Department of Data Science-NEP IV sem Syllabus

CourseCode	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme					
								Theory			Practical		Total Marks
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT	
SEMESTER-IV													
23BTCSL203DS	Computer Architecture and organization	PCC4	3	1		4	4	10	15	50			75
23BTCSL202DS/ 23BTCSP202DS	Database Management System	PCC5	3		2	5	4	10	15	50	25	25	125
23BTDSL211	Multidisciplinary Minor-II Data Analytics with Tableau SEPM(IT)	MD2	2			2	2	10	15	50			75
23BTDSL212	Open elective –II Machine Learning Concepts	OE2	2			2	2	10	15	50			75
23BTHUL204DS	Universal Human Values 2: Understanding Harmony	VEC2	2			2	2	10	15	50			75
1. 23BTDSL215 2. 23BTDSL216	Skill Enhancement Course –III 1. Web Development and Data Insights 2. Visual Data Analytics	VSEC 3	1	-	2	3	2	10	15		25	-	50
23BTHUL202DS	Aptitude & Employability Skills :2	AEC2	1	-	2	3	2	10	15		25	-	50
23BTHUL202DS	Entrepreneur Development Practices	EEMC 2	2	-			2	10	15	50		-	75
TOTAL			**16**	**1**	**6**	**21**	**20**	**80**	**120**	**300**	**75**	**25**	**600**

Subject/sem	Vocational and Skill Enhancement (VSEC)	Multi-Disciplinary Minor (MDM) TO OTHER BRANCH STUDENTS	Open Elective (OE) TO OTHER BRANCH STUDENTS
IV SEM	**VSEC3:** • Web Development and Data Insights • Visual Data Analytics	**MD2:** • Data Analytics with Tableau	**OE2:** • Machine Learning Concepts

Title: **Computer Architecture and Organization**										
Semester	IV	Course Title: Computer Architecture and Organization								
Term	EVEN	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Course Category	PCC8	Th	Tu	Pr	Credits	TAE	CAE	ESE	Int	Ext
Course Code	23BTCSL203DS	3	1	-	4	10	15	50	-	-
Teaching Mode	Offline									

Course Objectives	To understand the design principles of digital computing systems
	To provide an essential understanding of different subsystems of modern computer system and design aspects of these subsystems3
	To provide an overview of performance enhancement methods in instruction Execution
Course Outcomes	CO1: To describe the basic components and design of a computer system
	CO2: To examine the issues involved in the instruction execution and various stages of instruction life stage
	CO3: To apply the concept of various memories and interfacing technologies
	CO4: To analyze the different parallel processing technique
	CO5: To design different high-performance computing architecture

Mapping of Course Outcomes with Program Outcomes and Program-Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3												3		
CO2		3											2		
CO3		3											2		
CO4			3										3		
CO5			3											3	

Course Contents:

Unit	Contents	Hours
I	Basic functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU –registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set, Instruction set architecture CISC, RISC, Case study: Instruction sets of common CPUs	12
II	Data representation method, IEEE standard: single and double precision format and examples, Fixed point Addition, Subtraction, Multiplication, and Division. Floating Point Arithmetic, High-performance arithmetic. Booth's algorithm: Multiplication & Division	12
III	Memory hierarchy, Memory Chip Organization, Cache memory, and Virtual memory. Parallel Bus Architectures, Internal Communication Methodologies, DMA, Serial Bus Architectures, Mass storage, Input and Output Devices, Segmentation, TLB	12
IV	An Overview of Pipelining: Basic concepts of Pipelining, Pipelined Datapath, and Control. Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Arithmetic and Instruction Pipeline, throughput and speedup, pipeline hazards.	12
V	CPU control unit design: hardwired and micro-programmed design approaches, Case study: Von Neumann Architecture, Design of a simple hypothetical CPU, Multicore processors architecture, Simple MIPS Processor Components, Designing a Datapath for a Simple Processor	12

