



ANNASAHAB DANGE COLLEGE OF ENGINEERING AND TECHNOLOGY, ASHTA
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Department of Bachelor in Computer Application

Course Details:

Class	T.Y. B.C.A, Sem.-V		
Course Code and Course Title	0BCPE301, Introduction to Data Science [Data Science]		
Prerequisite/s	---		
Teaching Scheme: Lecture/Tutorial/Practical	03/00/04		
Credits	05		
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0BCPE301_1	Explain the fundamental concepts of Data Science, including data types, data lifecycle, big data, and applications in business and other domains.
0BCPE301_2	Apply the Data Science process to collect, clean, transform, and analyze data using appropriate visualization techniques.
0BCPE301_3	Analyze different types of data analytics and implement basic analytical techniques such as regression, classification, clustering, and association rules.
0BCPE301_4	Make use of data science tools and programming languages (Python, R, Excel, SQL, Weka) to build and evaluate simple data-driven models.

Course Contents: Theory		
Unit 1	Introduction to Data Science: Concept of Data Science, Need for Data Science, Components of Data Science, Big data, Facets of data: Structured data, Unstructured data, Machine-generated data, Graph-based or network data, Audio, image and video, Streaming data, The need for Business Analytics, Data Science Life Cycle, Applications of data science.	11Hrs
Unit 2	Data Science Process: Overview of data science process, Problem definition, Data collection (APIs, DB, Web), Cleansing, integrating and transforming data, Exploratory data analysis. Data Modelling, Presentation and automation, Data visualization techniques.	12Hrs


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Unit 3	Data Analytics: Types of Analytics - Descriptive, Predictive, Prescriptive, Data Analytics Lifecycle: Overview – Discovery, Data Preparation, Model Planning, Model Building, Introduction to Regression analysis, Classification techniques, Clustering, Association rules analysis.	11 Hrs
Unit 4	Data Science Tools and Algorithms: Basic Data Science languages- R, Python, Knowledge of Excel, SQL Database, Introduction to Weka, Regression Algorithms – Simple Linear Regression, Multiple Regression ,Logistic Regression, K-Nearest Neighbours Algorithm, K-means algorithm.	11 Hrs
	Total Lecture Hours	45

Course Contents: Laboratory:

Expt. No.	Title
1	Study and demonstrate different types of data (structured, unstructured, streaming, etc.) with real examples.
2	Case study on applications of data science in business/healthcare/social media.
3	Explore datasets and identify facets of data (text, image, network data).
4	Data collection from open datasets (e.g., CSV/online source) and understanding dataset structure.
5	Data cleaning: handling missing values using Python/Excel.
6	Data cleaning: removing duplicates and inconsistencies using Python/Excel.
7	Data transformation: normalization techniques.
8	Data transformation: encoding categorical data.
9	Perform Exploratory Data Analysis (EDA) using summary statistics.
10	Data visualization using charts/graphs in Python or Excel.
11	Apply full data science process (data collection → cleaning → EDA).
12	Demonstration of Types of Data Analytics (Descriptive, Predictive, Prescriptive).
13	Implementation of Simple Linear Regression Model.


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14	Implementation of Logistic Regression for Classification.
15	Classification using Decision Tree.
16	Classification using K-Nearest Neighbors (KNN).
17	Apply clustering (K-Means) to group data points.
18	Perform association rule mining (market basket analysis concept using sample data).
19	Introduction to Data Science Tools: Python, Excel, and SQL.
20	Implementation of Machine Learning Algorithms using Python/Weka.
Total Practical Sessions	
30	
Total Practical Hours	
60	

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Data Analytics Made Accessible	Dr. Anil Maheshwari	CreateSpace / Amazon	Latest	2014
02	An Introduction to Statistical Learning	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani	Springer	2 nd Edition	2021

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Practical Statistics for Data Scientists	Peter Bruce, Andrew Bruce, Peter Gedeck	O'Reilly Media	2 nd Edition	2020
02	Think Stats: Probability and Statistics for Programmers	Allen B. Downey	O'Reilly Media	2 nd Edition	2014


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Web Resources:

1. Coursera – Introduction to Data Science in Python - <https://www.coursera.org/learn/python-data-analysis/>
2. GeeksforGeeks – Data Science with Python Tutorial - <https://www.geeksforgeeks.org/data-science/data-science-with-python-tutorial/>
3. Real Python – Data Science Learning Path - <https://realpython.com/tutorials/data-science/>
4. LearnDataSci – Data Science Resources - <https://www.learndatasci.com/>

YouTube Link:

1. <https://www.youtube.com/watch?v=ua-CiDNNj30>
2. <https://www.youtube.com/watch?v=0P7QnIQDBJY>
3. <https://www.youtube.com/watch?v=Q0vpV3e7G8I>


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Course Details:

Class		T.Y. B.C.A, Sem.- V	
Course Code and Course Title		0BCPE302 – Deep Learning [Artificial Intelligence & Machine Learning]	
Prerequisite/s		0BCPE217: Introduction to ML	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		05	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE302_1	Explain fundamental concepts of deep learning and computer vision.
0BCPE302_2	Apply convolutional neural network techniques for image processing tasks.
0BCPE302_3	Analyze deep learning models for object detection, segmentation, and recognition.
0BCPE302_4	Analyze computer vision problems and interpret appropriate deep learning solutions.

Course Contents: Theory

Unit 1	Basics of Deep Learning & Computer Vision: What is Computer Vision? (real-life examples), Introduction to Neural Networks, Perceptron and simple Multi-layer Networks, Activation Functions (ReLU, Sigmoid, Softmax – basic idea) , Loss functions (what error means) , Concept of backpropagation (how model learns)	11 Hrs
Unit 2	Convolutional Neural Networks (CNNs): What is CNN and why it is used for images, Convolution (filters), padding, stride (intuitive understanding), Pooling layers (max pooling), Famous models: AlexNet, VGG, ResNet (overview only), Transfer learning (using ready models), Basic evaluation (accuracy, confusion matrix)	12 Hrs
Unit 3	Advanced Computer Vision : Object detection (basic idea of YOLO) , Image segmentation (basic idea of U-Net) , Autoencoders (image compression idea) , GANs (how machines generate images) , Simple idea of image captioning and video analysis	12 Hrs


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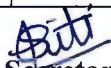


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Unit 4	Applications and Deployment : Applications: Face recognition, medical images, self-driving cars , Data preprocessing and image augmentation, Model training basics (epochs, learning rate), Introduction to TensorFlow / PyTorch (usage only), Basic idea of model deployment, Ethical issues (bias, privacy)	10 Hrs
Total Lecture Hours		45 Hrs

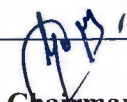
Course Contents: Laboratory

List of Practical's	
Expt. No.	Title of Experiment
1	Installation and setup of Python
2	Basic image operations (read, save, resize, gray scale conversion)
3	Image preprocessing techniques (normalization, filtering, edge detection)
4	Data augmentation (rotation, flipping, cropping, scaling)
5	Implementation of Image Augmentation Impact Analysis
6	Implementation of a simple Artificial Neural Network (ANN) using Python
7	Study of activation functions (ReLU, Sigmoid, Softmax) and loss functions
8	Implementation of Convolutional Neural Network (CNN) for image classification (e.g., MNIST/CIFAR-10)
9	Experiment with hyperparameters (learning rate, epochs, batch size)
10	Model evaluation using accuracy, precision, recall, confusion matrix
11	Visualization of feature maps and filters
12	Use of pre-trained models (VGG16 / ResNet50)
13	Implementation of Image Classification using Transfer Learning
14	Fine-tuning on a custom dataset
15	Implementation of Real-time Image Classification using Webcam
16	Implementation of object detection using YOLO / SSD (pre-trained model usage)
17	Implementation of Face Detection using OpenCV
18	Basic image segmentation using U-Net (concept + implementation)
19	Implementation of Autoencoder or basic GAN for image generation
20	Small Application: Develop an end-to-end computer vision system such as: - Face mask detection - Handwritten digit recognition

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	- Object classification system - Medical image classifier			
Total Practical Session	30	Total Practical Hours	60	

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Deep Learning	Ian Goodfellow, Yoshua Bengio, Aaron Courville	The MIT Press	1st Edition	2016
02	Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow	Aurélien Géron	Oreilly	2 nd Edition	2019
03	Deep Learning	S. Sridhar	Oxford Univ. Press India	1st Edition	2019
04	Computer Vision: Algorithms and Applications	Richard Szeliski	Springer	2 nd Edition	2022

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Deep Learning for Computer Vision with Python	Adrian Rosebrock	PyImageSearch	3 rd Edition	2019
02	Deep Learning with Python	Francois Chollet	Manning Publications	1 st Edition	2017
03	Deep Learning and Computer Vision	R.K. Mishra	BPB Publications	1 st Edition	2021

Online Courses:

- | | | |
|----|--|---|
| 01 | Coursera – Deep Learning Specialization | https://www.coursera.org/specializations/deep-learning-computer-vision |
| 02 | Coursera – Deep Learning for Computer Vision | https://www.coursera.org/learn/computer-vision-deep-learning |

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Course Details:

Class		T.Y. B.C.A, Sem.-V	
Course Code and Course Title		0BCPE303, Web Programming-III [Full Stack Development]	
Prerequisite/s		0BCPE208-Web Programming-I 0BCPE218-Web Programming-II	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		05	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE303_1	Explain advanced PHP concepts and web development techniques
0BCPE303_2	Develop dynamic web applications using PHP and forms
0BCPE303_3	Implement CRUD operations using MongoDB
0BCPE303_4	Integrate PHP with MongoDB for real-world applications

Course Contents: Theory

Unit 1	Advanced PHP Programming: Overview of PHP in Modern Web Development and Architecture, Advanced Control Structures and Functions (recursive functions, variable scope, function handling), Object-Oriented PHP: Classes, Objects, Constructors & Destructors, Inheritance, Encapsulation, and Polymorphism, Code reusability and modular programming, Working with Arrays and Superglobals: Superglobals (\$_GET, \$_POST, \$_SESSION, \$_COOKIE, \$_FILES), Advanced Form Handling: Form validation and sanitization, File upload handling, Session and Cookie Management (secure implementation techniques), File Handling and Data Processing (file operations, JSON handling), Error Handling and Debugging: Exception handling, Logging and debugging techniques, Introduction to PHP Security Practices: Input validation and sanitization, Preventing common vulnerabilities (SQL Injection, XSS basics)	12Hrs
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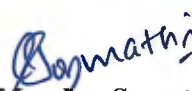
Unit 2	PHP and Web Development Concepts Working with HTML forms and validation, PHP with MySQL (intro only for comparison), Introduction to AJAX with PHP, Object-Oriented PHP (Classes, Objects, Inheritance, Polymorphism), PHP Security (SQL injection, XSS prevention basics), Introduction to REST APIs in PHP	11Hrs
Unit 3	Introduction to MongoDB: Introduction to NoSQL databases, Overview of MongoDB architecture Installation and setup of MongoDB, MongoDB Data Model (Collections, Documents), CRUD Operations: Insert documents, Query documents, Update documents, Delete documents, Indexing and Aggregation basics	11 Hrs
Unit 4	PHP with MongoDB Integration: Introduction to MongoDB PHP Driver, Connecting PHP with MongoDB CRUD operations using PHP + MongoDB, Building dynamic web applications using MongoDB, Handling JSON data in PHP	11 Hrs
Total Lecture Hours		45

Course Contents: Laboratory:

Expt. No.	Title
1	Write a PHP program demonstrating advanced control structures and user-defined Functions including recursive functions and variable scope.
2	Write a PHP program to implement Object-Oriented Programming concepts such as classes, objects, Inheritance, Polymorphism, constructors, and destructors
3	Develop a PHP program to demonstrate inheritance, encapsulation, and polymorphism for code reusability and modular design.
4	Write a PHP program to perform operations using arrays and superglobals (\$_GET, \$_POST, \$_SESSION, \$_COOKIE, \$_FILES).
5	Develop a PHP form-based application implementing input validation, sanitization, and secure data handling.
6	Create a PHP application to handle file uploads and perform file operations including reading, writing, and JSON data processing.

