **B.C.A. Part-II (Sem. III & IV)** under the Faculty of Commerce & Management as per National Education Policy, 2020 **(NEP 2.0)**

This syllabi shall be implemented from the academic **year 2025-2026** onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in (Online Syllabus).

The question paper on the pre-revised syllabi of above mentioned course will be set for the examinations to be held in October/November 2025 & March/ April, 2026. These chances are available for repeater students, if any.

You are therefore, requested to bring this to the notice of all Students and Teachers concerned.

Thanking you,

Yours faithfully,

(Dr. S. M. Kubal)
Dy. Registrar

Encl: As above

for Information and necessary action

Copy to:

1	Dean, Faculty of Commerce & Management	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B. Com. Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

SHIVAJI UNIVERSITY,KOLHAPUR

Estd. 1962,

NAAC "A++" Grade

Faculty of Commerce and Management

Draft Syllabus for

Bachelor of Computer Applications (BCA)

Part II(SEM-III& IV)

CBCS Course Structure to be implemented from Academic Year2025-26
(Under NEP 2.0)
As Per AICTE Model Curriculum

(Subject to the modifications that will be made from time to time)

SEMESTER III

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical	
							Int	Uni	Total	Int	Uni
1	CC201	Probability and Statistics	4	0	0	4	20	80	100	--	--
2	CC202	Data Base Management System	3	0	2	4	10	40	50	--	50
3	SEC201	Python Programming	3	0	2	4	10	40	50	--	50
4	CC203	Software Engineering	3	0	0	3	15	60	75	--	--
5	DSE201.1	**Professional Elective I** Basics of Data Analytics using Spreadsheet	4	0	4	6	20	80	100	50	--
	DSE201.2	**Professional Elective I** Feature Engineering									
	DSE201.3	**Professional Elective I** Web Programming I									
6	VAC201.1	Yoga	0	0	2	1	20	30	50	--	--
	VAC201.2	Sports									
	VAC201.3	NCC									
	VAC201.4	NSS									
	VAC201.5	Disaster Management									
	VAC201.6	Vivek Vahini									
TOTAL						**22**			**425**	**50**	**100**
Total Marks										**575**	

Note: Professional Elective-I course (DSE201) should be kept from the same group as next consecutive semesters wherever applicable.

SEMESTER IV

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical	
							Int	Uni	Total	Int	Uni
1	CC204	Relational Database Management System(RDBMS)	1	0	2	2	--	--	--	--	50
2	CC205	Computer Networks	3	0	0	3	15	60	75	--	--
3	CC206	Design and Analysis of Algorithm	3	0	0	3	15	60	75	--	--
4	CC207	Artificial Intelligence	4	0	4	6	20	80	100	--	50
5	DSE202.1	**Professional Elective II** Data Visualization	4	0	4	6	20	80	100	50	--
	DSE202.2	**Professional Elective II** Introduction to ML									
	DSE202.3	**Professional Elective II** Web Programming II									
6	SEC202	Design Thinking and Innovation	0	0	2	1	20	30	50	--	--
TOTAL						**22**			**400**	**50**	**100**
Total Marks										**575**	

Note: Professional Elective-II course (DSE202) should be kept from the same group as per the Course selected under Professional Elective–I (DSE201.1/ DSE201.2/ DSE201.3) for this semester as well as next consecutive semesters wherever applicable.

SEMESTER-III

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
CC201	**Probability and Statistics**	4	0	0	4	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	80	100	--	--
Course Outcomes (COs):	CO1: Understand measures of central tendency and dispersion. CO2: Represent the statistical data in a systematic way to analyze and draw meaningful information from them. CO3: Apply fundamental concepts of probability to analyze data and make informed decisions. CO4: Formulate the hypothesis and use various tests for testing of hypothesis.									
Prerequisite										Hrs.
UNIT I	Basic concepts of Statistics, qualitative and quantitative data, classification of data, construction of frequency distribution, diagrammatic representation of data. Measures of Central Tendency: Arithmetic mean, median and mode—their properties Measures of Dispersion: Range, mean deviation, quartile deviation, variance and standard deviation.									15
UNIT II	Correlation: Definition, scatter diagram, types of correlation, measures—Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient. Regression: Linear regression-fitting by least square method and interpretation, regression equations, regression coefficients									15
UNIT III	Concepts of probability: Experiment and sample space, events and operations with events, probability of an event, basic probability rules, applications of probability rules, conditional probability. Random Variables: Discrete and continuous random variable, probability distribution of a random variable, probability mass function, probability density function, expectation and variance of a random variable. Standard Probability Distributions: Binomial probability distribution, Poisson probability distribution, Normal probability distribution.									15
UNIT IV	Sampling Distribution: Concept of Population and Sample, parameter and statistic, sampling distribution of sample mean and sample proportion. Statistical Inference: Estimation and Hypothesis Testing (only concept).Hypothesis Testing for a Single Population: Concept of a hypothesis testing, tests involving a population mean and population proportion (z test and t test).Chi square test for independence of attributes and goodness of fit.									15
TextBooks/ ReferenceBooks	1.Manish Sharma, Amit Gupta, The Practice of Business Statistics, Khanna Book Publishing Company, 2010 (AICTE Recommended Textbook) 2.Das N. G., Statistical Methods, Combined Edition, Tata McGraw Hill, 2010. 3.Ross Sheldon M., Introduction to Probability and Statistics for Engineers and Scientists, 6th Edition, Elsevier, 2021.									

	4.Miller Irwin and Miller Marylees, Mathematical Statistics with Applications, Seventh Edition, Pearson Education, 2005 5. Pal Nabendu and Sarkar Sahadeb, Statistics: Concepts and Applications, Second Edition, PHI, 2013 6. Montgomery Douglas and Runger George C., Applied Statistics and Probability for Engineers, Wiley, 2016. 7. Reena Garg, Engineering Mathematics, Khanna Publishing House, 2024.
Web Resources	https://nptel.ac.in/courses/111106112 https://nptel.ac.in/courses/111105041

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
CC202	**Database Management Systems**	3	0	2	4	**Int**	**Uni**	**Total**	**Int**	**Uni**
						10	40	50	--	50
Course Outcomes (COs):	CO1: Understand Core Concepts of DBMS CO2: Understand components of Database Design CO3: Identify different database models CO4: Demonstrate Database Design including forms and reports through MS-Access									
Prerequisite	Basic knowledge of Set Theory.									Hrs.
UNIT I	Introduction to Databases: Definition of Data, Database, and DBMS, Overview of Database Applications, Advantages and Disadvantages of DBMS, Roles of Database Users and Administrators Data Models: Introduction to Data Models, Types of Data Models (Hierarchical, Network, Relational, Object-oriented), Importance of Data Models in DBMS									12
UNIT II	Entity-Relationship (ER) Model, Entities and Entity Sets, Attributes and Relationships, ER Diagrams, Key Constraints and Weak Entity Sets, Introduction to the Relational Model and Relational Schema Operations: Selection, Projection, Set Operations, Join Operations, Division, Tuple and Domain Relational Calculus									15
UNIT III	Normalization and Database Design: Functional Dependencies: Normal Forms (1NF, 2NF, 3NF, BCNF), Case Studies: Library system, sales system, hospital system Database Design: Keys: Primary Key, Candidate Key, Super Key, Foreign Key, Unique Key									8
UNIT IV	DBMS using MS access – Introduction and features, Tables, DDL DML and DQL queries using wizards, Join tables and queries using wizard, Relationships, Macros, Forms, Reports, Module									10
TextBooks/ Reference Books	1.Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", third edition,McGraw – Hill, 2018 2.Korth, Silbertz, Sudarshan," Database System Concepts", Seventh Edition, McGraw – Hill.(2019) 3.R.P. Mahapatra, Govind Verma, "Database Management Systems", Khanna Publishing House, 2025.									
Web Resources	1.https://oracle-base.com/articles 2.https://forums.oracle.com/ords/apexds/domain/dev- community/category/sql_and_pl_sql 3.https://asktom.oracle.com/ords/f?p=100:1:0									

CC202: Database Management Systems Practical List

1. Draw an ER Diagram of Sales system.
2. Draw an ER Diagram of Hospital Management System.
3. Convert The ER diagram in question no 1 into tables.
4. Convert the ER diagram of question no 2 into tables.
5. Consider the following Schema
   Supplier(SID, Sname, branch, city, phone)
   Part (PID, Pname, color, price)
   Supplies(SID, PID, qty, date_supplied)
   a. Create above tables in ACCESS for data entry.
   b. Create relationships between these tables in ACCESS.
   c. Perform SQL Queries including joins
   d. Create a form for these tablesand perform data entry.
   e. Create a report in Access
6. Demonstrate how to create a blank form in Access.
7. Demonstrate how to split form in Access.
8. Demonstrate how tocreate a form that displays multiple records in Access.
9. Demonstrate how tocreatea form that contains a subform in Access.
10. Demonstrate how tocreatea Navigation form in Access.
11. Demonstrate how tocreatereports in Access.
12. Demonstrate how to create reports in Access with grouping, sorting or totals.
13. Demonstrate how tohighlight data with conditional formatting.