Text Books	1.	Computer Organization and Architecture by Carl Hamacher 4th Edition
	2.	Advance computer Architecture by Kai Hwang under Tata McGraw Hill Publications
	3.	Introduction to Parallel Processing: Algorithms & Architectures, Behrooz Parhami in Springer Shop
EBooks	1.	Computer Architecture and Organization by William Stalling http://home.ustc.edu.cn/~leedsong/reference_books_tools/Computer%20Organization%20and%20Architecture%2010th%20-%20William%20Stallings.pdf
Reference Books	1.	Introduction to Parallel Processing by P. Ravi Prakash, M. Sasikumar, Dinesh Shikhare By PHI Publications
	2.	Fundamentals of Parallel Processing by Jordan Harry, Alaghband Gita, PHI Publication
	3	Parallel Computers – Architecture and Programming by V. Rajaraman And C. Siva Ram Murthy.
	4.	Introduction to Parallel Programming by Steven Brawer
On-line TL Material	1.	NPTL https://nptel.ac.in/courses/106/105/106105163/

Course Title: **DATABASE MANAGEMENT SYSTEM**										
Semester	IV	Teaching Scheme				Evaluation cheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	PCC5	3 Hrs.		2	4	10	15	50	25	25
Course Code	23BTCSL202 DS									
Teaching Mode	Offline	3 Hrs			Total	75			50	
Duration of ESE	2 Hrs					125				

Course Objectives	This course introduces general idea of database management system, also gives idea to design databases using data modeling and designtechniques.
	It is also aimed to developing skills to implement real life applications which involve database handling.
	This course also provide carrier opportunities in subject areas of designing, storage techniques and data handling and managingtechniques
Course Outcomes	**CO1**: Analyze an information storage problem and derived an information model expression in the form of Entity relation diagramand design appropriate data model for it.
	CO2: Demonstrate SQL queries to perform CRUD (Create, Retrieve,Update, Delete) operations on database and perform inferential analysis of data model
	CO3: Identify features of database management systems and Relational database and Understand functional dependencies and various normalization forms
	CO4: Perform basic transaction processing and m nagement and ensure database security, integrity and concurrency control
	CO5: Analyze the management of structured and unstructured data management with recent tools and technologies

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	--	--	3	--	3	--	--	--	--	--	--	--	2	--
CO2	--	--	3	3	--	--	--	--	--	--	--	--	3	--
CO3	--	2	3	--	--	--	--	--	--	--	--	--	--	3
CO4	--	--	3	2	--	--	--	--	--	--	--	--	2	--
CO5	--	--	2	--	3	--	--	--	--	--	--	--	2	--

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Unit	Contents	Hours
I	Introduction to DBMS - DBMS Architecture, Data Models, E-R Diagram, Relational Database design:	8
II	SQL Concepts - Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints, Functions - aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types.	9
III	Functional Dependency (FD) – Basic concepts, closure of set of FD, closure of attribute set, Decomposition, Normalization – 1NF, 2NF, 3NF, BCNF, 4NF	8
IV	Transaction control commands – Commit, Rollback, Save point. Transaction Management: Transaction concepts, properties of transactions, serializability of transactions, Two- Phase Commit protocol, Deadlock, two-phase locking protocol. Cursors, Stored Procedures, Stored Function, Database Trigger, Database recovery.	10
V	Indexing and hashing, Query processing, Query Optimization, Data Mining, Advances in databases	10

Text Books	1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts 4th Ed, McGraw Hill, 2002.
	2.	Jeff Ullman, and Jennifer Widom, A First Course in Database systems, 2nd Ed.
E-Books	1.	https://ebooks.lpude.in/computer_application/mca/term_1/DCAP204_MANAGING_DATABASE_DCAP402_DATABASE_MANAGEMENT_SYSTEMS.pdf
Reference Books	1.	G. K. Gupta :"Database Management Systems", McGraw – Hill.
	2.	Regina Obe, Leo Hsu, PostgreSQL: Up and Running, 3rd Ed, O'Reilly Media 2017.
	3.	Kristina Chodorow, Shannon Bradshaw, MongoDB: The Definitive Guide, 3rd Ed, O'Reilly Media 2018.
	4.	RamezElmasri and ShamkantNavathe, Fundamentals of Database Systems 2nd Ed, Benjamin Cummings, 1994.
online TL Material	1.	https://nptel.ac.in/courses/106/105/106105175/