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7	Develop a PHP program to demonstrate session management.
8	Write a PHP program to create and retrieve cookies.
9	Develop a PHP program for form validation using server-side scripting.
10	Create a simple AJAX-based PHP application.
11	Develop a RESTful API using PHP.
12	Install MongoDB and execute basic database commands.
13	Perform insert delete operations in MongoDB collections.
14	Execute query operations to retrieve data from MongoDB
15	Implement update operations in MongoDB documents.
16	Create indexes in MongoDB and analyze performance.
17	Implement aggregation framework queries in MongoDB.
18	Connect PHP application with MongoDB database.
19	Perform CRUD operations using PHP with MongoDB.
20	Develop a mini project using PHP and MongoDB (e.g., Student Management System or Blog).
Total Practical Session	
30	Total Practical Hours
	60


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Text Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	PHP programming concepts Lessons for beginners	Marcel-Florin Stiube	Marcel-Florin Stiube	Latest	-
02	The Joy of PHP A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL	Alan Forbes	CreateSpace Independent Publishing Platform	1 st edition	2012
03	Full Stack Development with MongoDB	Manu Sharma	Walter de Gruyter GmbH	1 st edition	2022

Reference Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	NoSQL For Dummies	Adam Fowler	Wiley	2 nd Edition	2015
02	Web Development with MongoDB and Node.js	Jason Krol	Packt Publishing	2 nd Edition	2014

Web Resources:

1. www.javatpoint.com
2. www.w3schools.com
3. www.geeksforgeeks.com

YouTube Link:

1. <https://www.youtube.com/watch?v=c2M-rlkkT5o>
2. https://www.youtube.com/results?search_query=rest+api+using+php
3. <https://www.youtube.com/watch?v=dLA0I6-qQ5k>


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Course Details:

Class			T.Y. B.C.A, Sem.-V
Course Code and Course Title			0BCPE304, Time Series Analysis [Data Science]
Prerequisite/s			--
Teaching Scheme: Lecture/Tutorial/Practical			03/00/04
Credits			05
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE304 _1	Understand the basic concepts of time series data and identify its components (trend, seasonal, cyclical, and irregular).
0BCPE304 _2	Apply simple methods to analyze trends in time series data, such as moving averages and least squares.
0BCPE304 _3	Analyse and measure seasonal variations and interpret seasonal indices in real-world datasets.
0BCPE304 _4	Use basic forecasting techniques and evaluate prediction accuracy using simple error measures.

Course Contents: Theory

Unit 1	Introduction to Time Series: Meaning and definition of time series ,Components of time series: Trend, Seasonal, Cyclical, Irregular ,Types of time series data (discrete, continuous) ,Examples and real-life applications (sales, weather, stock prices) ,Methods of data collection and basic visualization , Plotting time series (line graphs, basic charts using tools like Excel/Python), Introduction to patterns and interpretation	11Hrs
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Unit 2	Trend Analysis: Meaning of trend, Methods to measure trend:Freehand (graphical method), Moving averages (simple moving average),Least squares method (linear trend) Comparison of methods ,Basic forecasting using trend	11Hrs
Unit 3	Seasonal Analysis: Meaning of seasonality ,Seasonal variations and causes , Methods to measure seasonality: Simple averages method ,Ratio-to-moving-average method (basic idea only) ,Seasonal indices and interpretation ,Deseasonalization of data	11 Hrs
Unit 4	Basic Forecasting Methods: Introduction to forecasting ,Naïve forecasting method ,Moving average forecasting,Exponential smoothing (simple explanation, no heavy math),Measuring forecast accuracy:Mean Absolute Error (MAE),Mean Squared Error (MSE) (basic idea only),Applications in business and IT	12 Hrs
	Total Lecture Hours	45

Course Contents : Laboratory :

Expt. No.	Title
1	You are given monthly sales data of a retail shop for one year. Plot the time series graph and identify visible patterns such as trend or seasonality.
2	Collect daily temperature data for 15–30 days. Create a time series plot and describe any variations or irregularities observed.
3	Analyse daily website visitor data for a month. Plot the data and identify peak and low traffic periods.
4	A dataset of quarterly production values is provided. Plot the graph and identify which components (trend, seasonal, irregular) are present with justification.
5	Given yearly profit data of a company, calculate 3-year moving averages and plot the trend line.
6	Using given sales data, fit a straight-line trend using the least squares method and predict values for the next 2 years.


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7	Implement a small application for Sales Trend and Seasonal Analysis using time series data.				
8	Apply both freehand and moving average methods on a dataset and compare the trend obtained.				
9	A dataset of annual production is given. Identify the trend and forecast production for the next 3 years.				
10	Using monthly sales data for 2 years, calculate seasonal indices using the simple averages method.				
11	Given quarterly data, compute seasonal variations using the ratio-to-moving-average method (guided steps).				
12	Using calculated seasonal indices, remove seasonal effects from the dataset and analyze the adjusted values.				
13	Plot quarterly demand data and identify seasonal peaks and troughs. Explain possible reasons for the pattern.				
14	Implement a small application for demand forecasting and accuracy evaluation using time series data.				
15	Using monthly demand data, apply the naïve method to forecast the next period and compare it with actual values.				
16	Compute 3-period and 5-period moving average forecasts and compare their results.				
17	Apply simple exponential smoothing with a given smoothing constant (α) and forecast future values.				
18	Given actual and forecasted values, calculate MAE and MSE and determine which method gives better accuracy.				
19	Create forecasting charts/dashboard using Excel or Python				
20	Analyse real-world dataset (stock/rainfall/sales) and prepare forecasting report				
Total Practical Sessions		30	Total Practical Hours		60

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	The Analysis of Time Series: An Introduction	Chris Chatfield	Chapman & Hall / CRC Press (Taylor & Francis)	6 th Edition	2016


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02	The Analysis of Time Series: An Introduction with R	Chris Chatfield and Haipeng Xing	CRC Press (Taylor & Francis)	7 th Edition	2019
03	Business Statistics and Business Mathematics	S. P. Gupta, P. K. Gupta	Sultan Chand & Sons	5 th Edition	2022

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Time Series Analysis: Forecasting and Control	George E. P. Box, Gwilym M. Jenkins, Gregory C. Reinsel, Greta M. Ljung	Wiley	5 th Edition	2015
02	Time Series Analysis and Its Applications: With R Examples	Robert H. Shumway and David S. Stoffer	Springer	4 th Edition	2017

Web Resources:

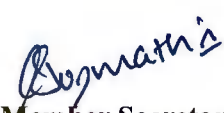
1. Coursera – Practical Time Series Analysis
2. Great Learning – Time Series Analysis with R

YouTube Link:

1. <https://www.youtube.com/watch?v=JntA9XaTebS>
2. https://www.youtube.com/watch?v=vV12dGe_Fho


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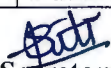
Class		T.Y. B.C.A, Sem.- V	
Course Code and Course Title		OBCPE305 Digital Image Processing [Artificial Intelligence & Machine Learning]	
Prerequisite/s		-	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		05	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

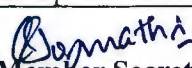
OBCPE305_1	Explain fundamentals of digital images and image formation given basic concepts and tools with correct interpretation of image types and representation.
OBCPE305_2	Apply image enhancement techniques in spatial and frequency domains given sample images with improved visual quality and appropriate method selection.
OBCPE305_3	Explain image restoration and compression techniques given noise models and compression methods with proper understanding of noise handling and data reduction.
OBCPE305_4	Apply image segmentation and morphological operations given input images with accurate region extraction and meaningful analysis.

Course Contents: Theory

Unit 1	Basics of Digital Images & Image Formation: What is an Image? Types (Analog vs Digital) , Applications of Image Processing (Medical, Social Media, Security, etc.) , Basic Components of Image Processing System , Digital Image Representation (Pixels, Resolution) , Image Types: Binary, Grayscale, Color , Image File Formats (JPEG, PNG, BMP – basic idea) , Introduction to Image Acquisition (Camera, Scanner) , Basics of Human Visual System (very simple explanation) , Introduction to MATLAB / Python tools for image processing, Simple image display and reading concepts	11Hrs
Unit 2	Image Enhancement Spatial Domain Techniques: Gray level transformations (negative, log, gamma), Contrast stretching, Histogram processing (equalization, specification) Spatial filtering: Smoothing (mean, median), Sharpening (Laplacian, Sobel, Prewitt) Frequency Domain Techniques: Concept of Fourier Transform, Frequency domain filtering, Low-pass, high-pass filters, Ideal, Butterworth, Gaussian filters, Comparison: Spatial vs Frequency	12Hrs


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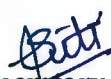




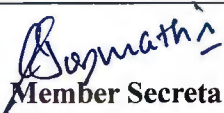
Unit 3	Image Restoration & Compression Image degradation model, Noise models (Gaussian, Salt & Pepper), Image restoration: Inverse filtering, Wiener filtering (basic concept), Image compression: Need and fundamentals, Lossless compression (RLE, Huffman Coding), Lossy compression (JPEG basics)	10Hrs
Unit 4	Image Segmentation, Morphology & Applications Image segmentation: Thresholding techniques, Edge detection (Sobel, Canny), Region-based segmentation Morphological operations: Dilation, erosion, Opening, closing Representation & Feature Extraction basics Introduction to Computer Vision, Applications: Face detection, OCR, Medical imaging Introduction to tools (MATLAB / Python OpenCV)	12Hrs
Total Lecture Hours		45 Hrs

Course Contents: Laboratory

List of Practical's	
Expt. No.	Title of Experiment
1	To study different image file formats and develop a program to read and display digital images using suitable software tools.
2	To perform basic image operations such as resizing and cropping on a digital image using programming techniques.
3	To develop a program to convert a color image into a grayscale image and analyze the difference between them.
4	To implement image negative transformation and observe its effect on image intensity values.
5	To apply log and gamma transformations on a digital image and study their effect on brightness and contrast.
6	To plot the histogram of a digital image and apply histogram equalization to enhance its contrast.
7	To implement contrast stretching on a digital image to improve its visual quality.
8	To apply smoothing filters such as mean and median filters to reduce noise in a digital image.
9	To apply sharpening techniques using edge detection filters such as Sobel, Prewitt, and Laplacian.
10	To compute and visualize the Fourier Transform of a digital image and analyze its frequency spectrum.
11	To implement low-pass and high-pass filters in the frequency domain and observe their effects on image quality.


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12	To simulate image degradation by adding different types of noise such as Gaussian and salt-and-pepper noise.
13	To implement noise removal techniques using appropriate filters and evaluate the restored image quality.
14	To apply Wiener filtering for image restoration and compare the results with degraded images.
15	To implement Run Length Encoding technique for compressing a digital image.
16	To implement Huffman coding technique for efficient image compression based on pixel intensity distribution.
17	To detect edges in a digital image using techniques such as Canny and Sobel operators.
18	To implement image thresholding techniques (global and adaptive) and analyze the segmented output.
19	To perform morphological operations such as dilation, erosion, opening, and closing on a binary image.
20	To implement region-based image segmentation using region growing method and analyze the extracted regions.
Total Practical Session 30 	

Text Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Digital Image Processing	Rafael C. Gonzalez, Richard E. Woods	Pearson Education	4 th edition	2018
02	Digital Image Processing	S. Jayaraman, S. Esakkirajan, T. Veerakumar	McGraw Hill Education (India)	2 nd edition	2017


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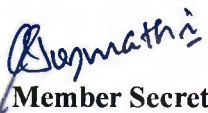


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Reference Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of Digital Image Processing	Anil K. Jain	Pearson Education	1 st edition	1989
02	Digital Image Processing Using MATLAB	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins	Pearson Education	2 nd edition	2009
03	Digital Image Processing and Analysis	B. Chanda	PHI Learning	2 nd edition	2011


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Course Details:

Class		T.Y. B.C.A, Sem.-V	
Course Code and Course Title		0BCPE306, Web Programming-IV[Full Stack Development]	
Prerequisite/s		0BCPE208-Web Programming-I 0BCPE218-Web Programming-II	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		05	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE306_1	Explain JavaScript concepts used in developing interactive and dynamic web applications.
0BCPE306_2	Implement user interfaces using React JS components and hooks.
0BCPE306_3	Develop backend services and RESTful APIs using Node.js and Express.js.
0BCPE306_4	Build and integrate full-stack applications with database connectivity and basic Deployment.