<table>
<tr><th>Course Code</th><th>Cours Title</th><th>L</th><th>T</th><th>P</th><th>Credit</th><th colspan="3">Theory</th><th colspan="2">Practical</th></tr>
<tr><td rowspan="2">SEC201</td><td rowspan="2">Python Programming</td><td rowspan="2">3</td><td rowspan="2">0</td><td rowspan="2">2</td><td rowspan="2">4</td><td>Int</td><td>Uni</td><td>Total</td><td>Int</td><td>Uni</td></tr>
<tr><td>10</td><td>40</td><td>50</td><td>--</td><td>50</td></tr>
<tr><td>Course Outcomes (COs):</td><td colspan="9">CO1: Develop modular Python programs.
CO2: Apply suitable Python libraries to solve a given problem.
CO3: Understand basic Data visualization and File handling in Python.</td></tr>
<tr><td>Prerequisite</td><td colspan="8">Understanding of Problem solving techniques using a programming language and basic datastructures.</td><td>Hrs.</td></tr>
<tr><td>UNIT I</td><td colspan="8">Introduction: History and Application areas of Python; Structure of Python Program;Identifiers and Keywords; Operators and Precedence; Basic Data Types and type conversion;Statements and expressions; Input/Output statements.
Strings: Creating and Storing Strings, Built-in functions for strings; string operators, Stringslicing and joining; Formatting Strings.
Control Flow Statements: Conditional Flow statements; Loop Control Statements; Nestedcontrol Flow; continue and break statements, continue, Pass and exit.</td><td>15</td></tr>
<tr><td>UNIT II</td><td colspan="8">Functions: Built-In Functions, Function Definition and call; Scope and Lifetime of Variables,Default Parameters, Command Line Arguments; Lambda Functions; Assert statement;Importing User defined module;
Mutable and Immutable objects: Lists, Tuples and Dictionaries; Commonly used Functions on Lists, Tuples and Dictionaries. Passing Lists, tuples and Dictionaries as argumentsto functions. Using Math and Numpy module for list of integers and arrays.</td><td>15</td></tr>
<tr><td>UNIT III</td><td colspan="8">Files: Types of Files; Creating, Reading and writing on Text and Binary Files;The Pickle Module, Reading and Writing CSV Files. Reading and writing of csv and JSON files.
Exception Handling: Try-except-else-finally block, raise statement, hierarchy of exceptions,adding exceptions.
Data visualization: Plotting various 2D and 3D graphics; Histogram; Pi charts; Sine and cosinecurves.</td><td>15</td></tr>
<tr><td>TextBooks/ Reference Books</td><td colspan="9">1. Venkatesh, Nagaraju Y, Introduction to Python Programming, Khanna Publishing House, 2021.
2. Jeeva Jose, Introduction to Computing & Problem Solving With PYTHON, Khanna Publishing House, 2023.
3. Sheetal Taneja & Naveen kumar: Python Programming a Modular approach – A Modularapproach with Graphics, Database, Mobile and Web applications, Pearson, 2017.
4. Think Python, by Allen Downey, 2 nd edition, 2015, O'Reilly. https://drive.google.com/file/d/1p9Pul6d5UvnQrO9-Q-LE2_p4YvMk5cIg/view
5. An introduction to Python for absolute beginners, by Bob Dowling, Cambridge Univ.
6. Introduction to Computation and Programming using Python, by John Guttag, 2 nd edition,2016, PHI India.</td></tr>
<tr><td>Web Resources</td><td colspan="9">1. https://www.learnpython.org/
2. https://www.w3schools.com/python/default.asp</td></tr>
</table>

SEC201:Python Programming Lab

1. Write a program to find whether a number is a prime number.
2. Write a program to print m raise to power n, where m and n are read from the user.
3. Write a program having a parameterized function that returns True or False depending onwhether the parameter passed is even or odd.
4. Write a program to print the summation of the following series upto n terms:1-2+3-4+5-6+7 - - - -n
5. Write a menu driven program to perform the following operations on strings using stringbuilt in functions.

a. Find the frequency of a character in a string.
b. Replace a character by another character in a string.
c. Remove the first occurrence of a character from a string.
d. Remove all occurrences of a character from a string.

6. Write a program that accepts two strings and returns the indices of all the occurrences of thesecond string in the first string as a list. If the second string is not present in the first string,then it should return -1
7. Using Numpy module write menu driven program to do following

a. Create an array filled with 1's.
b. Find maximum and minimum values from an array
c. Dot product of 2 arrays.
d. Reshape a 1-D array to 2-D array.

8. Write a function that takes a sentence as input from the user and calculates the frequency ofeach letter. Use a variable of dictionary type to maintain the count.
9. Consider a tuple t1=(1,2,5,7,9,2,4,6,8,10). Write a program to perform following operations:

a. Print contents of t1 in 2 separate lines such that half values come on one line and otherhalf in the next line.
b. Print all even values of t1 as another tuple t2.
c. Concatenate a tuple t2=(11,13,15) witht1.
d. Return maximum and minimum value from t1.

10. Write a function that reads a file file1 and copies only alternative lines to another file file2.Alternative lines copied should be the odd numbered lines.
11. Write a Python program to handle a ZeroDivisionError exception when dividing a number by zero.
12. Write a program that reads a list of integers from the user and throws an exception if any numbers are duplicates.
13. Write a program that makes use of a function to display sine, cosine, polynomial andexponential curves.
14. Take as input in the months and profits made by a company ABC over a year.
    Representthis data using a line plot.
    Generated line plot must include X axis label name = Month Number and Y axis label Name = Total profit.

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
CC203	**Software Engineering**	3	0	0	3	**Int**	**Uni**	**Total**	**Int**	**Uni**
						15	60	75	--	--
Course Outcomes (COs):	**CO1:** To Acquire a comprehensive understanding of the software development lifecycle and its application in contemporary software engineering practices. **CO2:** To Develop proficiency in project management methodologies and strategic decision-making for successful software project execution. **CO3:** To Master the art of software design, development, and testing to produce robust and efficient software solutions. **CO4:** To understand the importance of quality management in software engineering for sustenance and reliability.									
Prerequisite	Basic understands of Software, Applications, Programming fundamentals									Hrs
UNIT I	**Introduction**: Role of software, changing nature of software, layered technology, a process framework. **Process models:** The waterfall model, incremental process models, evolutionary process models, the unified process.**Agile software development:** Agility Principles, Agile methods, Plan-driven and agiledevelopment, Extreme programming, Scrum, A Tool Set for the Agile Process.									12
UNIT II	**Software Requirements Engineering:** Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management. Inoduction to System Analysis and Tools(DFD,ERD)									12
UNIT III	**Design:** Design process and design quality, design concepts, the design model, software architecture, data design, Input Design, Output Design, Basic structural modeling, class diagrams,sequence diagrams, collaboration diagrams, use case diagrams, component diagrams. **Testing Strategies:** A strategic approach to software testing, test strategies for conventionalsoftware, black-box and white-box testing, validation testing, system testing, the art of debugging.									12
UNIT IV	**Quality Management:** Software quality, software quality attributes and Quality concepts, software quality assurance. SCM, vesion control and **Release Management**									9
TextBooks/ ReferenceBooks	1. Software Engineering, N.S. Gill, Khanna Publishing House, 2023 (AICTERecommended Textbook) 2. Software Engineering, Ian Somerville, 9th edition, Pearson education. 3. Software Engineering A practitioner's Approach, 8th edition, Roger S Pressman, BruceR. Maxim. McGraw Hill Education, 2015. 4. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007 5. Software Engineering: Principles and Practice Hans van Vliet									

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
DSE201.1	**Professional Elective – I** Basics of Data Analytics using Spreadsheet	4	0	4	6	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	80	100	50	--
Course Outcomes (COs):	CO1: Understand the basics of MS Excel for data analytics and its applications. CO2: To explore advanced Excel functions and data analytics tools. CO3: Develop proficiency in using spreadsheet software for data manipulation andAnalysis. CO4: Build and use spreadsheet models for decision making & Communicate data insights effectively									
Prerequisite	Knowledge on basics of mathematical & Statistical concepts such as arithmetic,Percentages, averages, and basic algebra.									Hrs
UNIT I	**Introduction to MS-Excel** Spreadsheets basics, Need for Spreadsheets, Work-Book, Work –Sheet, Parts of aMS-Excel Work-Sheet- Program area, Work area, Contents of Title-Bar, Manu-Bar,Contents of Manu Ribbons, Meaning of Cell- Cell address, Formula-Bar, Row-Numbers, Column-Letters, Quick Access to Tool-Bar, Office Button, FloatingFrames, Adding Work-Sheets in Sheet Tab, Status- Bar., and other features of Excel.									15
UNIT II	**Advanced Excel Functions:** VLOOKUP, HLOOKUP, INDEX-MATCH, and PivotTables. Data Analysis ToolPak: UsingExcel's built-in data analysis tools such as Descriptive Statistics, Histograms, Correlation, and Regression.									15
UNIT III	**Introduction to Data Analytics** Understanding data and its types (structured, unstructured, semi-structured)-What is Data Analytics- Types of data Analytics-Importance of Data Analytics- Applications of Data Analytics.									15
UNIT IV	**Case Studies on Data Analytics:** Data Collection Methods - Different Data Sources & format - Data Cleaning and Transformation - Handling Missing Data and Outliers. - Ethical considerations in data analytics. - Real-world Applications of Data Analytics- Industry-specific applications (finance, marketing, operations) - Case Study **Note: Case study is for discussion not to be considered for evaluation.**									15
TextBooks/ Reference Books	1. "Beginner's Guide for Data Analysis using R Programming" by Jeeva Jose,Khanna Publishing House, 2024. 2. "Data Analytics" by V.K. Jain, Khanna Book Publishing Company, 2024. 3. "Excel Data Analysis For Dummies" by Stephen L. Nelson and E. C. Nelson, JohnWiley & Sons; 3rd edition, 2016 4. "Data Analysis Using Microsoft Excel" by Michael R. Middleton, Thomson,Brooks/Cole, 3rd edition , 2004 5. "Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach,John Wiley & Sons, 25 Sept 2018 6. "Spreadsheet Modeling and Decision Analysis: A Practical Introduction toBusiness Analytics" by Cliff T Ragsdale, Cegage learning asia pet. 2015 7. "Mastering Excel" by WebTech Solutions, Khanna Publishing House, 2024.									