Course Code	23BTCSP202 DS

Course Title: **SOFTWARE ENGINEERING AND PROJECT MANAGEMENT MD-2**										
Semester	IV	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term		Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	C	2Hrs	--	--	3	10	15	50	25	--
Course Code	23BTITL204DS									
Teaching Mode	Offline	4 Hrs			Total	75			25	
Duration of ESE	3 Hrs					100				

Course Objectives	The student should be made to: 1. Understand the phases in a software project
	2. Understand fundamental concepts of requirements engineering and Analysis Modeling.
	3. Understand the major considerations for enterprise integration and deployment.
	4.Learn various testing and maintenance measures
Course Outcomes	Up on successful completion of this course, student will be able to:
	CO1: Identify the key activities in managing a software project
	CO2: Compare different process models and design techniques.
	CO3: Understand the concepts of requirements engineering and Analysis. Modeling.
	CO4: Apply quality management and project management procedure for software design and deployment.
	CO5: Remember various software testing and planning approaches.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	-	-	-	-	-	-	-	3	-	-	-	-
CO2	3	2	3	-	-	-	-	-	-	-	3	-	-	-	-
CO3	2	3	3	2	1	-	-	-	-	-	3	-	3	2	-
CO4	2	3	3	-	-	-	-	-	-	-	3	-	3	3	-
CO5	3	-	3	1	-	-	-	-	-	-	3	-	-	3	-

Course Contents:

Unit	Contents	Hours
I	**SOFTWARE PROCESS** Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models, Agile models, Software Project Management, Project Scheduling – Scheduling, Earned Value Analysis.	6
II	**REQUIREMENTS ANALYSIS AND SPECIFICATION** Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary	6
III	**SOFTWARE DESIGN** Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.	6
IV	**PROJECT MANAGEMENT** Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II – Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM – Scheduling and Tracking –	6
V	**TESTING** Software testing fundamentals-Internal and external views of Testing-white box testing – basis path testing-control structure testing-black box testing Debugging	6

Text Books	1.	Roger S. Pressman, "Software Engineering – A Practitioner"s Approach", Seventh Edition, McGraw-Hill International Edition, 2010.
	2.	Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
E--Books	1.	Foundations of Software Engineering by Kevin Amaratunga
	2.	The New Software Engineering by Sue Conger
Reference Books	1.	Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited, 2009.
	2.	PankajJalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
on line TL Material	1.	Certification Courses available: https://nptel.ac.in/downloads/106105087/
	2.	Free Courses available: https://swayam.gov.in/course/236-software-enginnering

Course Title: Data Analytics with Tableau-MD2										
Semester	**IV**	**Teaching Scheme**				**Evaluation Scheme**				
						Theory			**Practical**	
Term	**EVEN**	**TH**	**TU**	**PR**	**Credits**	**TAE**	**CAE**	**ESE**	**INT**	**EXT**
Course Category	**MD2**	**2**	**-**	**-**	**2**	**10**	**15**	**50**	**-**	**-**
Course Code	**23BTDSL211**									
Teaching Mode	**Offline**	**2**			**Total**	**75**			**--**	
Duration of ESE	**3**					**75**				

Course Objectives	1. To introduce students the basics of Tableau, including the user interface and key features.
	2. To provide students with the knowledge of blending and joining data from multiple sources.
	3. To encourage students to explore advanced analytics features and create interactive dashboards by combining multiple visualizations.
Course Outcomes	CO1: Understand the representation of tableau and its fields.
	CO2: Analyze various data organization that are present in tableau.
	CO3: Apply visualization tips in tableau.
	CO4: Apply the various charts and maps used for data visualization.
	CO5: Design the Database connection with tableau and forecast the predictions.

Course Outcomes	Program Outcomes and Program Specific Outcomes													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	2	2	1								1	2
CO2	3	3	3	3	3								1	2
CO3	2	2	3	3	3							1	1	1
CO4	2	3	3	2	3							2	2	3
CO5	2	2	3	3	3							2	2	3

Course Contents:

Unit	Contents	Hours
I	**Unit I: Introduction** What is Tableau? Terminology, Tableau v/s Excel, Applications and key factors, Data-types, views of data and records, Measure, Dimension, Discrete and Continuous.	6
II	**Unit II: Organizing and Simplifying Data** Drill down and hierarchies, Sorting, Grouping, Parameters, Combine, Sets, Title, Caption, Exporting, Granularity, Worksheet Interface, Managing Metadata, Dashboard, Tableau bins: fixed and variable.	6
III	**Unit III: Data Connections in Tableau** Connecting to tableau server, Join and types of join, Data Blending, Joining v/s Blending, Filters, size, color, label, tooltip, shapes, detail, font, alignment, shading, borders, calculations, Number and String functions, Logical function, conditional formatting, Rank.	6
IV	**Unit IV: Charts and Maps** Introduction to Chart, Scatter charts, Line charts, Reference lines, Bubble chart, Bar chart, Stacked chart, Pie chart, Bump chart, Funnel chart, Waterfall chart, Chart linking Techniques. Introduction to Maps, Map options, Map layers, Word maps, Tree maps.	6
V	**Unit V: Use Cases** Custom Territories, Custom Geocoding, Religion Wise population, National Park, Highlighting and Actions, Publishing Reports, Dashboard Designing, Interacting with Tableau online.	6

Text Book:	1.	Tableau 10 for beginners, version: 10.x, Chandraish Sinha
Online TL Material:	1.	https://www.udemy.com/ tableau-desktop-a-complete-introduction/
	2.	https://www.datacamp.com/courses/introduction-to-tableau/

Course Title: Machine Learning Concepts-OPEN ELECTIVE-II(to other branch students)										
Semester	IV	Teaching Scheme				**Evaluation Scheme**				
						Theory			**Practical**	
Term	EVEN	Th	Tu	Pr	Credits	**TAE**	**CAE**	**ESE**	**INT**	**EXT**
Course Category	**Open elective-II**	2	--	2	2	**10**	**15**	**50**		
Course Code	23BTDSL 212									
Teaching Mode	OFFLINE	5			Total	**75**				
Duration of ESE	3									

Course Objectives	1. To introduce the basic concepts and techniques of machine learning. 2. To understand major machine learning algorithms. 3. To identify machine learning techniques suitable for a given problem.
Course Outcomes	On successful completion of the course, students will be able to: 1. Understand basic necessary mathematics for machine learning. 2. Apply supervised machine learning model to solve a specific problem. 3. Apply Instance based learning for a given application. 4. Solve problems using probabilistic machine learning model support vector machine, hidden markov model. 5. Apply unsupervised machine learning model to solve a specific problem.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	**Program Outcomes and Program Specific Outcomes**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**3**	**3**	**3**	**3**	**2**						**2**	**2**	**1**
CO2	**2**	**3**	**3**	**2**	**2**	**2**							**2**	**1**
CO3	**2**	**3**	**3**	**1**	**2**	**3**							**2**	**1**
CO4	**2**	**3**	**3**	**3**	**2**	**2**						**2**	**2**	**1**
CO5	**2**	**3**	**3**	**3**	**2**	**3**						**3**	**2**	**1**

Unit	Contents	Hours
I	Necessary Mathematics for Machine Learning: **Linear Algebra:** Matrix, Vector, Transpose, Vector space, Rank, Norm, Determinant, Trace, Eigen values and Eigen vectors, **Statistics and Calculus**: Probability, Random variable, Binomial, Poisson, normal distribution, Sampling and Sampling distribution, Derivatives, Rules of Derivatives, Partial derivatives, Mean, Median and Mode.	**6**
II	Introduction to Machine Learning, types process and Applications, Evaluation of model, under fitting, over fitting, Bias variance Trade off, Concept of loss functions, Limitations of Machine Learning. Regression: Linear Regression, Logistic Regression.	**6**
III	Instance-Based Learning: k-Nearest neighbour algorithm, Case-based learning. Decision tree algorithm, Random forest Algorithm, Basics of ANN, Activation functions, learning process in ANN, Implementation of ANN.	**6**
IV	Probabilistic Machine Learning, Naive Bayes classifier, Bayes optimal classifiers, Support Vector Machine, Hidden Markov Models	**6**
V	Clustering and Unsupervised Learning: K-means, Hierarchical Clustering using single linkage, complete linkage and average linkage methods. Capstone projects in machine learning.	**6**