Course Contents: Theory

Unit I	Introduction to Web & JavaScript Fundamentals Evolution of Web Applications (Static vs Dynamic vs SPA), Introduction to Full Stack Development and JavaScript Ecosystem,,Advanced JavaScript Concepts: Objects and Classes, Prototypes and Inheritance, Encapsulation and Code Reusability,Asynchronous JavaScript: Callbacks, Promises, Async/Await,Event Handling and Callback Functions,Introduction to NPM and package management	10Hrs
Unit 2	Frontend Development using React JS Introduction to React: SPA concept, Virtual DOM,Setting up React App (Create React App / Vite), JSX & Components: Functional & Class Components, Props & State,React Hooks: useState, useEffect,Event Handling & Forms, Conditional Rendering,Lists and Keys, React Router (Navigation), Styling in React (CSS, Inline, Bootstrap)	13Hrs

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BCA- TY- Page 20 of 70

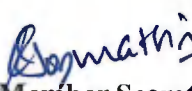
Unit 3	Backend Development using Node.js & Express Node.js Core Concepts: Event Loop, Non-blocking I/O, Working with Modules: Built-in Modules (fs, http, path), Custom Modules, Express.js Framework: Installation & Setup, Routing (GET, POST, PUT, DELETE), Middleware, RESTful APIs: API Design Principles, Handling HTTP Requests and Responses, Database Integration: Introduction to MongoDB, CRUD using Mongoose, Error Handling & Debugging	12 Hrs
Unit 4	Full Stack Integration & Deployment Connecting React with Node.js Backend, API Consumption using fetch / axios, Handling CORS and JSON data exchange, Basic Authentication Concepts, Project Structure for Full Stack Applications, Debugging and Error Handling, Introduction to Deployment, Frontend deployment (Netlify/Vercel – overview), Backend deployment (basic concept), Mini Project Development (Full Stack Application)	10 Hrs
Total Lecture Hours		45

Course Contents: Laboratory:

Expt. No.	Title
1	Develop a JavaScript program to illustrate different types of web applications (static, Dynamic, and SPA) and explain full stack architecture.
2	Create a JavaScript program to demonstrate object creation, classes, and encapsulation for code reusability.
3	Implement a JavaScript program to demonstrate prototype-based inheritance and method Overriding.
4	Write a JavaScript program to convert a Promise-based asynchronous function into an async/await implementation.
5	Set up a new React application using either Create React App or Vite and develop a basic application to display static content using functional components.
6	Develop a React application to demonstrate data handling using props and state.
7	Develop a React application that handles user events by displaying a message on button Click and dynamically showing text entered in an input field.
8	Develop a React application using controlled components to create a form with name, email, and password fields, implement validation for required inputs and valid email format, and display appropriate error messages
9	Develop a React application to display dynamic content using conditional rendering and list rendering.


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10	Develop a React application that uses the useEffect hook to fetch or simulate API data and display the retrieved data in the user interface.
11	Develop a multi-page React application using React Router to implement navigation and create multiple pages such as Home, About, and Contact.
12	Develop a small React application (e.g., To-Do List or Student Record System) using components, props, and state, implementing CRUD-like operations (add/delete items) along with routing and styling.
13	Develop a basic application using Node.js that demonstrates execution of a simple program and usage of custom modules.
14	Create a Node.js program that utilizes built-in modules such as fs and path to perform file handling operations.
15	Develop a basic HTTP server using Node.js to handle client requests and send appropriate Responses.
16	Build a web server using Express.js and demonstrate basic server setup and execution.
17	Implement routing in an Express application using HTTP methods such as GET, POST, PUT, and DELETE.
18	Develop a RESTful API for managing student data that performs CRUD operations using Express.js.
19	Develop a Full Stack application by connecting a React Frontend with a Node.js Backend to fetch and display data using API calls.
20	Design and implement a mini project (e.g., Student Management System or Task Manager) integrating frontend, backend, database, and basic UI styling.
Total Practical Session	
30	Total Practical Hours
60	

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Full Stack Development with React, Node.js, and MongoDB: A Complete Guide	GREYSON. CHESTERFIELD	Amazon Digital Services LLC - Kdp	1 st Edition	2025
02	Pro MERN Stack Full Stack Web App Development with Mongo, Express, React, and Node	Vasan Subramanian	Apress	2 nd Edition	2019

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Reference Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Full-Stack React Projects Learn MERN Stack Development by Building Modern Web Apps Using MongoDB, Express, React, and Node.js	Shama Hoque	Packt Publishing	1 st Edition	2020
02	React Key Concepts: An In-Depth Guide to Reacts Core Features	Maximilian Schwarz Müller	Packt Publishing	2 nd edition	2022
03	Web Development with Node & Express: Leveraging the JavaScript Stack	Ethan Brown	O'Reilly Media	2 nd edition	2019

Web Resources:

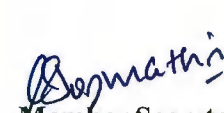
1. www.javatpoint.com
2. www.w3schools.com
3. www.geeksforgeeks.com

YouTube Link:

1. https://www.youtube.com/results?search_query=codewithharry+react+js+playlist
2. <https://www.youtube.com/watch?v=F9gB5b4jgOI>


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Course Details:

Class		T.Y. B.C.A, Sem.-V	
Course Code and Course Title		0BCPE307, Big Data Analytics [Data Science]	
Prerequisite/s		--	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/02	
Credits		04	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

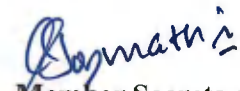
0BCPE307_1	Describe the characteristics, applications, and challenges of Big Data
0BCPE307_2	Implement data loading, cleaning, and transformation techniques successfully on standard datasets.
0BCPE307_3	Construct charts, graphs, and dashboards for data interpretation as per specified requirements.
0BCPE307_4	Explain the working of HDFS, MapReduce, and Spark by completing assigned practical tasks.
0BCPE307_5	Analyse data patterns and derive meaningful insights through project report/presentation with satisfactory performance

Course Contents: Theory

Unit I	Introduction to Big Data: Meaning and Characteristics of Big Data 5 V's of Big Data (Volume, Velocity, Variety, Veracity, Value) Traditional Data vs Big Data, Sources of Big Data, Applications of Big Data, Challenges in Big Data	10 Hrs
Unit 2	Big Data Technologies: Introduction to Hadoop, Hadoop Ecosystem (HDFS, MapReduce, YARN), NoSQL Databases – MongoDB, Cassandra, Cloud Computing for Big Data, Data Warehousing Basics	12 Hrs


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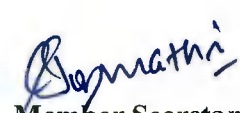
Unit 3	Data Analytics using Python: Python for Data Analytics, Data Structures and Data Handling Techniques , Numerical Computing using Python Libraries, Data Acquisition and Preparation Methods , Data Cleaning and Preprocessing Techniques , Data Transformation and Analysis Methods, Data Visualization using Matplotlib / Seaborn, Statistical Analysis and Interpretation.	13 Hrs
Unit 4	Advanced Analytics & Applications: Introduction to Apache Spark, Machine Learning Basics in Big Data, Predictive Analytics, Recommendation Systems, Real-world Case Studies (Netflix, Amazon, Healthcare, Banking), Future Trends in Big Data	10 Hrs
	Total Lecture Hours	45

Course Contents: Laboratory:

Expt. No.	Title			
1	Create NumPy Arrays and Perform Array Operations, Indexing, Slicing, Reshaping and Mathematical Functions.			
2	Load and analyze datasets using Python data handling libraries.			
3	Create Bar Chart, Pie Chart, Line Graph, Heatmap, Histogram and Correlation Analysis Using Matplotlib and Seaborn.			
4	Perform Descriptive statistics and summary measures on datasets.			
5	Implement data preprocessing techniques for analytical datasets.			
6	Install and configure Hadoop environment / Hadoop Sandbox.			
7	Introduction to Hadoop commands and HDFS simulation.			
8	Perform HDFS file operations (create, upload, download, copy, delete files).			
9	Create directories and manage permissions in HDFS.			
10	Execute Word Count program using MapReduce.			
Total Practical Sessions		15	Total Practical Hours	30


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Text Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Big Data Analytics: Introduction to Hadoop, Spark and Machine Learning	Raj Kamal, Preeti Saxena,	McGraw Hill Education,	1 st Edition	2019
02	Big Data and Analytics	Seema Acharya & Subhasini Chellappan	Wiley India	1 st Edition	2015

Reference Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Hadoop: The Definitive Guide	Tom White	O'Reilly Media	4 th Edition	2015
02	Big Data Black Book	DT Editorial Services	Wiley	2 nd Edition	2016

Web Resources:

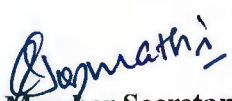
1. Apache Hadoop – <https://hadoop.apache.org>
2. Apache Spark – <https://spark.apache.org>
3. Pandas Documentation – <https://pandas.pydata.org>
4. Jupyter Notebook – <https://jupyter.org>
5. Kaggle Datasets – <https://www.kaggle.com>

YouTube Link:

1. <https://www.youtube.com/watch?v=-56x56UppqQ>
2. <https://www.youtube.com/watch?v=0P7QnIQDBJY>


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Course Details:

Class			T.Y. B.C.A, Sem.-V
Course Code and Course Title			0BCPE308, Natural Language Processing [Artificial Intelligence & Machine Learning]
Prerequisite/s			0BCPE217: Introduction to ML
Teaching Scheme: Lecture/Tutorial/Practical			03/00/04
Credits			05
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0BCPE308_1	Understand fundamental concepts and techniques of Natural Language Processing.
0BCPE308_2	Apply appropriate methods to preprocess, represent, and analyze textual data
0BCPE308_3	Implement basic NLP tasks and models to solve real-world language processing problems.
0BCPE308_4	Demonstrate the ability to use NLP tools and techniques for developing simple applications.