DSE201.1: Professional Elective – I Basics of Data Analytics using Spreadsheet Program List

PART – A: Understanding and Describing the Data

Introduction to Excel and Basic Functions

1. Getting started with Excel: Workbook, Worksheet, Cells, and Ranges
2. Data entry and basic formatting techniques
3. Using basic arithmetic functions: SUM, AVERAGE, MIN, MAX, ROUND
4. Introduction to cell referencing: relative, absolute, and mixed

Data Importing and Pre-processing

1. Importing data from various sources (CSV, text files, web data)
2. Data cleaning: removing duplicates, handling missing data, and standardizing formats
3. Data transformation: text-to-columns, data validation techniques
4. Using the "Find & Replace" and "Text Functions" (LEFT, RIGHT,MID, CONCATENATE)

Descriptive Statistics Using Excel

1. Calculating measures of central tendency: mean, median, mode
2. Computing measures of dispersion: range, variance, standard deviation
3. Creating and interpreting frequency distributions and histograms
4. Using Excel's "Data Analysis Toolpak" for basic statistical analysis

PART- B: Beyond the Basics: Visualizing and Communicating Data

Advanced Spreadsheet Functions

1. Using logical functions: IF, AND, OR, IFERROR
2. Lookup and reference functions: VLOOKUP, HLOOKUP, INDEX, MATCH
3. Data aggregation techniques: SUMIFS, COUNTIFS, AVERAGEIFS
4. Text functions for data manipulation: TRIM, CLEAN, TEXT, RIGHT, LRFT, MID

Data Visualization Techniques

1. Creating various chart types: bar, line, pie, scatter
2. Advanced charting techniques: combo charts, dual-axis charts
3. Data visualization best practices: choosing the right chart, formatting, and styling
4. Creating and customizing PivotTables and Pivot Charts

Dashboard Creation

1. Introduction to dashboards: concepts and components
2. Using PivotTables and Pivot Charts for dashboard elements
3. Applying conditional formatting for dynamic visual cues
4. Creating interactive dashboards with slicers and timeline

<table>
<tr><th>Course Code</th><th>Cours Title</th><th>L</th><th>T</th><th>P</th><th>Credit</th><th colspan="3">Theory</th><th colspan="2">Practical</th></tr>
<tr><td rowspan="2">DSE201.2</td><td rowspan="2">Professional Elective – I
Feature Engineering</td><td rowspan="2">4</td><td rowspan="2">0</td><td rowspan="2">4</td><td rowspan="2">6</td><td>Int</td><td>Uni</td><td>Total</td><td>Int</td><td>Uni</td></tr>
<tr><td>20</td><td>80</td><td>100</td><td>50</td><td>--</td></tr>
<tr><td>Course Outcomes (COs):</td><td colspan="10">CO1:Understand the importance of features in machine learning and differentiate between various types of data and features
CO2:Apply basic feature preprocessing techniques
CO3:Implement feature engineering techniques for numerical data and utilize categorical data techniques
CO4: Understand feature selection and feature transformation techniques with their applications</td></tr>
<tr><td>Prerequisite</td><td colspan="9"></td><td>Hrs</td></tr>
<tr><td>UNIT I</td><td colspan="9">IntroductiontoFeatureEngineering
Introduction to Data and Features:Importane of Features in Machine Learning
Data types and features:Numerical,Categorical,Ordinal,Discrete,Continuous, Interval and Ratio</td><td>15</td></tr>
<tr><td>UNIT II</td><td colspan="9">BasicFeaturePreprocessing
Handling Missing Data and Data Cleaning
Feature Scaling-Standardization, Min-MaxScaling
Normalization andTransformation</td><td>15</td></tr>
<tr><td>UNIT III</td><td colspan="9">FeatureEngineering Techniques
Techniques for Numerical Data: Binning and Discretization, Polynomial and Interaction Features
Categorical Data Techniques:One Hot Encoding, Label Encoding</td><td>15</td></tr>
<tr><td>UNIT IV</td><td colspan="9">Feature Extraction vs. Feature Selection
Feature Selection Methods:Filter Method,Wrapper Method,Hybrid Method
Feature Reduction:Introduction to Principal Components Analysis(PCA), Application of PCA</td><td>15</td></tr>
<tr><td>TextBooks/ Reference Books</td><td colspan="10">1.M.C.Trivedi,Data Science and Data Analytics Using Python Programming, Khanna Publishing House, 2024.
2.Zheng,Alice,&Casari,Amanda.(2018).Feature engineering for machine learning: Principles and techniques for data scientists. O'Reilly Media, Inc.
3. Kalita,J.K.,Bhattacharyya,D.K.,&Roy,S.(2023).Fundamentals of Data Science: Theory and Practice. Elsevier. ISBN-13: 9780323917780.</td></tr>
</table>

DSE201.2 FeatureEngineering Laboratory

1. Fillmissing values in the"Age"column using the mean/median/mode value in a dataset with columns "Age", "Height", "Weight", and "Grade".
2. Clean a data set having columns 'Name', ‘Gender’and'Age’wherethe"Name"columncontainsan entry like "invalid data"
3. ApplyMin-Max normalization having columns "Height"and"Weight"ina dataset
4. Visualize the distribution of"Age"in a dataset using a histogram
5. Compute and visualize the correlation matrix for"Height"and"Weight"inadataset
6. Bin"Age" into categoriessuchas"Young"(0-18),"Adult"(19-40), "Middle-Aged"(41-60),and "Senior" (60+)
7. Create polynomial features from two numerical columns"Height"and "Weight"
8. Apply alogarithmic transformation to the"Distance"columnina dataset
9. Apply one-hot encoding to the"Category"column containing values["Good","Better","Best"] and the "Gender" column with ["Male", "Female"]
10. Tokenize the text data for a dataset with a column'Text
11. Apply stemming to thetextforadataset withacolumn'Text’
12. Applyl emmatization for a dataset with a column 'Text’
13. Convert text data into aBag-of-Word srepresentation for a dataset with a column'Text'.
14. ApplyTF-ID Ftransformation to text data foracolumn'Text'
15. Resize an image in a dataset to256x256 pixels
16. Rotate image in a dataset by 30 degrees and translate by 10 pixels
17. Decompose a time series into trend,seasonal,and residual components for a dataset with a column 'TimeSeries'
18. PerformPrincipal Component Analysis(PCA)on a dataset and visualize the first two principal Components

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
DSE201.3	**Professional Elective – I** Web Programming I	4	0	4	6	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	80	100	50	--
Course Outcomes (COs):	CO1. Understand the fundamentals of HTML5 and CSS3. CO2. Learn how to build web applications using HTML5, CSS3, and jQuery. CO3. Develop skills in making responsive web site using bootstrap. CO4. Explore features of jQuery to make interactive web applications.									
Prerequisite	Basic understanding of HTML, CSS and JavaScript									Hrs
UNIT I	**Introduction to HTML5** HTML5 Introduction , Limitations of HTML, Advantages of HTML5, Features of HTML5, HTML5 Syntax , HTML5 Page Structure, Obsolete Elements/Deprecated Elements, HTML5 New Elements, HTML5 Input Types, Web Forms 2.0, HTML5 Form Elements , HTML5 Form Attributes , HTML5 Canvas, HTML5 Audio, HTML5 Video									15
UNIT II	**Introduction To CSS3** Intro CSS3,CSS3 Borders, CSS3 Backgrounds, CSS3 Text Effects, CSS3 Fonts, Positioning (Relative/Absolute), CSS3 Transforms, CSS3 Transitions, CSS3 Animations,CSS3 User Interface, Intro to Responsive Web Design, Importance of Responsive Web Design, Tips for Responsiveness									15
UNIT III	**Introduction to Bootstrap** Bootstrap Grid System, Grid options, Bootstrap CSS Overview, Bootstrap Typography, Bootstrap Tables, Bootstrap Forms, Bootstrap Buttons, Bootstrap Glyphicons, Bootstrap Dropdowns, Bootstrap Button Groups, Bootstrap Button Dropdowns, Bootstrap Input Groups, Bootstrap Navbar, Bootstrap Pagination, Bootstrap Alerts, Bootstrap Progress Bars									15
UNIT IV	**Introduction to jQuery** JQuery Introduction, Overview of jQuery's features, Downloading and installing jQuery, Creating a simple jQuery enabled page, jQuery Syntax, jQuery Selectors, jQuery Events, jQuery Effects, jQuery and HTML contents, jQuery and CSS Classes, jQuery Animations and Effects									15
TextBooks/ Reference Books	1. HTML 5, CSS 3 & Bootstrap 4 All-in-One: a complete introduction to front end web development by Mike Ludo 2. HTML5: The Missing Manual 2nd Edition by Matthew MacDonald 3. CSS3: The Missing Manual (Missing Manuals) Revised Edition by David Sawyer McFarland 4. JavaScript & jQuery: The Missing Manual 3rd Edition by David Sawyer McFarland 5. Responsive Web Design with HTML5 and CSS3 - Second Edition: Build responsive and future-proof websites to meet the demands of modern web users 2nd Edition by Ben Frain 6. Front-end Web Developer (Careers in Technology Series): JavaScript, HTML5, and CSS3 (Bootcamp) 1st Edition by Mark Sapp									

DSE201.3 Professional Elective– I Advance Web Technology Laboratory
1. Create a simple Web Page with HTML5 & CSS3 2. Write a program to set Headers , Paragraph for web page 3. Write a program to set pages for webpage 4. Write a program to create animation elements 5. Write a program to create a responsive website for all devices 6. Write a program to create Box and set Positions for elements 7. Write a program to create buttons and use for pages or send forms 8. Write a program to insert Video and Audio in webpage 9. Write a program to create attractive Form using different form elements 10. Write a program to create Circle, Thumbnail and set Text on images 11. Write a JQuery program to demonstrate different selectors. 12. Write a JQuery program to demonstrate different events. 13. Write a JQuery program to set and get HTML contents and attributes. 14. Write a JQuery program to set and return CSS properties.

