



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

**SHIVAJI UNIVERSITY, KOLHAPUR - 416004,
MAHARASHTRA**

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शिवाजी विद्यापीठ, कोल्हापूर - ४१६००४, महाराष्ट्र

दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१-२६०९०९४



Ref./SU/BOS/Com & Mgt./155

Date : 25/05/2026

The Principal
All Concerned Affiliated Colleges/ Institutions,
Shivaji University, Kolhapur

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

Sir/Madam,

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

This syllabi shall be implemented from the academic year **2026-2027** onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in (Online Syllabus).

The question paper on the pre-revised syllabi of above mentioned programme will be set for the examinations to be held in October/November 2026 & March/April, 2027. These chances are available for repeater students, if any.

You are therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,


Dy. Registrar

Encl: As above

for Information and necessary action

Copy to:

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

SHIVAJI UNIVERSITY, KOLHAPUR



Estd. 1962, NAAC "A" Grade

Faculty of Commerce and Management

**Syllabus for
Bachelor of Computer Applications (BCA) Part III (SEM-V & VI)
CBCS Course Structure to be implemented from Academic
Year June 2026-27 (Under NEP 2.0)
as per AICTE Model Curriculum**

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

BCA III - SEMESTER V

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	External	Total	
1	DSE301*	3.1 Introduction to Data Science (Data Science) 3.1 Neural Network (AI &ML) 3.1 Advance Java (Full Stack Devp.)	3	0	4	5	15	60	75	50
2	DSE302*	3.2 Time Series Analysis (Data Science) 3.2 Digital Image Processing (AI &ML) 3.2 Dot Net Technology (Full Stack Devp.)	3	0	4	5	15	60	75	50
3	DSE303*	3.3 Machine Learning (Data Science) 3.3Natural Language Processing (AI &ML) 3.3Emerging Web Technology (Full Stack Devp.)	3	0	4	5	15	60	75	50
4	SEC301	Quantitative Techniques	1	2	0	3	15	60	75	
5	SEC302	Internship/capstone Project	0	0	8	4	20	80	100	
6	SEC303	Major Project [evaluation in sixth semester]	-	-	-	0				
TOTAL						22			400	150
Total Marks										550

Professional Elective (Data Science)

Course Code	Professional Elective (Data Science)
DSE301	Introduction to Data Science
DSE302	Time Series Analysis
DSE303	Machine Learning

DSE301	Introduction to Data Science				
Course Outcomes	CO1: To introduce students to the fundamentals of Data Science. CO2: To develop skills in data preprocessing and visualization. CO3: To apply statistical techniques in data analysis. CO4: To understand basic machine learning concepts and tools.				
Prerequisite:	Basic understanding of programming concepts				
Total Hours of Teaching : 60	Lecture	Tutorial	Practical	Total Per Week	Credit Points:-5
	3	0	4	7	
Total Marks: 125	External Exam Theory: 60		Internal : 15		
	Practical Exam:50				
Syllabus Content:					
. Unit I Introduction to Data Science ▪ Definition and scope of Data Science ▪ Importance of Data Science in industry and research ▪ Data science lifecycle: problem definition → data collection → preprocessing → analysis → model building → evaluation ▪ Types of data: structured, unstructured, semi-structured ▪ Data sources and formats (CSV, JSON, SQL, NoSQL)					15 Hours
Unit II Data Acquisition & Preprocessing ▪ Data collection methods and tools ▪ Data cleaning: handling missing values, duplicates, outliers ▪ Data transformation: normalization, scaling, encoding ▪ Data integration and reduction					15 Hours
Unit III Exploratory Data Analysis (EDA) ▪ Introduction to EDA and its role in data science					15 Hours

▪ Descriptive statistics: mean, median, mode; variance, standard deviation ▪ Visualization basics: histograms, box plots, scatter plots ▪ Using tools/libraries (e.g., Python Pandas & Matplotlib/Seaborn) for EDA	
Unit IV Data Science Tools & Applications ▪ Overview of tools used in data science (Excel, Python, R) ▪ Introduction to SQL for data querying ▪ Brief introduction to databases and big data basics ▪ Case studies: simple data projects ▪ Ethical concerns: data privacy, security, bias ▪ Introduction to data quality concepts	15 Hours
References	
Introduction to Data Science Lab	
1. Write a Python program to create and display a Pandas Data Frame. 2. Write a program to read data from a CSV file using Pandas. 3. Write a program to read data from a JSON file and convert it into a Data Frame. 4. Write a program to identify missing values in a dataset. 5. Write a program to handle missing values using mean, median, or mode. 6. Write a program to remove duplicate records from a dataset. 7. Write a program to perform data normalization using Min-Max scaling. 8. Write a program to encode categorical data using Label Encoding. 9. Write a program to calculate descriptive statistics (mean, median, mode, standard deviation). 10. Write a program to create a histogram using Matplotlib. 11. Write a program to create a scatter plot between two variables. 12. Write a program to create a box plot to identify outliers. 13. Write basic SQL queries (SELECT, WHERE, ORDER BY) on a sample table. 14. Perform Exploratory Data Analysis (EDA) on a given dataset and display summary. 15. Create visualizations using Seaborn library. 16. Perform data integration by merging two datasets.	