Course Contents: Theory		
Unit 1	Introduction to NLP & Text Preprocessing, Introduction to NLP and its applications, NLP vs NLU vs NLG, Challenges in NLP, Text preprocessing techniques: Sentence segmentation, Tokenization (word & sentence level), Stopword removal, Stemming, Lemmatization, Case normalization, Regular Expressions, Tools Introduction: Installation & basic usage of NLTK, spaCy	10Hrs
Unit 2	Language Modeling & Text Representation: Corpus and vocabulary, N-gram language models (Unigram, Bigram, Trigram), Probability basics in NLP, Bag of Words (BoW), TF-IDF, Word embeddings (basic idea): Word2Vec, GloVe, Introduction to vectorization techniques	12Hrs
Unit 3	NLP Tasks & Applications: Part-of-Speech (POS) Tagging: Rule-based vs statistical tagging, Hidden Markov Models, Named Entity Recognition (NER), Text Classification: Naive Bayes, Logistic Regression, Sentiment Analysis: Lexicon-based approach, Machine learning-based approach, Information Retrieval basics: Definition, IR vs NLP, Components of IR system, Concept of indexing and searching, Introduction to search engines	12 Hrs

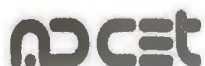
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Unit 4	Advanced NLP Concepts, Introduction to Deep Learning in NLP, Recurrent Neural Networks (RNN) (basic), Long Short-Term Memory (LSTM) (basic), Introduction to Transformers and Attention Mechanism, Overview of modern NLP models (BERT, GPT – conceptual only), Applications: Machine Translation, Speech Recognition	11 Hrs
Total Lecture Hours		45 Hrs

Course Contents: Laboratory:

Expt. No.	Title
1	Write a program to install, import, and explore basic functionalities of commonly used NLP libraries in Python.
2	Write a program to perform sentence segmentation on a given paragraph using NLTK.
3	Write a program to implement word tokenization and display frequency of each word.
4	Write a program to remove stop words from a given text and perform stemming using Porter Stemmer.
5	Write a program to perform case normalization and lemmatization on a given text.
6	Write a program using Regular Expressions to extract email IDs, phone numbers, and dates from text.
7	Write a program to generate Unigram, Bigram, and Trigram models from a given text corpus.
8	Write a program to calculate the probability of a sentence using an N-gram model.
9	Write a program to implement Bag of Words (BoW) using scikit-learn.
10	Write a program to compute TF-IDF features for a dataset.
11	Write a program to perform Part-of-Speech (POS) tagging using NLTK.
12	Write a program to implement POS tagging using a statistical approach (HMM concept – demonstration).
13	Write a program to perform Named Entity Recognition (NER) using spaCy.
14	Write a program to implement text classification using Naive Bayes and Logistic Regression.
15	Write a program to perform Sentiment Analysis using lexicon-based approach.

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16	Write a program to perform Sentiment Analysis using Machine Learning.
17	Write a program to compute sentence similarity using TF-IDF and cosine similarity with scikit-learn.
18	Write a program to evaluate classification models using: Accuracy, Precision, Recall
19	Write a program to create an index of documents and perform search operations.
20	Write a Python program to: Accept user query, Convert documents into TF-IDF vectors Retrieve and display top relevant documents
Total Practical Session	
30	Total Practical Hours
	60

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Natural Language Understanding	Allen, James	Person Publication	8 th edition	2002
02	Speech and Language Processing. An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition	Daniel Jurafsky, James H. Martin	Pearson Prentice Hall	1 st edition	2009

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems	Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana	O'Reilly Media	1 st edition	2020
02	Natural Language Processing with Python	Steven Bird, Ewan Klein, Edward Loper	O'Reilly Media	1 st edition	2009

Web Resources: Hugging Face NLP Course- www.geeksforgeeks.com

Beti
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Pratik
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Pranav
Member Secretary-AC

Pratik
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Course Details:

Class		T.Y. B.C.A, Sem.-V	
Course Code and Course Title		0BCPE309, Web Programming-V [Full Stack Development]	
Prerequisite/s		--	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/02	
Credits		04	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE309_1	Understand the basic concepts of UI/UX design, design thinking principles, and the Figma environment to create user personas.
0BCPE309_2	Apply user research techniques to map User Journeys and User Flows for a selected application.
0BCPE309_3	Apply wireframing techniques and information structure to create simple UI layouts including login and home screens.
0BCPE309_4	Analyse user interfaces by testing interactive prototypes and using feedback to improve designs.

Course Contents: Theory

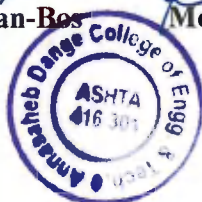
Unit 1	UI/UX Foundations: Design Thinking Introduction to UI (User Interface) and UX (User Experience), Difference between UI and UX, Role of UI/UX designer, Importance of UI/UX in applications, Introduction to design thinking, Creating Simple User Personas, Understanding User Journey, Basic UI design principles: Colour, Typography, Layout, Awareness of UI/UX design tools used in the design process, Installation of Figma.	12Hrs
Unit 2	User Research & UX Design Process Introduction to UX Design Process, Understanding Users and their Needs, Basic Methods of User Research (Survey, Interview), Introduction to User Flow, Designing for Usability: ease of navigation, readability, accessibility.	10Hrs

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Unit 3	Wireframing & UI Design Tools Introduction to Wireframing, Types of Wireframes (Low-fidelity, High-fidelity), Sketching Wireframes using Paper, understanding tool interface (basic layout), basic tools: frame, shapes, text, colours, Creating Simple UI Layouts: Login Page, Home Screen, and Introduction to Information Structure (basic screen arrangement).	11 Hrs.
Unit 4	UI Design, Prototyping & Testing Applying UI Design Principles: Colour, Typography, Spacing, Alignment, Creating UI Components: Buttons, Forms, Navigation elements, Designing Complete Screens: Mobile screen / Web page design, Introduction to Prototyping using Figma: Linking screens, creating clickable prototype, Basic Usability Testing: Testing design with users (peer testing), Collecting simple feedback.	12 Hrs.
Total Lecture Hours		45

Course Contents: Laboratory:

Expt. No.	Title
1	Getting to Know the User: Creating user personas by defining details such as name, age, goals and needs for a selected application.
2	Design a user journey by showing step-by-step interaction of a user with an application (e.g., login to task completion).
3	Sketching a Basic Interface on paper to Resolve College [Canteen/Notice Board] Issues using Design thinking.
4	Design a simple webpage (e.g., login page or calculator screen) on paper, Figma tool and label UI elements.
5	Create a user flow diagram showing steps to complete a task (e.g., login to dashboard) using Shapes and connectors.
6	Create low-fidelity wireframes for a mobile interface (login page and home screen).
7	Design UI screens by applying layout, spacing, and alignment using Figma.
8	Design UI components such as buttons, forms, and navigation elements using Figma.
9	Create a simple prototype by linking multiple screens using Figma.
10	Design a prototype for a web or mobile application (mini project) such as a food ordering or Online shopping system.
Total Practical Session	
15	Total Practical Hours
	30

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Text Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	The Design of Everyday Things	Donald A. Norman	Basic Books	Revised and Expanded Edition	2013
02	About Face: The Essentials of Interaction Design	Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel	Wiley	4 th Edition	2014
03	Ultimate Figma for UI/UX Design	Aditi Sharma	Orange Education	1st Edition	2025

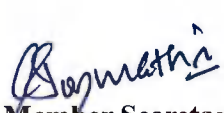
Reference Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Lean UX: Applying Lean Principles to Improve User Experience	Jeff Gothelf, Josh Seiden	O'Reilly Media	1 st Edition	2013
02	Don't Make Me Think, Revisited: A Common-Sense Approach to Web Usability	Steve Krug	O'Reilly Media	3 rd Edition	2014

Web Resources:

1. "UI UX Design Full Course (2025)," Intellipaat, YouTube, available at: <https://www.youtube.com/watch?v=2icljqpaddk>
2. "Figma UX Design UI Essentials Course," YouTube, Available at: <https://www.youtube.com/watch?v=kbZejnPXyLM&list=PLttcEXjN1UcHu4tCUSNhhUQ4riGARGeap>


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Course Details:

Class			T.Y. B.C.A, Sem.-V
Course Code and Course Title			0BCSE310, Quantitative Techniques
Prerequisite/s			--
Teaching Scheme: Lecture/Tutorial/Practical			01/01/00
Credits			02
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

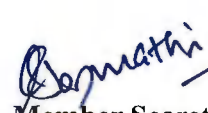
0BCSE310_1	Formulate and solve simple Linear Programming Problems graphically for decision-making and optimization in Operations Research.
0BCSE310_2	Solve balanced and unbalanced Assignment Problems using Hungarian Method for optimal resource allocation and decision-making.
0BCSE310_3	Apply Travelling Salesman Problem concepts using Assignment Model approach to determine optimal routes and minimize travelling cost.
0BCSE310_4	Apply payoff matrix, maximin and minimax principles to solve simple 2×2 game problems in Game Theory.

Course Contents: Theory

Unit 1	Linear Programming Problems Introduction to Operations Research, Applications of Operations Research Introduction to Linear Programming Problems, Formulation of Linear Programming Problems, Graphical solution of simple LPPs	4 Hrs
Unit 2	Introduction to Assignment Problems Balanced and Unbalanced Assignment Problems, Hungarian Method Maximization and Minimization Assignment Problems, Restricted Assignments	4 Hrs
Unit 3	Travelling Salesman Problem Introduction to Travelling Salesman Problem, Applications of Travelling Salesman Problem, Mathematical representation of TSP, Travelling Salesman Problem using Assignment Model approach	3 Hrs
Unit 4	Game Theory Introduction to Game Theory, Terminology of games, Payoff Matrix, Two-person Zero-sum Games, Maximin and Minimax Principles, Simple game problems (only 2×2 games)	4 Hrs
Total Lecture Hours		15


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List of Tutorial:

Sr. No.	Title of tutorials		
1	Formulation of simple real-life Linear Programming Problems		
2	Graphical solution of maximization problems		
3	Graphical solution of minimization problems		
4	Balanced assignment problems using Hungarian Method (Minimization)		
5	Unbalanced assignment problems using Hungarian Method		
6	Maximization assignment problems and restricted assignments		
7	Travelling Salesman Problems using assignment approach		
8	Two-person zero sum game		
9	payoff matrix and maximin–minimax principles in Game Theory		
10	Saddle point and simple game problems		
Total tutorials Sessions		15	Total tutorials Hours
			15

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Operation Research	Kanti Swarup, P. K. Gupta and Man Mohan	Sultan Chand and Sons	13 th Edition	2007

Reference Books

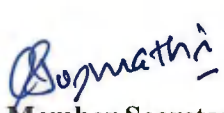
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Operation Research: Theory and Application	J. K. Sharma	Trinity Press	6 th Edition	2016

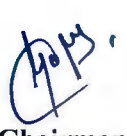
YouTube Link:

1. <https://www.youtube.com/playlist?list=PLU6SqDYcYsfLewoQPYjgg7SMBLjSV704v>
2. https://www.youtube.com/playlist?list=PLEHGYFbPuuMFV4_ZNPO6fXa4kZ0EM0vP1


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ANNASAHAB DANGE COLLEGE OF ENGINEERING AND TECHNOLOGY, ASHTA
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Department of Bachelor in Computer Application

Course Details:

Class			TY BCA , SEM V
Course Code and Course Title			0BCSE311, Internship
Prerequisite/s			-
Teaching Scheme: Lecture/Tutorial/Practical			00/00/08
Credits			4
Evaluation Scheme	P	ISE/ESE	100/00

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCSE311_1	Explain the knowledge and practical exposure gained during the internship in an organization.
0BCSE311_2	Understand professional practices, work ethics, and organizational culture in the industry.
0BCSE311_3	Demonstrate technical and problem-solving skills in computer applications through assigned tasks.
0BCSE311_4	Apply theoretical concepts of computer science to solve real-world industry problems using appropriate tools.
0BCSE311_5	Communicate effectively and prepare a detailed internship report presenting work experience and learning outcomes.

Internship Requirements:

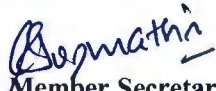
- All students are required to complete an internship at a research organization, university, or industry to gain practical exposure through meaningful projects that align with their academic learning. This internship must be approved by the Head of the Institution and has duration of **8 weeks**, as specified in the curriculum.
- The tables below represent the outline of the internship guidelines and student responsibilities: For detailed guidelines and procedures, refer to the Institute Internship Policy Document.

Internship Guidelines:

1. Request Letter	Obtain a request letter from the institute, signed by the Institute Director, addressed to the HR manager or relevant authority.
2. Confirmation Letter	Submit the confirmation letter from the industry or organization to the Internship Coordinator and Department Office.