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
VAC201.1	**Yoga and Physical fitness**	0	0	2	1	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	30	50	--	--
Course Outcomes (COs):	CO1: Gain a comprehensive understanding of yoga and its modern applications for holistic well-being. CO2: Demonstrate proficiency in yogic anatomy and physiology, enhancing yoga practice and promoting physical and energetic balance. CO3: Master the Eight Limbs of Yoga and comprehend their psychological impact, fostering personal growth and self-realization. CO4: Integrate yoga principles into sports and physical fitness activities to enhance performance and prevent injuries. CO5: Develop skills in wellness management and nutrition.									
Note	All the theoretical contents shall be delivered through the practical workshop mode only. No class room teaching is encouraged in this course.									Hrs.
UNIT I	● Yoga: Meaning and definition ● Importance of yoga in 21st century ● Introduction to Yogic Anatomy and Physiology ● Yoga & sports, Yoga for healthy lifestyle ● Types of Yoga: - Hatha yaga, laya yoga, mantra yoga, ● bhakti yoga, karma yoga, jnana yoga, raj yoga ● Study of Chakras, Koshas, Pranas, Nadis, Gunas, Vayus and its application in Yogic practices. ● Ashtang Yoga: - Yama, niyama, asana, pranayama, Pratyahar, dharna, dhyan, Samadhi: Benefits, Utilities & their psychological impact on body and mind. According to yoga concept of normality in modern psychology, concept of personality & its development, yogic management of psycho-somatic ailments: frustration, anxiety, depression									
UNIT II	● Sports for Physical Fitness: Meaning and definition ● Physical Activity – Concept, Benefits of Participation in Physical Activities ● Components and Significance of Physical Fitness -Health, Skill and Cosmetic Fitness ● Types of Physical Activities – Walking, Jogging, Running, Calisthenics, Rope Skipping, Cycling, Swimming, Circuit Training, Weight training, Adventure Sports ● Principles of Physical Fitness, Warming Up, Conditioning, Cooling Down, Methods to Develop and Measure Health and Skill related components of Physical Fitness ● Measurement of Health Related Physical Fitness (HRPF)									
UNIT III	● Physical Wellness: Concept, Components ● Types of wellness: psychological, social, emotional, and spiritual. ● Significance with reference to Positive Lifestyle 2.2 ● Concepts of Quality of Life and Body Image ● Factors affecting Wellness ● Wellness Programmes									
UNIT IV	● Concept of Nutrients, Nutrition, Balanced Diet, Dietary Aids and Gimmicks ● Energy and Activity- Calorie Intake, Energy Balance Equation									

	● Obesity - Concept, Causes, Obesity Related Health Problems ● Weight Management through Behavioural Modifications	
TextBooks/ Reference Books	● Anand O P. Yog Dawra Kaya Kalp. Sewasth Sahitya Perkashan. Kanpur. ● Brown, J.E. Nutrition Now Thomson-Wadsworth. ● Corbin et.al.Fitness & Wellness-Concepts. McGraw Hill. Publishers. New York.U.S.A ● Corbin, C. B., G. J. Welk, W. R Corbin, K. A. Welk, Concepts of Physical Fitness: Active Lifestyle for Wellness. McGraw Hill, New York, USA. ● Hoeger, W W K and S.A. Hoeger. Principles and Labs for Fitness and Wellness, Thomson Wadsworth, California, USA. ● Hoeger, W.W. & S. Hoeger Fitness and Wellness. 7th Ed. Thomson Wadsworth, Boston, USA. ● Kamlesh, M. L. & Singh, M. K.) Physical Education (Naveen Publications). ● Kansal, D.K. Text book of Applied Measurement, Evaluation & Sports Selection. Sports & Spiritual Science Publications, New Delhi. ● Kumari, Sheela, S., Rana, Amita, and Kaushik, Seema,, Fitness, Aerobics and Gym Operations, Khel Sahitya, New Delhi ● Lumpkin, A. Introduction to Physical Education, Exercise Science and Sports Studies, McGraw Hill, New York, U.S.A. ● Sarin N) Yoga Dawara Rogon Ka Upchhar.Khel Sahitya Kendra ● Savard, M. and C. Svec The Body Shape Solution to Weight Loss and Wellness: The Apples & Pears Approach to Losing Weight, Living Longer, and Feeling Healthier. Atria Books, Sydney, Australia. ● Siedentop, D. Introduction to Physical Education, Fitness and Sport, McGraw Hill Companies Inc., New York, USA. ● Sri Swami Ramas. Breathing. Sadhana Mandir Trust.Rishikesh. ● Swami Ram Yoga & Married Life Sadhana Mandir Trust. Rishikesh	

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
VAC201.2	**Sports**	0	0	2	1	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	30	50	--	--
Course Outcomes (COs):	CO1: Understand the fundamental principles and concepts of sports management, includingits scope, organizational structure, and ethical considerations. CO2: Analyse the role of marketing and sponsorship in the sports industry, with a focus onbranding, target audience segmentation, and event management. CO3: Develop proficiency in financial management techniques specific to the sports industry,including revenue generation, cost management, and investment strategies. CO4: Explore the application of analytics and technology in sports, including performanceevaluation, strategic decision-making, and fan engagement. CO5: Apply theoretical knowledge to practical scenarios through case studies and projects, fostering critical thinking and problem-solving skills in sports management contexts.									
Note	All the theoretical contents shall be delivered through the practical workshop mode only. No class room teaching is encouraged in this course.									Hrs.
UNIT I	**Introduction to Sports Management** ● Definition and scope of sports management ● Significance of sports management in society and its evolution over time ● Organizational structure of sports: amateur, professional, and non-profit entities ● Roles and responsibilities of key personnel: managers, coaches, and agents ● Governance bodies in sports: FIFA, IOC, and NCAA ● Legal issues: contracts, negotiations, intellectual property rights ● Ethical considerations: fair play and doping									
UNIT II	**Sports Marketing and Sponsorship** ● Unique aspects of sports marketing ● Fan engagement strategies ● Target audience identification and segmentation ● Branding strategies for sports teams and athletes ● Sponsorship and endorsement deals ● Negotiating and managing partnerships ● Event management: planning, organizing, and promoting sports events									
UNIT III	**Financial Management in Sports** ● Revenue generation in sports: ticket sales, broadcasting rights, merchandise sales ● Financial models: budgeting and forecasting ● Cost management: player salaries, facility expenses, operational costs ● Investment opportunities in sports ● Risk management techniques specific to sports organizations									
UNIT IV	**Sports Analytics and Technology** ● Introduction to sports analytics ● Evaluating player performance ● Devising game strategies ● Fan engagement through technology ● Analytical techniques: statistical analysis, data visualization, predictive modeling									

	● Key performance indicators (KPIs) in sports ● Applications of analytics: talent scouting, injury prevention, performance optimization.	
TextBooks/ Reference Books	1. Pedersen, P. M., Thibault, L., & Pedersen, P. M. (2019). Contemporary Sport Management. Human Kinetics. 2. Hoye, R., Smith, A. C. T., Nicholson, M., et al. (2021). Sports Management: Principlesand Applications. Routledge. 3. Chelladurai, P., & Kerwin, S. (2017). Introduction to Sport Management: Theory and Practice. Human Kinetics. 4. Hoye, R., Cuskelly, G., & Nicholson, M. (2019). Sports Governance: A Guide for Sport Organizations. Routledge. 5. Conrad, M. (2018). The Business of Sports: A Primer for Journalists. Routledge. 6. Shank, M. D. (2019). Sports Marketing: A Strategic Perspective. Pearson. 7. Collett, P., & Fenton, W. (2019). The Sponsorship Handbook: Essential Tools, Tips and Techniques for Sponsors and Sponsorship Seekers. Kogan Page. 8. Fullerton, S. Jr., & Funk, D. C. (2019). Sports Marketing: A Practical Approach. Routledge. 9. Conrad, M. (2019). Winning in Sports Business: Essential Marketing, Finance, and Management Strategies. Routledge. 10. McCarty, L. A., & McPherson, G. (2019). Sports Event Management: The Caribbean Experience. Routledge. 11. Brown, M. T., Rascher, D., & Leeds, M. A. (2017). Financial Management in the Sport Industry. Routledge. 12. Winfree, J. A., & Rosentraub, M. S. (2017). Sports Finance and Management: Real Estate, Entertainment, and the Remaking of the Business. Taylor & Francis. 13. Foster, G., O'Reilly, N., & Cuskelly, G. (2018). Sports Business Management: Decision Making Around the Globe. Routledge. 14. Brown, M. T., & Shick, D. M. (2019). Financial Management in the Sport Industry. Routledge. 15. Conrad, M. (2018). The Business of Sports: A Primer for Journalists. Routledge. 16. Alamar, B. C. (2013). Sports Analytics: A Guide for Coaches, Managers, and Other Decision Makers. Columbia University Press. 17. Miller, T. W. (2019). Sports Analytics and Data Science: Winning the Game with Methods and Models. FT Press. 18. Marchi, M., Albert, J., & Baumer, B. (2014). Analyzing Baseball Data with R. Chapman and Hall/CRC. 19. Schumaker, R. P., Hwang, R. S. Y., & Chen, H. (2016). Sports Data Mining. Routledge. 20. Alamar, B. C. (2013). Sports Analytics: A Guide for Coaches, Managers, and Other Decision Makers. Columbia University Press.	

<table>
<tr><th>Course Code</th><th>Cours Title</th><th>L</th><th>T</th><th>P</th><th>Credit</th><th colspan="3">Theory</th><th colspan="2">Practical</th></tr>
<tr><td rowspan="2">VAC201.3</td><td rowspan="2">NCC</td><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">2</td><td rowspan="2">1</td><td>Int</td><td>Uni</td><td>Total</td><td>Int</td><td>Uni</td></tr>
<tr><td>20</td><td>30</td><td>50</td><td>--</td><td>--</td></tr>
<tr><td>Course Outcomes (COs):</td><td colspan="9">CO1: Understand the foundational role of drill in fostering discipline and leadership within a group, enabling effective command towards achieving common goals.
CO2: Appreciate the importance of grace and dignity in executing foot drill movements, recognizing their significance in enhancing performance and teamwork.
CO3: Comprehend the criticality of weapon handling and detailed safety measures, emphasizing the importance of accident prevention through strict adherence to safety protocols.
CO4: Develop an awareness of diverse terrain types and their strategic significance in battle craft, enabling informed decision-making and effective utilization of terrain features for tactical advantage.</td></tr>
<tr><td>Note</td><td colspan="8">All the theoretical contents shall be delivered through the practical workshop mode only. No class room teaching is encouraged in this course.</td><td>Hrs.</td></tr>
<tr><td>UNIT I</td><td colspan="8">Overview of NCC, its history, aims, objectives, and organizational structure, Incentives and duties associated with NCC cadetship; Maneuvers: Foot drill, Word of Command, Attention, and stand at ease, and Advanced maneuvers like turning and sizing; Parade formations: Parade line, open line, and closed line; Saluting protocols, parade conclusion, and dismissal procedures. Marching styles: style march, double time march, and slow march</td><td></td></tr>
<tr><td>UNIT II</td><td colspan="8">Weapon Training, Handling firearms, Introduction and characteristics of the .22 rifle; Handling Firearm techniques, emphasizing safety protocols and Best practices.</td><td></td></tr>
<tr><td>UNIT III</td><td colspan="8">Map Reading (MR): Topographical forms and technical terms, including relief, contours, and gradients, crucial for understanding terrain features; Cardinal points , magnetic variation and grid convergence</td><td></td></tr>
<tr><td>UNIT IV</td><td colspan="8">Field Craft & Battle Craft (FC & BC): Fundamental principles and techniques essential for effective field and battle craft operations; Methods of judging distance, including estimation, pacing, and visual cues</td><td></td></tr>
<tr><td>TextBooks/ ReferenceBooks</td><td colspan="9">● DGNCC Cadet's Hand Book - Common Subjects -All Wings
● Tiwari, R. (2019). NCC: Grooming Feeling of National Integration, Leadership and Discipline among Youth. Edwin Incorporation.
● Chhetri, R.S. (2010). Grooming Tomorrows Leaders, The National Cadet Corps.
● Directorate General National Cadet Corps (2003). National Cadet Corps, Youth in Action.
● Vanshpal, Ravi (2024). The NCC Days, Notion Press.</td></tr>
</table>