Text Books	Machine Learning- an Artificial Intelligence Approach, Volume-II, Tom Mitchell, Morgan Kaufmann, 1986.
	Machine Learning- Saikat Dutt, Subramanian Chandramouli, Pearson Education 2022
Reference Books	Deep Learning- Amit Kumar das, Saptarsi Goswami, Pearson Education 2021
	A. K. Jain and R. C. Dubes; Algorithms for Clustering Data; Prentice Hall PTR, 1988.
Online TL Material	https://unicornplatform.com/blog/top-5-best-websites-to-learn-machine-learning-for-free/
	https://www.udemy.com/course/complete-machine-learning-and-data-science-zero-to-mastery
	https://www.coursera.org/collections/machine-learning

Course Title: Web Development and Data Insights-VSEC3										
Semester	**IV**	**Teaching Scheme**				**Evaluation Scheme**				
						Theory			**Practical**	
Term	**EVEN**	**Th**	**Tu**	**Pr**	**Credits**	**TAE**	**CAE**	**ESE**	**INT**	**EXT**
Course Category	**VSEC3**	**1**	**–**	**2**	**2**	**10**	**15**	**-**	**25**	**–-**
Course Code	**23BTDSL215-1**									
		3			**TOTAL**	**25**			**25**	
						50				

Course Objectives	To understand the basics of Web Designing using HTML, CSS and Bootstrap.
	To be able to develop, publish and host a website.
Course Outcomes	CO1: Understand the concept of web design principles and its architecture.
	CO2: Demonstrate the various tags which is used to create the layout of the webpage
	CO3: Demonstrate various styling and ways of adding CSS in Web documents.
	CO4: Design and host responsive website using various components of Bootstrap
	CO5: Apply web analytics tools for problem solving

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	**Program Outcomes and Program Specific Outcomes**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**2**	**2**	**1**	**2**	**1**	**1**						**3**	**2**	
CO2	**2**	**3**	**2**	**2**	**3**	**2**						**3**	**3**	
CO3	**2**	**3**	**2**	**2**	**3**	**2**						**3**	**3**	**3**
CO4	**2**	**3**	**2**	**2**	**3**	**2**						**3**	**3**	
CO5	**3**	**3**	**3**	**3**	**3**	**2**	**3**					**3**	**3**	**2**

Unit	Contents	Hours
I	**Introduction to Web Technologies -** Introduction, Web Protocols and programs, Secure connections, Application and development tools, Web browser and Web server Web Design: Web site design principles, Planning the site and navigation, Architecture of Web-based systems-Client/server (2-tier) architecture, 3-Tier architecture. Case study of an e-commerce website.	**3**
II	**HTML -** Introduction to HTML, Prologue, Head section – Link, Base, Meta, Script, Style, Body Section – Header, Paragraphs, Text Formatting, Anchor, Images, Lists, Tables, Frames, Phrase (Special Purpose). HTML Forms: Form Attributes and Elements, Form Inputs types (text, submit, reset, radio, date, password, etc)	**3**
III	**Cascading Style Sheet (CSS) -** Introduction to CSS, Coding, setting properties and values for various tags, Text Fonts, Color Background Cursor, Style Sheet, In-Line, Embedded and External, Selector, Class, ID and Contextual **Bootstrap -** Introduction to Bootstrap framework, Bootstrap Grid system, Bootstrap components, Bootstrap tables, Images, Buttons, Navigation Bar, Filters.	**3**
IV	**Website Publishing and Hosting -** Introduction, Website Publishing vs Website Hosting, Create and hosting a static Website, Make a Business website, Make a website for real life scenario, Website Publishing Process, Website Hosting Process. Case Study and analysis/Mining of social Media platforms.	**3**
V	**Data Insights** - A Brief History of Web Analytics, Importance of Web Analytics process, How Web Analytics collects Web Data, Data collection methods in web analytics. Web Logs, Techniques and technologies used in web analytics, Web analytics tools: Google Analytics and its study	**3**
Text Books	"Internet and World Wide Web - How to Program", by Deitel, Deitel and Nieto, 5th Edition, PHI, 2011.	
	"The Web Warrior Guide to Web Programming", by Bai and Ekedhi,, 3rd Edition, Thomson, 2008.	
Reference Books	Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech	
	Beginning Web Programming-Jon Duckett WROX.	
	Programming world wide web, R.W. Sebesta. Fourth Edition, Pearson.	
	Internet and World Wide Web – How to program, Dietel and Nieto, Pearson.	
	https://www.oreilly.com/library/view/web-analytics-an/9780470130650/	
Online TL Material	https://html.com/	
	https://www.w3schools.com/html/	
	https://www.tutorialspoint.com/css/index.htm	
	https://analytics.google.com/analytics/academy/course/6	