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3. Mentorship	- A faculty member will act as a mentor for a group of students to monitor, evaluate, and guide their internship activities. - The mentor will visit the internship location at least once or twice during the internship period and provide feedback to the Internship Coordinator.
4. Progress Reports	Submit progress reports every two weeks to the mentor, along with a final report to the Internship Coordinator.
5. Evaluation	The mentor and an assessment panel will evaluate student performance post-internship, submitting an evaluation report to the Department Office.
6. Internship Certificate	Obtain and submit an Internship Certificate from the organization to the Internship Coordinator.
7. Presentation and Term Work	Deliver a presentation on internship work as part of term assessments; submit an internship diary and report for evaluation.

Student Responsibilities

Category	Responsibilities
Professionalism	Adherence to workplace rules, ethical conduct, professional communication
Computer Application Skills	Apply computer application fundamentals, use tools and software, conduct experiments, solve problems
Industry Knowledge	Learn industry standards, observe practices, understand project management
Professional Development	Improve communication, teamwork, problem-solving, time management, build network, enhance employability
Learning & Growth	Seek learning opportunities, apply classroom knowledge, maintain a journal, gain insights into career paths

Internship Evaluation Process

The Internship of students will be assessed in three key stages:

1. Evaluation by Industry

- Punctuality
- Willingness to learn
- Daily diary maintain
- Skill test performance
- Supervisor's remarks

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2. Evaluation by Faculty Mentor on Student performance and Internship Report

- Faculty Mentor will evaluate students based on their attendance, participation, and engagement during the internship.
- The quality and completeness of the internship report will also be assessed.

3. Seminar Presentation/Viva-Voce at the Institute

- Students will present a seminar based on their internship report before an expert committee formed by the relevant department, in accordance with institute norms.
- The evaluation criteria for the seminar presentation will include:
 - Quality of content presented
 - Planning and organization of the presentation
 - Effectiveness of delivery
 - Depth of knowledge and skills demonstrated
 - Attendance record, daily diary entries, and departmental reports will also be reviewed alongside the internship report.

This seminar presentation serves as an opportunity for students to share their knowledge and experiences with peers and faculty, enhancing their communication skills and building confidence.

Final Evaluation During the final evaluation, the student shall prepare and submit a report and give a presentation & Viva voce before his/her Department Committee at the college.

In-Semester Evaluation			
Criteria	Evaluated By	Weightage (%)	Description
Student Performance	Industry Supervisor	20%	Evaluated based on a rubric and feedback form, focusing on punctuality, eagerness to learn, skill tests, and professionalism
Submission of Internship Report with Certificate	Institute	20%	Assesses the quality, structure, and content of the report submitted by the student, reviewed by the mentor, along with the internship certificate.
Internship Diary, Attendance Record, and Industry-Faculty Interaction	Institute (During and End of Internship)	10%	Evaluates consistency and detail in maintaining the diary, adherence to attendance, and meaningful engagement during interactions with mentors.

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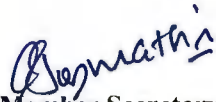
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	Presentation, Demonstration, or Case Studies	Institute	20%	Assesses the student's ability to effectively communicate insights, demonstrate practical learning outcomes, or analyze and present case studies..
	Viva-Voce	Institute	30%	Tests the student's depth of understanding, analytical skills, and ability to articulate their internship experience during an oral evaluation.


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Course Details:

Class			TY BCA ,SEM VI
Course Code and Course Title			0BCPC312,Generative AI
Prerequisite/s			-
Teaching Scheme: Lecture/Tutorial/Practical			02/00/04
Credits			4
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPC312_1	Explain the fundamentals of Artificial Intelligence and describe the concepts, types, and applications of Generative AI.
0BCPC312_2	Apply text generation techniques and prompt engineering using Large Language Models to generate effective outputs.
0BCPC312_3	Apply AI tools for image and media generation and explain basic concepts and challenges such as Deep fakes.
0BCPC312_4	Apply AI tools to develop simple applications and explain the impact and ethical considerations of Generative AI.

Course Contents: Theory		Hrs
Unit 1	Fundamentals of Generative AI : Introduction to Artificial Intelligence (AI) ,Difference between AI, Machine Learning (ML), and Deep Learning ,Introduction to Generative AI ,Generative AI vs. Traditional AI , Types of Generative AI: Text Generation, Image Generation ,Audio/Video Generation , Real-world applications : Chabots (Customer Support) ,AI Art and design ,Content Creation Tools , Overview of popular AI tools: Chat-based tools Image generation tools,Basic workflow of Generative AI: Input → Model → Output	11 Hrs
Unit 2	Text Generation & Prompt Engineering: Introduction to text Generation, Basic idea of Large Language Models (no technical architecture), Applications: Email writing, Blog/content writing, Text summarization Chatbots: Rule-based vs AI-based (basic comparison only) Prompt Engineering: What is a prompt? Types of prompts: Instruction ,Question ,Role-based ,Writing effective prompts ,Prompt improvement techniques (refining outputs) , Limitations: Hallucination (basic idea) ,Incorrect outputs	12 Hrs


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Unit 3	Image & Media Generation: Introduction to AI Image Generation ,Basic idea of Text-to-Image models ,Popular tools and platforms for image generation, Applications: Logo Design ,Poster Creation ,Social Media Graphics, Image editing using AI: Background removal ,Image enhancement ,Style transfer, Introduction to: AI Voice Generation ,AI Video Generation , Challenges in media generation: Quality issues ,Misuse	11 Hrs
Unit 4	AI Tools, Applications & Ethics: Practical AI Tools: Writing assistants, Coding assistants (basic use), AI for: Resume writing, Email drafting, Report generation, Basic Development Concepts: What is an API? ,Use of AI tools in simple applications ,No-code / Low-code tools , Applications of Generative AI: Business (marketing, Chabots) ,Education (content creation) ,Healthcare, Entertainment & software development , Ethics & Responsible AI: Introduction to AI ethics , Issues: Bias ,Fake content ,Privacy concerns, Responsible AI principles: Fairness ,Transparency ,Basic awareness of legal issues (copyright, misuse)	11 Hrs
Total Lecture Hours		45 Hrs

Course Contents: Laboratory

Sr. No.	Title of Practical's			
1	Implementation and Study of Python Libraries used in Generative AI			
2	Implementation of Text Pre-processing Techniques			
3	Implementation of N-gram Based Text Generation Model			
4	Implementation of Simple Markov Chain Text Generator			
5	Implementation of Generative AI Workflow (Input-Model-Output Pipeline Simulation)			
6	Implementation of Prompting Techniques and Programmatic Prompt Generation			
7	Implementation of Prompt Refinement and Output Improvement Techniques			
8	Implementation of Custom Text Generation using Pre-trained AI Tool			
9	Implementation of Rule-based Chatbot and AI-based Chatbot using API			
10	Implementation of Prompt Testing, Evaluation, and Hallucination Detection			
11	Implementation of Text-to-Image Generation using Generative AI API			
12	Implementation of Prompt Optimization for Image Generation			
13	Implementation of Basic Image Processing Techniques using Python			
14	Implementation of Image Caption Generation using Pre-trained Model			
15	Implementation of Text-to-Speech (Audio Generation) using AI			
16	Implementation of Resume and Email Generator using Generative AI			
17	Implementation of Generative AI API Integration in Python Application			
18	Implementation of Bias and Ethical Issue Analysis in AI-generated Content			
19	Implementation of AI-based Content Filtering System			
20	Implementation of small application based on Generative AI Application			
Total Practical Session		15	Total Practical Hours	30

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TextBooks:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Generative AI	N. Gayathri, S. Rakesh Kumar, Ramesh Chandran, Pethuru Raj, Danilo Pelusi	Wiley-Scrivener	1st Edition	2025
02	Generative AI: Foundations & Concepts	Usman Qamar, Muhammad Summair Raza	Wiley India	1st Edition	2026
03	Generative AI Essentials	Dr. Priyanka Singh, Hariom Singh	BPB Publications (India)	2nd Edition	2025

Reference Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Narrative and Generative AI: A Computational Account	Inderjeet Mani	Springer Cham	2nd Edition	2025
02	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson	4th Edition	2021
03	The Process of Generative AI Writing	Nathan Jung	Springer	1st Edition	2026

YouTube Links:-

[youtube.com/watch?reload=9&v=qYNweeDHiyU](https://www.youtube.com/watch?reload=9&v=qYNweeDHiyU)

<https://www.youtube.com/watch?v=DvhFcIRRXyI>




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Department of Bachelor in Computer Application

Course Details:

Class	T.Y. B.C.A, Sem.-VI		
Course Code and Course Title	0BCPE313, Exploratory Data Analysis [Data Science]		
Prerequisite/s	--		
Teaching Scheme: Lecture/Tutorial/Practical	03/00/04		
Credits	05		
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE313_1	Apply EDA techniques to analyze datasets.
0BCPE313_2	Perform data cleaning and preprocessing using appropriate tools.
0BCPE313_3	Use statistical methods to summarize and interpret data.
0BCPE313_4	Create effective visualizations for data analysis.
0BCPE313_5	Derive insights and support decision-making using data.

Course Contents: Theory

Unit 1	Introduction to Exploratory Data Analysis Concept and objectives of EDA, Role of EDA in data analysis pipeline, Types of data analysis: Descriptive, Diagnostic, Data understanding techniques, Overview of EDA tools and environments (Python, Jupyter Notebook)	10 Hrs
Unit 2	Data Cleaning and Preprocessing Data collection and dataset structures, Handling missing values (deletion, imputation), Handling duplicate data, Outlier detection and treatment, Data transformation: 1. Normalization and standardization 2. Encoding categorical variables, Data integration and reduction	12 Hrs
Unit 3	Statistical Data Analysis Measures of central tendency (mean, median, mode), Measures of dispersion (variance, standard deviation), Correlation analysis Distribution analysis (skewness, kurtosis) Hypothesis generation using data	13 Hrs

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Unit 4	Data Visualization for EDA Principles of effective visualization, Advanced visualization techniques: 1.Box plot 2.Pair plot 3.Correlation heatmap 4.Distribution plots, Visualization using: (Matplotlib, Seaborn), Identifying patterns, trends, and anomalies	10 Hrs
	Total Lecture Hours	45

Course Contents: Laboratory:

Expt. No.	Title
1	Install Python, Jupyter Notebook, and required libraries (NumPy, Pandas, Matplotlib, Seaborn).
2	Data import and inspection using Pandas.
3	Understanding dataset structure (head, tail, info, describe).
4	Handling missing values (deletion and imputation techniques).
5	Handling inconsistent and duplicate data.
6	Data transformation (scaling, normalization).
7	Encoding categorical variables (label encoding, one-hot encoding).
8	Data grouping and aggregation using Pandas.
9	Feature engineering techniques (creating new features).
10	Generate summary statistics (mean, median, mode, std deviation).
11	Univariate analysis (single variable analysis).
12	Bivariate analysis (relationship between two variables).
13	Multivariate analysis (multiple variable relationships).
14	Plot histogram and distribution plots.
15	Create boxplot for outlier visualization.
16	Visualize relationships using scatter plots.
17	Correlation analysis using heatmap (Seaborn).
18	Detect and handle outliers using statistical methods.