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
VAC201.4	NSS	0	0	2	1	Int	Uni	Total	Int	Uni
						20	30	50	--	--
Course Outcomes (COs):	CO1: To provide students with an understanding of the history, philosophy, and basic concepts of the National Service Scheme (NSS). CO2: To familiarize students with the aims, objectives, and organizational structure of NSS. CO3: To equip students with knowledge about NSS programmes, activities, and their relevance. CO4: To develop an understanding of community mobilization techniques and their importance in NSS activities. CO5: To cultivate an appreciation for volunteerism, shramdan (voluntary labor), and their role in community development initiatives.									
Note	All the theoretical contents shall be delivered through the practical workshop mode only. No class room teaching is encouraged in this course.									Hrs.
UNIT I	**Introduction and Basic Concepts of NSS** National Service Scheme (NSS) - history, philosophy, and fundamental concepts, aims and objectives, providing clarity on the organization's overarching goals. Symbols of NSS - Emblem, flag, motto, song, and badge; Organizational structure of NSS									
UNIT II	**NSS Programmes and Activities** Diverse programmes and activities conducted under the aegis of the National Service Scheme (NSS); Significance of commemorating important days recognized by the United Nations, Centre, State Government, and University; Examination of the methodology for adopting villages/slums and conducting surveys; Financial patterns of the NSS scheme									
UNIT III	**Community Mobilization** Dynamics of community mobilization within the framework of the National Service Scheme (NSS); Functioning of community stakeholders; The conceptual lens of community development.									
UNIT IV	**Volunteerism and Shramdan in the Indian Context: Roles and Motivations within the NSS Framework** Ethos of volunteerism and shramdan (voluntary labor) within the cultural context of India and the framework of the National Service Scheme (NSS); Motivations and constraints shaping volunteer engagement; Role of NSS volunteers in initiatives such as the Swatch Bharat Abhiyan and Digital India									
TextBooks/ Reference Books	1. Ministry of Youth Affairs and Sports, Government of India. (2022). National ServiceScheme (NSS) Manual. 2. Agarwalla, S. (2021). NSS and Youth Development. Mahaveer Publications 3. Bhattacharya, P. (2024). Stories Of NSS (English Version). Sahityasree. 4. Borah, R. and Borkakoty, B. (2022). NSS in Socioeconomic Development. Unika Prakashan. 5. Wondimu, H., & Admas, G. (2024). The motivation and engagement of student volunteersin volunteerism at the University of Gondar. *Discover Global Society*, *2*(1), 1-16. 6. Saha, A. K. (2002). Extension Education–The Third Dimension Needs and Aspirations									

of Indian Youth. *Journal of Social Sciences*, *6*(3), 209-214.
7. Mills, S. (2013). "An instruction in good citizenship": scouting and the historical geographies of citizenship education. *Transactions of the Institute of British Geographers*, *38*(1), 120–134. http://www.jstor.org/stable/24582445
8. Mishra, S. K., Sachdev, S., Marwaha, N., & Avasthi, A. (2016). Study of knowledge and attitude among college-going students toward voluntary blood donation from north India. *Journal of blood medicine*, 19-26.
9. Mukherji, B. (2007). Community Development in India. Orient Longmans.
10. History Background of NSS and its Philosophy, Aims and Objectives
11.https://www.osmania.ac.in/NSS%20URL/9.%20%20Historical%20Background%20of%20NSS%20and%20its%20Philosophy,%20Aim.pdf
12. In Defence of Nationalism https://www.mkgandhi.org/indiadreams/chap03.htm
13. Unlocking Youth Potential for Nation Building: Strengthening NYKS and NSS
14. https://www.undp.org/india/projects/strenghtening-nyks-and-nss

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
VAC201.5	**Disaster Management**	0	0	2	1	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	30	50	--	--
Course Outcomes (COs):	CO1: To provide understanding of the concepts related to disaster CO2: To highlight the importance and role of disaster management CO3: To enhance awareness of institutional processes and management strategies to mitigate the impacts of disasters									
Note	All the theoretical contents shall be delivered through the practical workshop mode only. No class room teaching is encouraged in this course.									Hrs.
UNIT I	**Concepts and Terminologies** Understanding key concepts of Hazards, disasters; Disaster types and causes (Geophysical, Hydrological, Meteorological, Biological and Atmospheric; Human-made); Global trends in disasters - Impacts (Physical, Social, Economic, Political, Environmental and Psychosocial); Defining Vulnerability (Physical Vulnerability; Economic Vulnerability; Social Vulnerability)									
UNIT II	**Key concepts of Disaster Management Cycle** Components of disaster management cycle (Phases: Response and recovery, Risk assessment, Mitigation and prevention, Preparedness planning, Prediction and warning); Disaster risk reduction (DRR), Community based disaster risk reduction									
UNIT III	**Initiatives at national and international level** Disaster Risk Management in India and at international level: Related policies, plans, programmes and legislation; International strategy for disaster reduction and other initiatives									
UNIT IV	**Emergency Management** Explosion and accidents (Industrial, Nuclear, Transport and Mining) - Spill (Oil and Hazardous material); Threats (Bomb and terrorist attacks) - Stampede and conflicts Training and Demonstration Workshops (at least two workshops) be organized in association with the NIDM, NDRF, NCDC, Param Military, Fire Brigade, CISF, local administration etc.									
TextBooks/ Reference Books	1. Sharma, S.C. (2022), Disaster Management, Khanna Book Publishing. 2. Clements, B. W., (2009): Disasters and Public Health: Planning and Response, Elsevier Inc. 3. Dunkan, K., and Brebbia, C. A., (Eds.) (2009): Disaster Management and Human Health Risk: Reducing Risk, Improving Outcomes, WIT Press, UK. 4. Singh, R. B. (ed.), (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi. 5. Ramkumar, Mu, (2009) Geological Hazards: Causes, Consequences and Methods of Containment, New India Publishing Agency, New Delhi. 6. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi. 7. Carter, N. (1991) Disaster Management: A Disaster Management Handbook. Asian Development Bank, Manila. 8. Govt. of India (2008) Vulnerability Atlas of India. BMTPC, New Delhi.									

	9. Govt. of India (2011) Disaster Management in India. Ministry of Home Affairs, New Delhi. 10. Matthews, J.A., (2002) Natural Hazards and Environmental Change, Bill McGuire, Ian Mason.
Web Resources	http://www.ndma.gov.in/en/ http://nidm.gov.in/ https://www.unisdr.org/ http://www.emdat.be https://www.weather.gov/safety/ https://www.preventionweb.net/risk/vulnerability

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
						Int	Uni	Total	Int	Uni
VAC201.6	**Vivek Vahini**	0	0	2	1	20	30	50	--	--
Course Outcomes (COs):	CO1: Enhancing scientific approach among students CO2: CirculateIntellectualism and Conscience among students and Society. CO3: Reducing discrimination based on race, gender and caste. CO4: Creating an egalitarian approach among students									
Note	Contribution of the concept of 'Vivekvahini' in Maharashtra was made by Late. Dr.Narendra Dabholkar & Prof. Dr. N. D. Patil, former chairman of Rayat Shikshan Sanstha, Satara,they put their heads together & the idea of inculcating scientific temper among college students was born. All the theoretical contents shall be delivered through the practical workshop mode only. No class room teaching is encouraged in this course.									Hrs.
Activities	Various student centering activities can be implemented viz. elocution competitions, essay writing competitions, quiz competitionand debate competition. Also, the wallpaper can be released to give a platform to the views of students. Participation in the awakening program which takes place in the area affiliated to thecollege.									