Course Title: Visual Data Analytics-VSEC3										
Semester	**IV**	**Teaching Scheme**				**Evaluation Scheme**				
						Theory			**Practical**	
Term	**EVEN**	**Th**	**Tu**	**Pr**	**Credits**	**TAE**	**CAE**	**ESE**	**INT**	**EXT**
Course Category	**VSEC3**	**1**	**--**	**2**	**2**	**10**	**15**	**-**	**25**	**-**
Course Code	**23BTDSL216**									
Teaching Mode	**Offline**	**3**			**TOTAL**	**25**			**25**	
						50				

Course Objectives	Introduce basic Python programming concepts necessary for data visualization.
	Learn the basics of creating static plots using Matplotlib and seaborn.
Course Outcomes	CO1: Understand basic Python commands necessary for data visualization.
	CO2: Apply basic Matplotlib functionalities to create and customize simple plots.
	CO3: Analyze complex datasets by creating advanced visualizations using multiple axes, histograms, box plots, heatmaps,
	CO4: Evaluate different Seaborn plot types and customization options to create informative statistical graphics for data analysis.
	CO5: Create comprehensive data visualization projects for real-world datasets.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	**Program Outcomes and Program Specific Outcomes**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**3**	**2**	**2**	**3**	**2**						**2**	**2**	**1**
CO2	**2**	**3**	**3**	**2**	**2**	**2**							**2**	**1**
CO3	**2**	**3**	**3**	**1**	**2**	**3**							**2**	**1**
CO4	**2**	**2**	**2**	**3**	**2**	**2**						**2**	**2**	**1**
CO5	**2**	**3**	**3**	**3**	**2**	**3**						**2**	**2**	**1**

Unit	Contents	Hours
I	**Introduction to Python:** Python installation and setup, Basic syntax and data types, Variables and operators, Control Structures: Conditional statements (if, elif, else) Loops (for, while), Functions and Modules: Defining and calling functions, Importing and using modules, Understanding scope and namespaces Data Structures: Lists, tuples, sets, and dictionaries, List comprehensions Basic Input and Output: Reading from and writing to files Basic error handling	**3**
II	**Data Visualization with Matplotlib:** Introduction to Matplotlib, Installing Matplotlib, Basic structure of a Matplotlib plot, Creating Simple Plots:Line plots Scatter plots,Bar charts, Customizing Plots:Adding titles and labels, Customizing colors and stylesCreating multiple subplots.	**3**
III	**Advanced features of Matplotlib:** Plotting with Multiple Axes:Creating plots with secondary y-axes, Using twin axes, Histograms and Box Plots:Creating histograms, Customizing bins and colors, Creating and customizing box plots Heatmaps and Contour Plots, Creating heatmaps, 3D Plotting:Creating 3D line plots and scatter plots, Customizing 3D plots, Animations: Introduction to animations in Matplotlib Creating simple animations	**3**
IV	**Introduction to Seaborn:** Installing Seaborn, Differences between Matplotlib and Seaborn, Creating Seaborn Plots: Line plots with Seaborn, Scatter plots with Seaborn, Categorical plots (bar plots, count plots), Statistical Plots: Distribution plots (histograms, KDE plots), Box plots and violin plots, Pair plots, Customizing Seaborn Plots, Integrating Seaborn with Matplotlib	**3**
V	**Case Studies and Projects:** Sales Data Analysis, Stock Market Analysis, Customer Segmentation Analysis	**3**
Text Books	Data visualization with Python: create an impact with meaningful data insights using interactive and engaging visuals: Mario Dobler	
	Storytelling With Data: A Data Visualization Guide for Business Professionals by Cole Nussbaumer Knaflic	
Online TL Material	https://www.coursera.org/learn/python-for-data-visualization	
	https://haralick.org/DV/Handbook_of_Data_Visualization.pdf	