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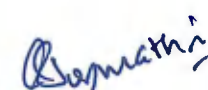
19	Pattern identification and trend analysis using visual tools.
20	Implement an application involving complete EDA including data visualization and insight generation.
Total Practical Sessions	
30	Total Practical Hours
	60

Text Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Data Analytics Made Accessible	Dr. Anil Maheshwari	CreateSpace	Latest	2014
02	Practical Statistics for Data Scientists	Peter Bruce	O'Reilly	1st Edition	2017
03	Business Analytics	U. Dinesh Kumar	Wiley India	1st Edition	2017

Reference Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Exploratory Data Analysis	John Tukey	Addison-Wesley	1st Edition	1977
02	Data Science from Scratch	Joel Grus	O'Reilly	2nd Edition	2019


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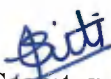


Web Resources:

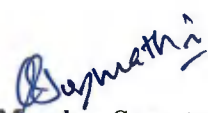
1. **Kaggle – Data Analysis & EDA Tutorials** <https://www.kaggle.com/learn>
2. **Towards Data Science – EDA Articles & Guides** <https://towardsdatascience.com/>
3. **GeeksforGeeks – Exploratory Data Analysis Tutorial**
<https://www.geeksforgeeks.org/exploratory-data-analysis-in-python/>
4. **Analytics Vidhya – EDA & Data Analysis Resources**
<https://www.analyticsvidhya.com/blog/category/exploratory-data-analysis/>
5. **DataCamp – Exploratory Data Analysis Courses**
<https://www.datacamp.com/courses/exploratory-data-analysis-in-python>
6. **W3Schools – Python Data Analysis**
<https://www.w3schools.com/python/pandas/default.asp>

YouTube Link :

1. <https://www.youtube.com/watch?v=-o3AxdVcUtQ>
2. <https://www.youtube.com/watch?v=fHFOANOHwh8>


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Course Details:

Class		T.Y. B.C.A, Sem.- VI	
Course Code and Course Title		OBCPE314 - Introduction To Agentic AI	
Prerequisite/s		OBCSE205:Python Programming	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		5	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

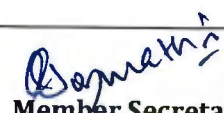
Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

OBCPE314_1	Understand the fundamental concepts of AI agents, their types, and how they perceive and act in environments.
OBCPE314_2	Identify and use popular no-code and low-code platforms to build simple AI agent workflows.
OBCPE314_3	Design basic multi-agent pipelines using tools such as n8n, Make, or similar automation platforms.
OBCPE314_4	Evaluate the performance and ethical implications of agentic AI systems.

Course Contents: Theory		Hrs
Unit 1	Foundations of Agentic AI What is an AI Agent? History and evolution of AI agents. Difference between traditional AI, Generative AI, and Agentic AI. Key characteristics: autonomy, goal-directed behavior, perception, memory, and action. Types of agents: Simple Reflex, Model-Based, Goal-Based, Utility-Based, and Learning Agents. Overview of Large Language Models (LLMs) as agent brains: ChatGPT, Gemini, Claude. Prompting techniques: zero-shot, few-shot, chain-of-thought prompting. Role of memory in agents: short-term vs. long-term. Introduction to Retrieval-Augmented Generation (RAG). Real-world applications of agentic AI in business, healthcare, and education.	11 Hrs
Unit 2	No-Code and Low-Code Agent Platforms Introduction to automation and no-code AI tools. Overview of platforms: n8n, Make (Integromat), Zapier, Flowise, Botpress. Building simple agent workflows without writing code. Connecting LLMs to data sources and external APIs visually. Designing trigger-based workflows and event-driven agents. Use cases: customer support bots, email automation, form processing, data pipelines. Introduction to vector databases (Pinecone, Chroma) at a conceptual level. Building a RAG-based Q&A agent using Flowise: uploading documents and querying with an LLM. Overview of agent deployment and sharing using no-code platforms.	12 Hrs


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Unit 3	Multi-Agent Systems and Agentic Ecosystem Concept of multi-agent systems (MAS). Agent communication, coordination, and role specialization. Introduction to agent frameworks: AutoGen, CrewAI, and LangChain (conceptual overview). Designing agent teams: Planner, Executor, and Critic roles. Simple multi-agent workflow design using no-code tools. Popular agentic tools and ecosystem: LlamaIndex overview, Relevance AI, AgentGPT. AI Copilots and assistants: Microsoft Copilot, Notion AI, GitHubCopilot. Overview of agent monitoring, logging, and observability. Advantages and challenges of multi-agent architectures.	11 Hrs
Unit 4	Ethics, Safety, and Future of Agentic AI Risks of autonomous agents: hallucination, task failure, misuse, and unintended actions. Principles of responsible AI in agentic systems: fairness, transparency, accountability. Human-in-the-loop (HITL): keeping humans in control of agent decisions. Privacy and data security concerns in agentic pipelines. Regulatory landscape and AI governance frameworks (EU AI Act overview). Bias in LLMs and its impact on agent behavior. Case studies: agentic AI failure analysis and lessons learned. Future trends: self-improving agents, agent economies, AGI considerations. Career opportunities in the agentic AI landscape.	11 Hrs
Total Lecture Hours		45 Hrs

Course Contents: Laboratory

List of Practical's

Expt. No.	Title of Practical's
1.	Explore and compare three AI agents (ChatGPT, Claude, Gemini) for the same task; document differences in reasoning, tone, and response quality.
2.	Practice zero-shot, few-shot, and chain-of-thought prompting on an LLM for tasks like summarization, translation, and question answering.
3.	Build a custom system prompt to create a role-specific AI assistant (e.g., a polite customer care agent or a strict code reviewer).
4.	Create a simple FAQ chatbot using Flowise connected to a plain text or PDF knowledge base using RAG.
5.	Build a no-code customer support bot using Botpress with at least 3 intents and fallback handling.
6.	Design a trigger-based automation workflow in n8n: when a Google Form is submitted, send a formatted email notification.
7.	Create a multi-step workflow in Make (Integromat) that fetches live weather data from an API and posts a daily summary to Slack or email.

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8.	Build a news summarizer agent in n8n: fetch headlines from an RSS feed, pass them to an LLM node, and generate a brief daily digest.				
9.	Upload a PDF document in Flowise and build a Q&A agent that answers questions about its contents using an LLM.				
10.	Design a data pipeline agent in n8n: read rows from a Google Sheet, process each row with an LLM, and write results back to another sheet.				
11.	Simulate a multi-agent role-play using ChatGPT or Claude with different system prompts for Planner, Executor, and Critic roles on a given task.				
12.	Build a two-agent workflow in n8n: Agent 1 generates a blog outline, Agent 2 writes the full blog post based on that outline.				
13.	Explore AgentGPT or Relevance AI: deploy a personal research assistant agent that searches the web and summarizes findings for a given topic.				
14.	Use Microsoft Copilot or Notion AI to automate a document drafting task; compare the output with a manual draft and document observations.				
15.	Integrate a vector database concept in Flowise: create embeddings from a document set and test retrieval accuracy for different queries.				
16.	Analyze an agentic AI failure case (hallucination or wrong tool use); document the root cause, impact, and propose corrective measures.				
17.	Conduct a bias analysis: test an LLM with prompts on a sensitive topic; document biased outputs and suggest mitigation strategies.				
18.	Design a human-in-the-loop (HITL) workflow in n8n where the agent pauses and waits for human approval before executing a critical action.				
19.	Research and present on an AI governance framework (e.g., EU AI Act); map its rules to a hypothetical agentic AI product.				
20.	Mini Project: Design and demonstrate a complete end-to-end agentic application using no-code/low-code tools (e.g., a recruitment screener, event planner bot, or personalized learning assistant). Submit a report and live demo.				
Total Practical Session		30	Total Practical Hours		60

TextBooks:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Pearson	2021	1
2	Building LLM Powered Applications	Valentina Alto	Packt Publishing	2024	2
3	Prompt Engineering for LLMs	John Berryman, Albert Ziegler	O'Reilly Media	2024	3

Reference Books:

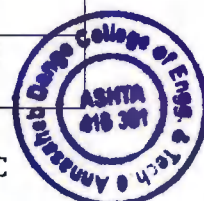
Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Generative AI with LangChain	Ben Auffarth	Packt Publishing	2023	1
2	The Age of Surveillance Capitalism	Shoshana Zuboff	PublicAffairs	2019	2

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Reference Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
3	Automate the Boring Stuff with Python	Al Sweigart	No Starch Press	2020	3




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Course Details:

Class		T.Y. B.C.A, Sem.-VI	
Course Code and Course Title		0BCPE315,Web Programming-VI [Full Stack Development]	
Prerequisite/s		--	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		05	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE315_1	Understand AngularJS framework and build dynamic web applications
0BCPE315_2	Develop single-page applications using AngularJS
0BCPE315_3	Design and implement REST APIs using Express.js
0BCPE315_4	Integrate frontend and backend for full-stack development

Course Contents: Theory

Unit 1	Introduction to Web Development & AngularJS Basics Overview of Web Development (Frontend vs Backend),Introduction to JavaScript ES6 features, Introduction to AngularJS , Features and Architecture of AngularJS , MVC & MVVM patterns,AngularJS Environment Setup, Modules and Controllers, Data Binding (One-way & Two-way), Expressions and Directives (ng-app, ng-model, ng-bind, ng-repeat)	11Hrs
Unit 2	Advanced AngularJS Concepts Services and Dependency Injection,Built-in Services (\$http, \$scope, \$rootScope),Routing and Navigation (ngRoute),Forms and Validation, Filters in AngularJS, Custom Directives, AngularJS Events	11Hrs


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Unit 3	Introduction to Node.js & Express.js Introduction to Node.js, Node.js Architecture & Event Loop, npm (Node Package Manager), Introduction to Express.js, Setting up Express Server, Routing in Express, Middleware concepts, Handling HTTP requests & responses, RESTful API development basics	11 Hrs
Unit 4	Full Stack Integration & Project Connecting AngularJS with Express.js backend, AJAX/HTTP communication, CRUD operations using REST APIs, Authentication basics (JWT or Sessions – intro level), Error handling & debugging, Deployment basics (local/server)	12 Hrs
Total Lecture Hours		45

Course Contents: Laboratory:

Expt. No.	Title
1	Create a simple AngularJS application to display "Hello World".
2	Demonstrate one-way and two-way data binding using ng-bind and ng-model.
3	Create an application using AngularJS expressions to perform arithmetic operations.
4	Implement basic directives (ng-app, ng-init, ng-repeat) to display a list of items.
5	Develop a small app using controllers and modules.
6	Create a program using AngularJS services and dependency injection.
7	Fetch and display data from a sample API using \$http service.
8	Implement routing (ngRoute) to navigate between multiple pages.
9	Create a form with validation (required, email, minlength, etc.).
10	Use filters (currency, date, uppercase) in an AngularJS application.
11	Develop a custom directive.
12	Demonstrate use of \$scope and \$rootScope events.
13	Install Node.js and create a basic server using Express.js.

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14	Create an Express app demonstrating routing (GET, POST methods).
15	Implement middleware functions in Express.js.
16	Develop a simple REST API (GET, POST, PUT, and DELETE).
17	Create an application to handle JSON data and HTTP responses.
18	Connect AngularJS frontend with Express.js backend using \$http/AJAX.
19	Perform CRUD operations (Create, Read, Update, Delete) using REST API.
20	Develop a full-stack small application (e.g., Student Management System / Task Manager).
Total Practical Session	
30	Total Practical Hours
	60

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Professional AngularJS	Adam Freeman	Wrox (John Wiley & Sons)	1 st Edition	2014
02	AngularJS: Novice to Ninja	Brad Green & Shyam Seshadri	SitePoint	1 st Edition	2015
03	AngularJS for Beginners	Krishna Rungta	Tech Publications India	Latest Edition	-

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Reference Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Beginning AngularJS	Andrew Grant	Apress	1 st Edition	2014
02	AngularJS Web Application Development Cookbook	Matt Frisbie	Packt Publishing	1 st Edition	2014
03	Modern Web Development with Node.js and Angular	Sanjib Sinha	BPB Publications	Latest Edition	-

Web Resources:

1. www.javatpoint.com
2. www.w3schools.com
3. www.geeksforgeeks.com

YouTube Link:

1. <https://www.youtube.com/playlist?list=PL6n9fhu94yhWKHkcL7RJmmXyxkuFB3KSI>

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Course Details:

Class		T.Y. B.C.A, Sem.-VI	
Course Code and Course Title		0BCPE316, Business Intelligence & Analytics [Data Science]	
Prerequisite/s		0BCPE216 Data Visualization	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		05	
Evaluation	40/30/30	ISE / MSE / ESE	40/30/30
	--	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE316_1	Explain Business Intelligence concepts, architecture, and data types for organizational decision-making using appropriate examples.
0BCPE316_2	Apply data warehousing concepts to construct star and snowflake schemas and OLAP operations for supporting business analytics.
0BCPE316_3	Analyze data using R programming techniques by performing data cleaning, transformation, and generating meaningful visualizations using libraries such as ggplot2.
0BCPE316_4	Identify statistical tests and regression models to analyze data and interpret results for informed decision-making using R tools.