SEMESTER –IV

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
CC204	**Relational Database Management System(RDBMS)**	1	0	2	2	**Int**	**Uni**	**Total**	**Int**	**Uni**
						--	--	--	--	50
Course Outcomes (COs):	CO1: Understand the Core Concepts of RDBMS CO2: Demonstrate different types querris useing Relational Database.									
Prerequisite	Basic knowledge of Set Theory and DBMS									Hrs.
UNIT I	Introduction to RDBMS: Definition, Constraints in a RDBMS: Primary Key, Foreign Key,Unique Key, NOT NULL, CHECK, SQL Basics: DDL,DML,DCL,TCL and DQL									15
UNIT II	Advace SQL: Math functions, string functions Aggregate Functions (Min(), Max(), Sum(), Avg(), Count()), Logical operators (AND, OR, NOT), Predicates (In, Like, Between, Alias, Distinct), Clauses(Group By, Having, Order by, top/limit), Inner Join, Natural Join, Full Outer Join, Left Outer Join, Right outer Join, Equi Join,Set Operations, Views, Introduction to PL/SQL, Cursor, trigger, stored procedure and functions									15
TextBooks/ Reference Books	1.Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, third edition, McGraw – Hill, 2018 2.Benjamin Rosenzweig, Elena Rakhimov, “Oracle PL/SQL by Example”, fifth edition, Prentice Hall, 2015 3.Korth, Silbertz, Sudarshan,” Database System Concepts”, Seventh Edition, McGraw - Hill.(2019) 4.R.P. Mahapatra, Govind Verma, “Database Management Systems”, Khanna Publishing House, 2025.									
Web Resources	1.https://oracle-base.com/articles 2.https://forums.oracle.com/ords/apexds/domain/dev- community/category/sql_and_pl_sql 3.https://asktom.oracle.com/ords/f?p=100:1:0									

CC204: Relational Database Management System(RDBMS) Lab

DDL Commands

Consider the following Schema Supplier(SID, Sname, branch, city, phone) Part(PID, Pname, color, price) Supplies(SID, PID, qty, date_supplied)
Create the above tables
Add a new attribute state in supplier table
Remove attribute city from supplier table
Modify the data type of phone attribute
Change the name of attribute city to address
Change a table's name, supplier to sup
Use truncate to delete the contents of supplies table
Remove the part table from database

DML Commands

1.Insert at least 10 records in tables supplier, part and supplies
2.Show the contents in tables supplier, part and supplies
3.Find the name and city of all suppliers
4.Find the name and phoneno of all suppliers who stay in 'Delhi'
5.Find all distinct branches of suppliers
6.Delete the record of the supplier whose SID is 204001
7.Delete all records of supplier table
8.Delete all records of suppliers whose city starts with capital A.
9.Find the supplier names which have 'lk' in any position
10.Find the supplier name where 'R' is in the second position
11.Find the name of supplier whose name starts with 'V' and ends with 'A'
12.Change the city of all suppliers to 'BOMBAY'
13.Change the city of supplier 'Vandana' to 'Goa'

Queries with Constraints

1.Create the supplier table with Primary Key Constraint
2.Create supplies table with Foreign key Constraint
3.Create a part table with UNIQUE Constraint
4.Create supplier Table with Check Constraints
5.Create Supplier table with Default Constraint

Queries on TCL

1.Create Savepoints
2.Rollback to SavePoints
3.Use Commit to save on Aggregate Functions:
4.Find the minimum, maximum, average and sum of costs of parts
5.Count the total number of parts present
6.Retrieve the average cost of all parts supplied by 'Mike' Queries on GROUP BY,

HAVING AND ORDER BY Clauses

1.Display total price of parts of each color
2.Find the branch and the number of suppliers in that branch for branches which have more then 2

suppliers
3.Find all parts sorted by pname in ascending order and cost in descending order
4.Find the branch and the number of suppliers in that branch Queries on Analytical,

Queries on Operators

1.Find the pname, phoneno and cost of parts which have cost equal to or greater than 200 and less than or equal to 600.
2.Find the sname , SID and branch of suppliers who are in 'local' branch or 'global' branch
3.Find the pname, phoneno and cost of parts for which cost is between 200 and 600
4.Find the pname and color of parts, which has the word 'NET' anywhere in its pname.
5.Find the PID and pname of parts with pname either 'NUT' or 'BOLT'
6.List the suppliers who supplied parts on '1st may2000', '12 JAN 2021' ,'17 dec 2000','10 Jan 2021'
7. Find all the distinct costs of parts

Join Operators

1. Perform Inner join on two tables
2.Perform Natural Join on two tables
3.Perform Left Outer Join on tables
4.Perform Right Outer join on tables
5.Perform Full Outer Join on tables Set Theory Operators
6.Show the use of UNION operator with union compatibility
7.Show the use of intersect operator with union compatibility
8.Show the use of minus operator with union compatibility
9.Find the Cartesian product of two tables

Demonstration on PL/SQL block, cursor, trigger, functions and stored procedure.

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
CC205	Computer Networks	3	0	0	3	**Int**	**Uni**	**Total**	**Int**	**Uni**
						15	60	75	--	--
Course Outcomes (COs):	**CO1:** Understand the fundamental concepts of Computer Networks and their applications. **CO2:** Develop problem-solving skills related to network design, implementation, and Troubleshooting. **CO3:** Implement network protocols and configure network devices **CO4**: Identify the applications of Networking with its management.									
Prerequisite	1. **Basic Networking Knowledge:** Familiarity with basic networking concepts such as IP addressing and network topologies. 2. **Programming Skills:** Ability to write basic network programs and scripts in languages suchas Python or C. 3. **Operating Systems**: Understanding of OS concepts related to networking, such as processmanagement and memory allocation									Hrs.
UNIT I	**Introduction to Computer Networks**: Definition and Objectives, Applications and Examples. Network Components and Architecture. **Network Models:** OSI Model: Layers and Functions, TCP/IP Model: Layers and Functions, Comparison between OSI and TCP/IP Models. **Network Topologies:** Physical vs. Logical Topologies, Common Topologies: Star, Ring, Bus,Mesh, Hybrid, Advantages and Disadvantages of Each Topology. **Data Transmission:** Analog vs. Digital Signals.**Transmission Modes**: Simplex, Half-Duplex,Full-Duplex, Bandwidth and Latency. **Networking Devices:** Routers, Switches, Hubs, Bridges, Gateways, Functions andConfigurations of Each Device.									5
UNIT II	**Data Link Layer and Networking Protocols** **Data Link Layer Fundamentals**: Functions of the Data Link Layer, Framing, Error Detection,and Error Correction, Flow Control Mechanisms.**Ethernet**: Ethernet Standards and Frame Structure, MAC Addressing and ARP, **Ethernet Switching**: Basic Concepts and Methods. **Network Protocols**: Introduction to TCP/IP Protocol Suite, IP Addressing: IPv4 and IPv6. Sub-netting and CIDR Notation. **Address Resolution Protocol (ARP):** ARP Operation and Table, ARP Spoofing and Security, Considerations **Virtual LANs (VLANs):** Concept of VLANs, VLAN Tagging and Configuration, Benefits andUse Cases.									15
UNIT III	**Network Layer and Transport Layer** **Network Layer:** IP Routing: Static vs. Dynamic Routing,Routing Protocols: RIP, OSPF, BGP,Network Address Translation (NAT). **Transport Layer**: TCP vs. UDP: Characteristics and Use Cases, TCP Handshake andConnection Management, Flow Control and Congestion Control in TCP. **Congestion Control Algorithms &Techniques:** Slow Start, Congestion Avoidance, Fast Retransmit, Fast Recovery, **TCP Variants:** TCP Reno, TCP Vegas.**Quality of Service (QoS):** QoS Principles and Mechanisms, Differentiated Services (DiffServ), and Integrated Services (IntServ) **Network Security Fundamentals:** Threats and Vulnerabilities, Basic Security Mechanisms:Firewalls, VPNs, Encryption.									15
UNIT IV	**Application Layer and Emerging Technologies** **Application Layer Protocols:** HTTP/HTTPS: Structure and Operation, FTP, SMTP, POP3,IMAP: Protocols and Uses, DNS: Domain Name System and Resolution **Network Applications:** Web Browsing, Email Communication, File Transfer, Voice over IP(VoIP) and Streaming.**Emerging Technologies:** Software-Defined Networking (SDN),									10

	Network FunctionVirtualization (NFV), Internet of Things (IoT) and Its Impact on Networking **Network Management**: SNMP, Simple Network Management Protocol, Network Monitoring, Tools and Techniques.**Future Trends in Networking**: 5G and Beyond, Network Automation and ArtificialIntelligence in Networking.	
TextBooks/ Reference Books	1. Andrew S. Tanenbaum, "Computer Networks", 5th Edition, Pearson Education, 2011. 2. James F. Kurose and Keith W. Ross, "Computer Networking: A Top-Down Approach", 8th Edition, Pearson, 2021. 3. Behrouz A. Forouzan, "Data Communications and Networking", 5th Edition, McGraw-HillEducation, 2012. 4. Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", 6th Edition, Morgan Kaufmann, 2019. 5. Bhavneet Sidhu, An Integrated Approach to Computer Networks, Khanna PublishingHouse, 2023. 6. Mastering PC Hardware & Networking, Khanna Publishing House, 2024.	
Web Resources	1. Cisco Networking Academy - Online Courses and Resources 2. NetworkLessons.com - Tutorials on Various Networking Topics	

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
CC206	**Design and Analysis of Algorithms**	3	0	0	3	**Int**	**Uni**	**Total**	**Int**	**Uni**
						15	60	75	--	--
Course Outcomes (COs):	CO1: To impart to students the understanding of basic algorithm designing paradigms. CO2: Identify basic knowledge on how to analyse an algorithm. CO3: To enable a student to synthesize efficient algorithms in commondesign situations and real-life problems. CO4: Identify the limitations of algorithms in solving specific problems.									
Prerequisite	Knowledge of Data Structures									Hrs.
UNITI	What is an algorithm? Design and performance analysis of algorithms, time complexity, spacecomplexity.Asymptotic notations (O, Ω, Θ) to measure growth of a function and application to measure complexity of algorithms. Analysis of sequential search, bubble sort, selection sort, insertion sort, matrix multiplication. **Recursion:** Basic concept. Analysis of recursive algorithms, Master's theorem.									10
UNITII	**The Divide & Conquer Design Technique:**The general concept. Binary search, finding the maximum and minimum, merge sort, quick sort.Best and worst case analysis for the mentioned algorithms. Strassen's matrix multiplication.Lower bound for comparison-based sorting. **The Greedy Design Technique:**The general concept. Applications to general Knapsack problem, finding minimum weightspanning trees: Prim's and Kruskal's algorithms, Dijkstra's algorithm for finding single sourceshortest paths problem.									15
UNITIII	**The Dynamic Programming Design Technique:**The general concept, Computation of Fibonacci series and Binomial coefficients, all pairshortest paths problem (Floyd-Warshall's algorithm), 0/1 Knapsack problem.Breadth First Search, Depth First Search, finding connected components, depth first search of adirected graph, topological sorting.									15
UNITIV	**Limitations of Algorithmic Power:**Back tracking Method: n-Queen problem; sum of subsets problem/ Hamiltonian circuitproblem/vertex cover problem. Computational Intractability: Overview of non-deterministic algorithms, P, NP, NP-Completeand NP-hard problems.									5
TextBooks/ ReferenceBooks	1. Gajendra Sharma, Design and Analysis of Algorithms, Khanna Publishing House(AICTE Recommended Textbook) 2. Cormen Thomas H., Leiserson Charles E., Rivest Ronald L. and Stein Clifford,Introduction to Algorithms, PHI publication, 3rd Edition, 2009. 3. Horowitz Ellis, Sahni Sartaj and Rajasekaran Sanguthevar, Fundamentals of ComputerAlgorithms, University Press (I) Pvt. Ltd., 2012. 4. Levitin Anany, Introduction to Design and Analysis of Algorithms, 3rd Edition, Pearson,2012 5. Aho Alfred V., Hopcroft John E. & Ullman Jeffrey D., The Design & Analysis ofComputer Algorithms, Addison Wesley Publications, Boston, 1983. 6. Kleinberg Jon & Tardos Eva, Algorithm Design, Pearson Education, 2006.									
Web Resources	1. https://nptel.ac.in/courses/106101060 2. https://www.cs.umd.edu/~mount/451/Lects/451lects.pdf									