Course Contents: Theory

Unit 1	Fundamentals of BI & Data Handling Introduction to Business Intelligence, importance and applications in organizations, difference between Business Intelligence, Data Analytics, and Data Science, BI architecture and components, data sources and types of data (structured, semi-structured, unstructured), introduction to data warehousing, OLTP and OLAP systems.	11 Hrs
Unit 2	Data Warehousing and ETL Concept of data warehouse, architecture and components, Data Warehouse Vs Operational database, data modeling using star schema and snowflake schema, fact table and dimension tables and their Relationships, OLAP operations such as roll-up, drill-down, slice and dice, ETL process: Data extraction, Data transformation, Data loading	11 Hrs



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Unit 3	R Programming and Data Visualization Introduction to R and its applications, Installation, setup, working directory, Basic syntax, variables, operators, Data types and vectors (creation and manipulation), Matrices, arrays, and factors (basic concepts) Functions and introduction to R packages, Reading and writing data (CSV and basic JSON), Data cleaning and data wrangling, Basic data visualization: Bar chart, Pie chart, Histogram, Box plot, Density plot, Plot customization: colors, labels, legends, titles Introduction to visualization using ggplot2	12 Hrs
Unit 4	Statistical Analysis and Regression using R Population vs Sample, Basic sampling concepts, Introduction to hypothesis testing, Null and alternative hypothesis, Concept of p-value, Concept of t-distribution, One-sample t-test, Steps in hypothesis testing, Interpretation of results in R, Concept of variance and need for ANOVA, One-way ANOVA, F-test, Post-hoc comparison, Introduction to regression, Simple linear regression, Interpretation, Multiple regression, Logistic regression, Goodness of fit (R^2), Residual analysis, Model interpretation, time series data, Trend and seasonality (basic concepts), Simple visualization in R.	11 Hrs
Total Lecture Hours		45

Course Contents: Laboratory:

Expt. No.	Title
1.	Study and demonstration of Business Intelligence tools (Power BI/Tableau interface).
2.	Create a sample dataset and identify fact and dimension tables.
3.	Perform data collection and dataset creation using Excel.
4.	Create application of basic Excel functions (SUM, AVERAGE, COUNT, IF) for simple data analysis.
5.	Study of data warehouse architecture and ETL process using case study.
6.	Design of Star Schema for a given business scenario.
7.	Design of Snowflake Schema and comparison with Star Schema.
8.	Perform ETL process (Extract data from CSV/Excel).
9.	Install R and RStudio, set working directory, and explore interface.

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10.	Perform arithmetic, relational, and logical operations in R.
11.	Create matrices and perform addition, multiplication, transpose.
12.	Create arrays and factors, and understand categorical data handling.
13.	Create and use functions with arguments and return values.
14.	Implement a program using functions like sum(), mean(), max(), min().
15.	Install and load packages (e.g., ggplot2).
16.	Implement a program to import dataset using read.csv() and display structure.
17.	Create a plot customization using R programming to add titles, labels, colors, legends to plots.
18.	Perform hypothesis testing using t.test() and interpret the p-value for decision making.
19.	Build a regression model using lm() and interpret slope, intercept, and R ² .
20.	Plot time series data to identify trend and seasonality and interpret patterns.
Total Practical Sessions	
30	
Total Practical Hours	
60	

Text Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Business Intelligence: A Managerial Perspective on Analytics	Ramesh Sharda, Dursun Delen & Efraim Turban	Pearson	4 th Edition	2019
02	R for Data Science	Hadley Wickham, Garrett Grolemund	O'Reilly	1 st Edition	2017
03	An Introduction to Statistical Learning with Applications in R	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani	Springer	2 nd Edition	2021


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Reference Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Business Intelligence and Analytics	R.N. Prasad	Khanna Publishing	Latest	2020
02	Practical Statistics for Data Scientists (with R)	Peter Bruce, Andrew Bruce, Peter Gedeck	O'Reilly	2 nd Edition	2020
03	The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling	Ralph Kimball, Margy Ross	Wiley	3 rd Edition	2013

Web Resources:

1. <https://learn.microsoft.com>
2. <https://cran.r-project.org>
3. <https://ggplot2.tidyverse.org>
4. <https://www.khanacademy.org>

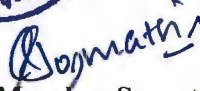
YouTube Link:

1. <https://www.youtube.com/watch?v=V8eKsto3Ug>
2. <https://www.youtube.com/watch?v=V8eKsto3Ug>




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Course Details:

Class		T.Y. B.C.A, Sem.- VI	
Course Code and Course Title		0BCPE317– Predictive Analysis [Artificial Intelligence & Machine Learning]	
Prerequisite/s		0BCPC202:DBMS, 0BCPE217:Introduction to ML	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		05	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

OBCPE317_1	Understand the basics of regression analysis for categorizing different models
OBCPE317_2	Apply various techniques used for identification of new patterns, relationships of data
OBCPE317_3	Analyse and visualize predicted data using data visualization tools
OBCPE317_4	Develop predictive models for various real-time applications

Course Contents: Theory

Unit 1	Simple Regression Analysis: - Fundamentals of Regression Analysis, Requirements in Regression Model Building, Model Diagnostics, Interpretation of Regression results for Management Decision. Multiple Regression Analysis: Concept - Significance of Multiple Regression Analysis, Structure of Model Estimation, Testing Rule of Multiple Regression Analysis Predictive Analysis under Machine Learning - Model of Artificial Neural Networks (ANN), Model of Random Forest, Model of Support Vector Machine, Assumptions under Machine Learning	12 Hrs
Unit 2	Non- linear Regression Analysis: - Types of Non-linear Regression Models, Model Transformation, Difference between Linear and Non-linear Regression Models. Diagnostics of Regression Modelling: Model Diagnostics, Multicollinearity , Autocorrelation Classification and Clustering Techniques - Association Rule Mining, Cause and Effect Model, decision trees, k-nearest neighbour, k-means clustering.	11 Hrs


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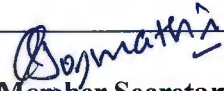
Unit 3	Dummy modelling: Dummy independent modelling, linear probability Model, Logit model, Probit model Panel Data Model: Concept - Panel Data Models, Fixed Effects Model, Random Effects Model, Forms of Panel Data Models, Applications to use Panel Data Models	10 Hrs
Unit 4	Time Series Forecasting: - Forecasting Techniques - Measures of Forecast Error - Trend Analysis - Time Series Models - Auto Regressive Model - Applications of Time Series Models Data Mining: - Data Interpretation – Data prediction - Data visualization-Data Dimensionality Reduction – Develop and test predictive model Simulation - Monte Carlo Simulation - Discriminant Event Simulation – Any application Using Simulation.	12 Hrs
Total Lecture Hours		45 Hrs

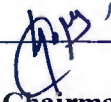
Course Contents: Laboratory

List of Practical's	
Expt. No.	Title of Experiment
1	Write a python program to demonstrate simple Linear Regression model on a sample dataset.
2	Write a python program to demonstrate multiple linear regression model on a sample dataset.
3	Write a python program to demonstrate Non Linear Regression models on a sample dataset.
4	Write a python program to demonstrate logistic regression for classification on a sample dataset.
5	Write a python program to demonstrate classification of different input images for any application.
6	Write a python program to demonstrate generation of new patterns using clustering technique.
7	Write a python program to detect and handle missing values in a dataset using appropriate techniques.
8	Write a python program to demonstrate Time series data analysis using Pandas.
9	Write a python program to perform time series forecasting using moving average method.
10	Write a python program to demonstrate Data visualization using Seaborn or Matplotlib.

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11	Write a python program to demonstrate dimensionality reduction using principal component analysis (PCA).
12	Write a python program to perform correlation analysis between variables and interpret the results.
13	Write a program to implement k-nearest neighbour algorithm to classify the given dataset.(can use any dataset)
14	Write a program to implement support vector machine algorithm on sample dataset.
15	Write a python program to implement random forest algorithm on a sample dataset.
16	Write a program to implement a decision tree classifier on given dataset.
17	Write a python program to evaluate model performance using metrics such as accuracy, precision, recall and F1-score.
18	Write a python program to demonstrate feature scaling techniques such as normalization and standardization on a dataset.
19	Miniproject (compulsory) Implement a python program for house price prediction.
20	Miniproject(compulsory): Implement a python program for stock market price prediction.
Total Practical Session 30 Total Practical Hours 60	

Text Books:					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	"Predictive Analytics For Dummies"	Anasse Bari, Mohamed Chaouchi, Tommy Jung	Wiley Publisher	2 nd edition	2016
02	"Machine Learning for Predictive Data Analysis",	Dr. Supriya Nagarkar, Dr. Asmita Namjoshi	Scientific International Publishing House,	1 st edition	2025


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Reference Books:					
Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	"Forecasting & Predictive Analytics"	Barry Keating, J. Holton Wilson, Shovan Choudhury	McGraw Hill publication	2 nd edition	2019
02	"Forecasting & Predictive Analytics"	Narasimhareddy	Notion Press	1 st edition	2024
03	"Data Mining & Predictive Analytics"	O. P. Wali	Wiley	2 nd edition	2015

Online Courses:

- YouTube Channel

- 1) <https://youtu.be/Xd1RsDUfuY8?si=W6kWoSIW-616jPXW>
- 2) <https://youtu.be/taiASM9Ehas?si=rH22KZLICyh94G-9>

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Course Details:

Class		T.Y. B.C.A, Sem.-VI	
Course Code and Course Title		0BCPE318, Web Programming-VII [Full Stack Development]	
Prerequisite/s		0BCPE303-Web Programming-III 0BCPE306-Web Programming-IV	
Teaching Scheme: Lecture/Tutorial/Practical		03/00/04	
Credits		05	
Evaluation	T	ISE / MSE / ESE	40/30/30
	P	ISE/ESE	25/25

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCPE318_1	Explain software build, environment, and deployment concepts.
0BCPE318_2	Apply version control operations using Git and GitHub.
0BCPE318_3	Perform testing and debugging of web applications.
0BCPE318_4	Deploy applications using platforms like Netlify and Vercel.
0BCPE318_5	Implement basic security and performance optimization techniques.
0BCPE318_6	Prepare technical documentation and demonstrate project delivery.