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
CC207	**Artificial Intelligence**	3	0	4	5	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	80	100	--	50
Course Outcomes (COs):	CO1: Understand the characteristics of rational agents, and the environment in which they operate, and gain insights about problem-solving agents. CO2: Gain insights about Uninformed and Heuristic search techniques and apply them to solve search applications. CO3: Obtain insights about the knowledge representation using Propositional logic, Predicate calculus and probabilistic reasoning through fuzzy logic. CO4: Obtain a basic understanding of the AI domains and their applications and examine the legal and ethical issues of AI									
Prerequisite	Basic understanding of computer science concepts, including data structures and algorithms. Proficiency in minimum one programming language, such as Python.									Hrs.
UNIT I	Introduction to AI: What is AI? Intelligent Agents: Agents and environment, the concept of Rationality, the nature of environment, the structure of Agents. Knowledge-Based Agents: Introduction to Knowledge-Based Agents, The Wumpus World as an Example World. Problem-solving: Problem-solving agents.									15
UNIT II	Advanced Search Techniques Uninformed Search: DFS, BFS and Iterative Deepening Search. Informed Search: Best First Search, A* search, AO* search. Adversarial Search & Games: Two-player zero-sum games, Minimax Search, Alpha-Beta pruning. Constraints and Constraint Satisfaction Problems (CSPs), Backtracking search for CSP. Evolutionary Search Techniques: Introduction to evolutionary algorithms, Genetic algorithms, Applications of evolutionary search in AI.									15
UNIT III	Logical Reasoning and Uncertainty Logic: Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting. Inference: Forward chaining, Backward chaining, Resolution, Truth maintenance systems. Introduction to Planning: Blocks World problem, Strips; Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, Introduction to Fuzzy set theory.									15
UNIT IV	AI Domains and Applications of AI Domains: Introduction to Machine Learning, Computer Vision, Robotics, Natural Language Processing, Deep Neural Networks, and their Applications. Expert Systems: The architecture and role of expert systems include two case studies. Legal and Ethical Issues: Concerns related to AI.									15
TextBooks/ Reference Books	1. M.C. Trivedi, A Classical Approach to Artificial Intelligence, Khanna Book Publishing Company, 2024 (AICTE Recommended Textbook). 2. Nilsson Nils J, Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4. 3. Dan W Patterson, Introduction to Artificial Intelligence & Expert Systems, PHI Learning 2010. 4. Rajiv Chopra, Data Science with Artificial Intelligence, Machine Learning and Deep Learning, Khanna Book Publishing Company, 2024. 5. M.C. Trivedi, Introduction to AI and Machine Learning, Khanna Book Publishing Company, 2024.									

	6. Russell, S. and Norvig, P., "Artificial Intelligence - A Modern Approach", 3rd edition, Prentice Hall 7. Van Hirtum, A. & Kolski, C. (2020). Constraint Satisfaction Problems: Algorithms and Applications. Springer 8. Rajiv Chopra, Machine Learning and Machine Intelligence, Khanna Book Publishing Company, 2024.

CC207: Artificial Intelligence LAB Experiments
1. Demonstrate basic problem-solving using Breadth-First Search on a simple grid. 2. Implement Depth-First Search (DFS) on a small graph. 3. Solve the Water Jug Problem using Breadth First Search (BFS). 4. Implement a Hill Climbing search to find the peak in a numeric dataset. 5. Apply the A* Search algorithm to find the shortest path in a 4x4 grid. 6. Implement the Minimax search algorithm for 2-player games. You may use a game tree with 3 plies. 7. Solve the 4 – Queens Problem as a CSP backtracking problem. 8. Use constraint propagation to solve a Magic Square puzzle. 9. Apply optimization techniques to find the maximum value in a list. 10. Represent and evaluate propositional logic expressions. 11. Implement a basic rule-based expert system for weather classification.

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
DSE202.1	**Professional Elective – II** Data Visualization	4	0	4	6	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	80	100	50	--
Course Outcomes (COs):	CO1: Understand the role of Power BI in data visualization and its importance. CO2: Explore the ethical considerations and challenges in data visualization. CO3: Learn about visual perception and its impact on data interpretation. CO4: Study different types of visualizations and their appropriate uses.									
Prerequisite	Familiarity with using a computer, including file management and basic software navigation. Basic knowledge of data structures, such as tables and databases. Basic understanding of data analysis concepts and familiarity with data types									Hrs
UNIT I	**Introduction to Power BI** Introduction to Power BI: Overview of Business Intelligence (BI), Introductionto Power BI and its components, Installing and setting up Power BI Desktop., Data Preparation and Transformation: Connecting to various data sources(e.g. Databases, Excel and Web services), Data loading and transformation usingPower Query Editor, Data cleansing and shaping techniques.									15
UNIT II	**Introduction to Data Visualization** Definition and importance of data visualization-Role of data visualization in decision making-Types of data (numerical, categorical, temporal, geographical)-Data visualization process (datacollection, exploration, analysis, visualization, interpretation)-Challenges and limitations of datavisualization.									15
UNIT III	**Visualization tools & Data Storytelling** Overview of Visualization Tools (e.g., Excel, Tableau, Power BI, Python)- Comparing and Contrasting features and Use Cases among these tools.Principles of Data Storytelling: Narrative and Context-Best Practices for Dashboard Layout andInteractivity.									15
UNIT IV	**Designing Effective Visualizations** Principles of Good Visualization Design - Understanding and Using Color in Visualizations –Importance of Data Modeling in Visualization.									15
TextBooks/ Reference Books	1. Storytelling with Data: A Data Visualization Guide for Business Professionals Cole Nussbaumer Knaflic, Wiley; 1st edition, 2015. 2. “The Visual Display of Quantitative Information” by Edward Tufte, Graphics Press USA; 2nd edition, 2001. 3. Data Visualization: A Practical Introduction" Kieran Healy, Princeton University Press,2018. 4. Analyzing Data with Power BI and Power Pivot for Excel", Alberto Ferrari and Marco Russo, Microsoft Press; 1st edition, 2017. 5. Microsoft Power BI Complete Reference", Devin Knight, Brian Knight, Mitchell Pearson, and Manuel Quintana, Packt Publishing; 1st edition, 2018									
Web Resources	1. https://learn.microsoft.com/en-us/power-bi/ 2. https://www.storytellingwithdata.com/ 3. https://jpsm.umd.edu/sites/jpsm.umd.edu/files/syllabi/Syllabus_Introduction%20to%20Data%20Visualization_Spring%202024.pdf									

DSE202.1 Professional Elective – II Data Visualization Program List
Introduction to Power BI Interface and Basics 1. Installation and interface overview 2. Exploring the Power BI workspace: Ribbon, panes, and canvas. 3. Importing data from Excel and CSV files. 4. Introduction to multiple data sources 5. Basic report creation: Adding visuals and saving a report. **Data Transformation and Preparation** 1. Using Power Query Editor 2. Cleaning data: Removing duplicates, handling missing values. 3. Transforming data: Splitting columns, changing data types, renaming columns. 4. Merging and appending queries. 5. Creating custom columns and calculated columns **Data Modeling** 1. Creating relationships between tables 2. Identifying and resolving data inconsistencies 3. Creating calculated columns and measures **Creating Basic Visualizations** 1. Creating various chart types (bar, column, line, pie, area, etc.,) 2. Formatting and customizing visualizations Publishing and Sharing Reports 3. Publishing a report to Power BI Service. 4. Sharing reports and dashboards with team members. 5. Setting up data refresh schedules and managing permissions.

Course Code	**Cours Title**	**L**	**T**	**P**	**Credit**	**Theory**			**Practical**	
DSE202.2	**Professional Elective–II** Introduction to ML	4	0	4	6	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	80	100	50	--
Course Outcomes (COs):	CO1: Define and explain machine learning concepts,types and types of Dataset. CO2: Implement and apply supervised and unsupervised learning techniques CO3: Develop and evaluate simple machine learning models CO4: Analyze Neural Networks and apply appropriate machine learning algorithms depending on the problems with some real-world data									
Prerequisite	Knowledge of different AI Domains and their Applications									Hrs
UNIT I	**Introduction to Machine Learning** Introduction:Definition, History and Application of Machine Learning Types of Machine Learning (Supervised, Unsupervised, Semi-Supervised, and Re inforcement Learning) Types of Datasets(Labeled and Unlabeled Datasets)									15
UNIT II	**Supervised Learning and Unsupervised Learning** Regression(LinearandNon-LinearRegression),LogisticRegression,Classification									15

	Algorithms (Naive Bayes, K-Nearest Neighbors, Decision Trees) Clustering Algorithms(K-Means,Hierarchical Clustering, DBSCAN,Clustering Validation Measures)	
UNIT III	**MLModels and Performance Evalu ation Parameters** Training,Validation and Testingo fMLModels Performance Evaluation Parameters(Confusion Matrix, Accuracy, Precision, Recall, F1 Score, AUC)	15
UNIT IV	**Neural Networks** Introduction to Neural Networks Ethical Considerations in MachineLearning CaseStudy and Real-WorldApplications	15
TextBooks/ Reference Books	1. SenseofData.CambridgeUniversityPress.ISBN:9781107422223, 2012. 2. Duda, R. O.,Hart,P.E., Stork,D(2007).Patternclassification(2Ed),JohnWiley& Sons, ISBN-13: 978-8126511167. 3. HaykinS.(2009).NeuralNetworksandLearningMachines,ThirdEdition,PHI Learning. 4. Chollet,F. (2018).DeepLearningwithPython. Manning Publications. 5. Bishop,C.M.(2006).PatternRecognitionandMachineLearning. Springer. 6. Goodfellow,I., Bengio, Y.,&Courville, A. (2016).DeepLearning. MIT Press. 7. Géron,A.(2017).Hands-OnMachineLearningwithScikit-Learnand TensorFlow: 8. Concepts,Tools,andTechniquestoBuildIntelligentSystems*(1sted.).O'Reilly Media	
Web Resources	1. https://www.coursera.org/learn/machine-learning 2. https://www.udacity.com/course/aws-machine-learning	

DSE202.2 Introduction to ML Laboratory

1. Use the any numerical dataset with one dependent variable and one independent variable and implement a linear regression model. Visualize the data points and plot the regression line.
2. Choose any binary classification dataset (useonlytwoclasses). Implement logistic regression.Plot the decision boundary between the two classes.
3. Choose any classification dataset.Implement a decision tree classifier and Visualize the decision tree
4. Implement Naïve Bayes classifier on any text classification dataset.
5. Implement a random forest classifier using a numerical dataset.
6. Implement a support vectormachine for linearly separable classes and visualize decision boundary along with the margins
7. Implement K-Means clustering on a point dataset and visualize and evaluate the clusters.
8. Implement hierarchical clustering on a dataset and plot the dendrogram.
9. Implement DBSCAN clustering on a dataset and visualize and evaluate the clusters.
10. Use the Iris Dataset or another numerical dataset. Implement PCAtoreducethe dimensionalityof the dataset. Applyanyclassifierbeforeandafter PCA.Evaluate and compare performance emetrics (e.g., accuracy) before and after PCA
11. Build asingle layer perceptronmodelto classifyAND, OR, and XOR problems(mayuse Tens or Flow/Keras) and visualize their decision boundaries.Also evaluate its performance.
12. Demonstrate the concept of boosting using the AdaBoost algorithm

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
DSE201.3	**Professional Elective–II** Web Programming II	4	0	4	6	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	80	100	50	--
Course Outcomes (COs):	CO1: To Understand the fundamentals of PHP programming language. CO2: To develop PHP applications using Error handling. CO3: To design object-oriented programming (OOP) principles for PHP CO4: To understand data abstraction using interfaces and abstract class.									
Prerequisite	Basics of web application development, scripting language and object-oriented programming (OOP)									Hrs
UNIT I	**Introduction to PHP and Web Development** History and evolution of PHP, Server-side scripting and client-side scripting, PHP syntax and structure, PHP Installation and Configuration, Installing PHP (Windows and Linux), PHP Development Environments (XAMPP, WAMP, LAMP) PHP Basics- PHP Syntax and Structure, Embedding PHP in HTML, PHP tags and comments, Variables, constants, and data types (strings, integers, floats, booleans) Operators (arithmetic, logical, comparison), Control Structures- Conditional statements (if, else, switch), Loops (for, while, do-while, foreach),Break, continue, and exit statements									15
UNIT II	**Functions and Arrays** Functions- Defining and calling functions, Function parameters and return values, Variable scope (global vs local), Built-in PHP functions (string manipulation, array functions, etc.) Arrays and Data Structures- Indexed Arrays, Creating, accessing, and modifying indexed arrays, Looping through arrays (foreach, for), Associative Arrays, Creating, accessing, and modifying associative arrays, Sorting and filtering arrays (array_merge, array_sort, array_filter),Multidimensional Arrays, Creating and accessing multidimensional arrays, Array Functions, Array manipulation functions (array_map, array_reduce, array_walk)									15
UNIT III	**Object-Oriented Programming (OOP) in PHP** Introduction to OOP, Object-Oriented Programming (OOP)Defination, Classes and objects, Basic OOP Concepts, Properties and methods, Constructor and destructor methods. Access modifiers (public, private, protected), Static properties and methods, Inheritance, Creating subclasses and extending parent classes, Polymorphism using method overriding and overloading, Interfaces and abstract classes, Encapsulation, Getter and setter methods.									15
UNIT IV	**Error Handling and Debugging** PHP Error Types, Notices, warnings, and fatal errors, Setting error reporting levels, Exception Handling, Using try, catch, finally blocks, Throwing and catching exceptions Custom exception classes, Debugging Tools, Using var_dump(), print_r(), die(), and debug_backtrace(), Introduction to Xdebug for step-by-step debugging, Logging errors to files									15
TextBooks/ Reference Books	1. Steven Holzner, "PHP: The Complete Reference Paperback", McGraw Hill Education (India), 2007. 2. David Sklar, Adam Trachtenberg, "PHP Cookbook: Solutions & Examples for PHP Programmers", 2014. 3. Object-oriented PHP by Peter Lavin 2006 O'Reilly Publication 4. Programming PHP by Rasmus Lerdorf, Kavin Tatrroe & Peter Maclntyre O'Reilly Publication									

DSE202.3 Web Programming II Laboratory

1. Create a PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number (non-negative integer). The function accept the number as an argument.
3. WAP to check whether the given number is prime or not.
4. Create a PHP page which accepts string from user. After submission that page displays the reverse of provided string.
5. Write a PHP function that checks if a string is all lower case.
6. Write a PHP script that checks whether a passed string is palindrome or not? (A palindrome is word, phrase, or sequence that reads the same backward as forward, e.g., madam or nurses run)
7. Write a PHP script to sort an array.
8. Create a login page having user name and password. On clicking submit, a welcome message should be displayed if the user is already registered (i.e.name is present in the database) otherwise error message should be displayed.
9. Create a simple 'birthday countdown' script, the script will count the number of days between current day and birth day.
10. Create a script to construct the following pattern, using nested for loop.

* *

* * *

* * * *

11. Write a PHP class 'Rectangle' that has properties for length and width. Implement methods to calculate the rectangle's area and perimeter.
12. Write a PHP class called 'Shape' with an abstract method 'calculateArea()'. Create two subclasses, 'Triangle' and 'Rectangle', that implement the 'calculateArea()' method.
13. Write a PHP interface called 'Resizable' with a method 'resize()'. Implement the 'Resizable' interface in a class called 'Square' and add functionality to resize the square.
14. Write a PHP a class hierarchy for a library system, including classes like 'LibraryItem', 'Book', 'DVD', etc. Implement appropriate properties and methods for each class.
15. Write a PHP abstract class called 'Animal' with abstract methods like 'eat()' and 'makeSound()'. Create subclasses like 'Dog', 'Cat', and 'Bird' that implement these methods.
16. Write a class called 'Employee' that extends the 'Person' class and adds properties like 'salary' and 'position'. Implement methods to display employee details.
17. Write a class called 'Math' with static methods like 'add()', 'subtract()', and 'multiply()'. Use these methods to perform mathematical calculations.
18. Write a PHP class called 'Calculator' that has a private property called 'result'. Implement methods to perform basic arithmetic operations like addition and subtraction.
19. Write a PHP class called 'ShoppingCart' with properties like 'items' and 'total'. Implement methods to add items to the cart and calculate the total cost.
20. Write a class called 'Validation' with static methods to validate email addresses, passwords, and other common input fields.
21. Write a PHP program that demonstrates the basic usage of try-catch blocks to handle exceptions.
22. Write a PHP program that implements a PHP function that divides two numbers but throws an exception if the denominator is zero.
23. Write a PHP script that uses try-catch blocks to handle different types of exceptions and display appropriate error messages.
24. Write a PHP program that reads data from a file and throws a custom exception if the file does not exist.

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
SEC202	**DesignThinking and Innovation**	0	0	2	1	**Int**	**Uni**	**Total**	**Int**	**Uni**
						20	30	50	--	--
Course Outcomes (COs):	CO1: Understand design-based thinking approach to solve problems CO2: Propose real-time innovative product designs and Choose appropriate frameworks, strategies, techniques during prototype development. CO3: Understand the importance of prototyping and design prototype for solving problem CO4: Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products									
Prerequisite										Hrs
UNIT I	**Basics of Design Thinking** 1.Understand the concept of innovation and its significance in business 2.Understanding creative thinking process and problem solving approaches 3.Know Design Thinking approach and its objective 4. Design Thinking and customer centricity – real world examples of customer challenges, use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product. 5. Discussion of a few global success stories like AirBnB, Apple, IDEO, Netflix etc. 6.Explain the four stages of Design Thinking Process – Empathize, Define, Ideate, Prototype, Implement									
UNIT II	**Learning to Empathize and Define the Problem** 1.Know the importance of empathy in innovation process – how can students develop empathy using design tools 2.Observing and assimilating information 3.Individual differences & Uniqueness Group Discussion and Activities to encourage the understanding, acceptance and appreciation of individual differences. 4.What are wicked problems 5.Identifying wicked problems around us and the potential impact of their solutions									
UNIT III	**Ideate, Prototype and Implement** 1.Know the various templates of ideation like brainstorming, systems thinking 2.Concept of brainstorming – how to reach consensus on wicked problems 3.Mapping customer experience for ideation 4.Know the methods of prototyping, purpose of rapid prototyping. 5.Implementation									
UNIT IV	**Feedback, Re-Design & Re-Create** 1.Feedback loop, focus on User Experience, address ergonomic challenges, user focused design 2.Final concept testing, 3.Final Presentation – Solving Problems through innovative design concepts & creativesolution									
TextBooks/ Reference Books	1.E Balaguruswamy (2023), Developing Thinking Skills (The way to Success), Khanna Book 2.Tim Brown, (2008), "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", Harvard Business Review 3.8 steps to Innovation by R T Krishnan & V Dabholkar, Collins Publishing 4.Design Thinking and Innovation 5.Design Thinking by Nigel Cross, Bloomsbury									