Course Contents: Theory

Unit I	Build, Project Preparation & Version Control Development vs Production environment, Project structure and organization, Environment variables (basic concepts), Build and packaging (overview), Introduction to version control, Repository creation and management, Branching and merging, Conflict resolution, Pull requests and collaboration workflow, Issue tracking basics	12Hrs
Unit 2	Testing & Debugging Practices Types of testing (Unit, Integration – overview), manual testing, techniques API testing (using tools like Postman), Debugging using browser, developer tools, Error handling techniques	10Hrs


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Unit 3	Application Deployment & Delivery Introduction to deployment, Static website deployment , Frontend deployment, Hosting concepts (shared hosting, domain basics) , Deployment using Netlify/Vercel (basic workflow) , Continuous deployment concept, Versioning and release basics	13 Hrs
Unit 4	Security, Performance & Documentation Input validation, Authentication basics , Common vulnerabilities (XSS, SQL Injection – overview), Secure coding practices , Page load optimization,, Image optimization, Basic caching concepts , Code optimization (minification concept) , Technical documentation (README) , API documentation basics , User manual preparation , Project presentation and demo	10 Hrs
Total Lecture Hours		45

Course Contents: Laboratory:

Expt. No.	Title
1	Create Git repository
2	Branching and merging
3	Resolve merge conflicts
4	Push project to GitHub
5	Create pull request
6	API testing using Postman
7	Debugging using browser tools
8	Implement error handling
9	Deploy static website using Netlify
10	Deploy frontend using Vercel
11	Configure environment variables
12	Run backend locally
13	Input validation implementation and Basic authentication
14	Performance optimization
15	API documentation preparation
16	Implement small Application: Full stack application (build, test, deploy, demonstrate)
17	Implement small Application: Full stack application (build, test, deploy, demonstrate)
18	Implement small Application: Full stack application (build, test, deploy, demonstrate)
19	Implement small Application: Full stack application (build, test, deploy, demonstrate)
20	Small Application report generation using AI tool (Ethical and responsible use of AI tools)

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Text Books					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Continuous Delivery	Jez Humble, David Farley	Addison-Wesley	1 st edition	2010
2	Pro Git	Scott Chacon, Ben Straub	Apress	2 nd edition	2014
3	The Art of Unit Testing	Roy Oshero	Manning Publications	2 nd edition	2013
4	Web Application Security	Andrew Hoffman	O'Reilly Media	1 st edition	2020
5	Git and GitHub for Beginners	Harwani B. M.	BPB Publications	Latest Edition	2023

Reference Books					
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
1	Version Control with Git	Jon Loeliger, Matthew McCullough	O'Reilly Media	2 nd edition	2012
2	High Performance Web Sites	Steve Souders	O'Reilly Media	1 st edition	2007
3	Web Performance in Action	Jeremy Wagner	Manning Publications	1 st edition	2017
4	Docs for Developers	Jared Bhatti et al.	Apress	1 st edition	2021
5	Code Complete	Steve McConnell	Microsoft Press	2 nd edition	2004

Web Resources:

1. <https://developer.mozilla.org/>
2. <https://git-scm.com/docs>
3. [Postman Docs](#) | [Postman Docs](#)

YouTube Link:

1. <https://www.youtube.com/watch?v=Ez8F0nW6S-w>
2. https://www.youtube.com/playlist?list=PLnNg6KqJ3HGiMMhPYMqzRURJu_hvgy4Eo
3. https://www.youtube.com/playlist?list=PLu0W_9lI9agwhy658ZPA0MTStKUJTWpi

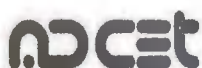
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Course Details:

Class			T.Y. B.C.A, Sem.- VI
Course Code and Course Title			0BCAE319,Soft Skills
Prerequisite/s			-
Teaching Scheme: Lecture/Tutorial/Practical			02/00/00
Credits			02
Evaluation	T	ISE / MSE / ESE	50/00/00
	P	ISE/ESE	-/-

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BCAE319_1	Explain the significance of soft skills and their role in professional and workplace effectiveness.
0BCAE319_2	Apply self-awareness, emotional intelligence, and professional behaviour in interpersonal and workplace contexts.
0BCAE319_3	Analyze team situations, leadership roles, and workplace interactions to identify appropriate behavioural strategies.
0BCAE319_4	Evaluate problems, conflicts, and decision-making scenarios using critical thinking and ethical reasoning.
0BCAE319_5	Develop professional competencies such as presentations, resumes, and interview performance for career readiness.

Course Contents: Theory

Unit I	Soft Skills: Introduction to soft skills and their significance in professional contexts; distinction between hard skills and soft skills; role of soft skills in workplace effectiveness and career growth; key dimensions of soft skills including attitude, adaptability, and ethical behavior; interpersonal sensitivity and professional conduct; understanding workplace expectations and behavioral competencies.	6 Hrs
Unit 2	Personality Development: Concept and importance of personality development; self-awareness and self-assessment through SWOT analysis; emotional intelligence and stress management; development of interpersonal relationships and social awareness; professional etiquette including email, telephonic, and workplace manners; grooming, body language, and personal presentation; attitude formation and personal branding.	7 Hrs

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Unit 3	Teamwork, Leadership & Thinking Skills: Team dynamics and group behaviour; collaboration and coordination in professional settings; leadership qualities, styles, and responsibilities; conflict resolution and negotiation strategies; critical thinking and structured problem-solving; decision-making processes in workplace scenarios; fostering cooperation and accountability within teams.	8 Hrs
Unit 4	Employability Skills: Resume building and professional documentation; group discussion techniques including expectations, evaluation criteria, and best practices; interview skills covering preparation, common questions, and behavioural responses; presentation and public speaking skills; workplace readiness including professional conduct and career planning; networking and transition from campus to corporate environment.	9 Hrs
Total Lecture Hours		30 Hrs

Text Books:

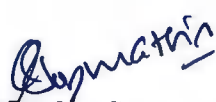
Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Business Communication	Raman, Meenakshi, and Prakash Singh	Oxford	2nd Edition	2012
02	Managing Soft Skills for Personality Development	Ghosh, B.N.	McGraw Hill Education	1 st Edition	2017
03	Soft Skills: An Integrated Approach to Maximise Personality	Chauhan, Gajendra Singh	Wiley	2 nd Edition	2015

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	How to Succeed at Interviews	Sudhir Andrews	Tata McGraw-Hill	-	1988
02	Effective Leadership	Robert Heller	DK Publishing	-	2002
03	The Art of Public Speaking	Stephen Lucas	Tata McGraw-Hill	1 st Edition	2001
04	From Campus to Corporate	K.K. Ramachandran & K.K. Karthick	Macmillan India	1 st Edition	2010
05	Emotional Intelligence	Daniel Goleman	Bantam Books	1 st Edition	1995

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Course Details:

Class			T.Y. B.C.A, Sem-VI
Course Code and Course Title			0BCSE320,Major Project
Prerequisite/s			--
Teaching Scheme: Lecture/Tutorial/Practical			00/00/08
Credits			04
Evaluation	T	ISE / MSE / ESE	-
	P	ISE/ESE	50/50

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0BCSE320_1	Identify and define a real-world software/IT problem
0BCSE320_2	Apply programming concepts, DBMS, and software tools
0BCSE320_3	Conduct thorough research, analyze data effectively, and interpret results to inform project decisions and optimize solutions.
0BCSE320_4	Develop a comprehensive project plan, including timelines, budgets, risk management strategies, and quality control measures
0BCSE320_5	Communicate project goals, methodology, and outcomes effectively through written reports, presentations, and technical documentation.
0BCSE320_6	Demonstrate critical thinking, problem-solving, and design skills throughout all phases of the project, adapting to challenges and making informed decisions.
0BCSE320_7	Gain practical experience in working independently and collaboratively within a team environment, fostering effective communication and teamwork.

General Guidelines:

1. **Project Scope:** The major project will involve the development and implementation of a significant software or IT-based application. This may encompass a wide range of activities, including:
 - **Design Projects:** Creating innovative solutions to real-world problems, such as designing new software applications, systems, or digital solutions.
 - **Experimental Studies:** Conducting research through experimentation, collecting and analyzing data, and drawing conclusions.
 - **Computer-Based Simulations:** Utilizing computational tools and software to model, simulate, and analyze system behavior, data processes, or application performance.

All projects must focus on topics relevant to the specific Department's specialization, ensuring a strong connection to the core curriculum and industry practices.


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2. Project Components: The successful completion of the major project necessitates the integration of several critical components:

- Problem Identification & Definition: Clearly identifying and defining a software, IT-related, or real-world problem or challenge within the project scope.
- Literature Review: Conducting thorough research on existing knowledge, methodologies, and best practices related to the project.
- Problem Formulation: Translating the identified problem into a well-defined set of software or IT-based objectives, requirements, and constraints.
- Design & Development: Designing, developing, and implementing solutions, which may include:
 - Conceptual design and ideation
 - Detailed design and prototyping
 - System integration and testing
- Utilization of Modern Tools & Techniques: Employing relevant and contemporary software tools and technologies throughout the project, such as:
 - Simulation and analysis software
 - Data acquisition and analysis tools
 - Project management software

3. Project Synopsis Submission: Students are required to submit a project synopsis outlining the proposed major project. This synopsis must include the following:

- Project Scope: A clear and concise description of the project, including its objectives, boundaries, and relevance to the chosen area of specialization.
- Project Objectives: Specific, measurable, achievable, relevant, and time-bound (SMART) objectives that the project aims to achieve.
- Methodology: A detailed description of the project approach, including:
 - Research methodology (e.g., literature review, experimental design, simulation methods)
 - Design and development process (if applicable)
 - Data collection and analysis methods
- Resources & Tools: A list of anticipated resources, including:
 - Software (e.g., simulation, data analysis)
 - Equipment and materials
 - Access to facilities (e.g., laboratories, workshops)
- Expected Results: A clear statement of the anticipated outcomes of the project including:
 - Measurable results (e.g., performance data, design specifications, research findings)
 - Potential impact and contributions


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- **Project Timeline:** A realistic and detailed project schedule, including key milestones and deadlines for completion.

The project synopsis submission serves as a crucial step in the project planning process, ensuring that students have a well-defined plan before commencing their work.

4. **Project Duration:** The project work is structured to be completed within six semesters to work under the guidance of the assigned project guide throughout this period.
5. **Group Formation:** students will typically work in groups of 2 to 4 members to complete the major project. The maximum group size is strictly limited to 4 members.
6. **Assessment**

- **Project Synopsis & Progress Presentations:** The project synopsis and progress presentations will be evaluated using established rubrics.
- **Project Diary & Report -** The project diary, meticulously maintained throughout the project duration, will be a crucial component of the overall assessment. The final project report will be assessed during the End-semester Examination (ESE).
- **Project Presentations -** Students will make three presentations before the project evaluation committee. These presentations will be collectively assessed.

In Semester Evaluation	
Particulars	Marks
Synopsis Presentation	10
Progress Presentation-I	10
Progress Presentation-II	15
Progress Presentation-III	15
End Semester Examinations	
Project Work Report	25
Viva-Voce Examination	25

7. Submission Requirements

➤ **Project Work Diary:**

- **Maintenance:** Meticulously maintained by the group throughout the project duration.
- **Entries:** Reflects daily or weekly efforts, including project selection, literature review, experimental work, data analysis, and any other relevant activities.
- **Countersignature:** Weekly countersigned by the assigned project guide.

➤ **Project Synopsis:**

 **Member Secretary-BoS**

 **Chairman-BoS**

 **Member Secretary-AC**

 **Chairman-AC**



Department of Bachelor in Computer Application

✓ Format Submitted in the prescribed format including:

- Project Title
- Student Names & URN Numbers
- Guide's Name & Department
- Project Relevance & Significance
- Comprehensive Literature Review(minimum 10 peer-reviewed journal articles)
- Proposed Work: Objectives, Methodology, and Approach
- Expected Outcomes
- Detailed Budget Estimate
- References (in the specified format)

✓ Approval:

- Signed by each group member.
- Approved by the project guide.
- Endorsed by the Head of the Department.

➤ Project Report:

✓ Format:

- Typed report of minimum 50 and maximum 100 pages.
- Adheres to the standardized format for page size, margins, font, and spacing.
- References: All references (journal articles, books) must be cited correctly in the specified format.

✓ Project Presentations :

- Presentations: Students must present their project progress to faculty members and review panel members during scheduled reviews.
- Submission: Soft copies of all presentation slides (PowerPoint/PPT) must be submitted to the project guide.

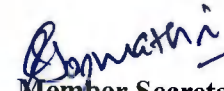
✓ Project Documentation:

The Project Coordinator shall maintain a separate file with following documents

- Approved Project Synopsis
- Project Review Schedule
- Soft Copies of all presentation slides in Google Drive
- Assessment marks for each review, along with the corresponding rubrics


Member Secretary-BoS


Chairman-BoS


Member Secretary-AC


Chairman-AC