BCA - III SEM – V (NEP 2.0)						
Time Series Analysis						
DSE302*						
Course Outcomes:	After completing this course, students will be able to:- CO1: Understand the concept, types, and components of Time Series data. CO2: Analyze trends and seasonal variations using basic statistical methods. CO3: Apply time series decomposition and simple forecasting techniques. CO4: Interpret time-based data for decision-making in educational and business contexts. CO5: Relate Time Series Analysis concepts to Data Analytics and Machine Learning applications.					
Total Hours of Teaching : 45		Lecture	Tutorial	Practical	Total Per Week	Credit Points : 05
		3	0	4	5	
Total Marks :75		External Exam Theory : 60				Internal : 15
Practical : 50		External Exam. Practical:50				
Syllabus Content:						
Unit: I	UNIT I: Introduction to Time Series Concept of Time Series: Definition and meaning of Time Series, Characteristics of Time Series Data. Types of Time Series: Annual Time Series, Quarterly Time Series, Monthly Time Series, Daily Time Series. Components of Time Series: Trend (T), Seasonal Variation (S), Cyclical Variation (C), Irregular Variation (I). Applications of Time Series Analysis: Educational Data Analysis, Business and Economic Forecasting, Student Performance and Enrollment Analysis.					15 Hours
Unit: II	UNIT II: Trend Analysis and Time Series Decomposition Trend Analysis: Meaning and importance of Trend, Types of Trend (Upward, Downward, Horizontal). Methods of Measuring Trend: Graphical Method, Semi-Average Method, Moving Average Method, Least Square Method. Time Series Decomposition Models: Additive Model, Multiplicative Model. Practical Applications of Trend Analysis: Enrollment Trend Analysis, Result Performance Analysis.					15 Hours
Unit: III	UNIT III: Seasonal, Cyclical, and Irregular Variations Seasonal Variations: Concept of Seasonal Index, Methods of Measuring Seasonal Variations: Simple Average Method, Ratio to Moving Average Method, Ratio to Trend Method. Cyclical Variations: Meaning and characteristics, Business cycles and their impact on Time Series, Irregular Variations: Nature and causes of irregular changes, Impact of unexpected events on data. Interpretation of Time Series Data: Combined analysis of all components					15 Hours
Unit: IV	UNIT IV: Forecasting and Modern Time Series Techniques					15 Hours

	Concept of Forecasting: Short-term and Long-term Forecasting, Importance of Forecasting. Forecasting Techniques: Naïve Forecasting, Simple Moving Average, Simple Exponential Smoothing. Introduction to Statistical Time Series Models: Auto Regression (AR) – basic concept: Moving Average (MA) – basic concept, ARIMA Model – introduction, Time Series in Data Analytics: Role of Time Series in Data Science, Applications in Educational and Business Data, Future Scope in Machine Learning and AI	
Text Books:	1. Introduction to Time Series Analysis and Forecasting — Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci Comprehensive coverage of basic theory and forecasting methods with practical examples. 2. The Analysis of Time Series: Theory and Practice — C. Chatfield Classic introduction bridging theory and practice of time series analysis. 3. Practical Time Series Analysis — (Packt Publishing) Hands-on approach with examples, especially useful if your course includes tools like Python/Analytics. 4. Practical Time Series Analysis and Forecasting — Chetanaanand Kaul (Educohack Press, 2024) Applied book focused on forecasting techniques and real datasets.	
Reference Books:	1. Time Series Analysis: Forecasting and Control – George E. P. Box, Gwilym M. Jenkins & Gregory C. Reinsel (Wiley) Classic and widely respected reference on time series theory and forecasting models. 2. Time Series for Data Science: Analysis and Forecasting – Wayne A. Woodward, Bivin Philip Sadler & Stephen Robertson Focuses on practical and data science-oriented techniques — regression, ARIMA, smoothing, neural networks. 3. The Analysis of Time Series: Theory and Practice – C. Chatfield Balances theory and applications; great for both beginners and deeper study. 4. Time Series Analysis, Modeling and Applications: A Computational Intelligence Perspective – Witold Pedrycz & Shyi-Ming Chen (Springer) Advanced reference covering intelligent computing approaches alongside classical methods.	
Time Series Analysis – Lab Problems Chapter 1: Introduction to Time Series 1. Given a dataset, determine whether it is a Time Series or not and justify your answer. 2. Classify the given Time Series data into Annual, Quarterly, Monthly, or Daily Time Series. 3. Identify and explain the components of Time Series (Trend, Seasonal, Cyclical, and Irregular) from the given data. 4. Plot a Time Series graph and interpret the pattern observed.		

Chapter 2: Trend Analysis and Decomposition

1. Plot a Time Series graph and identify the type of trend present.
2. Calculate the Trend using the **Moving Average Method**.
3. Determine the Trend equation using the **Least Square Method**.
4. Decompose the given Time Series using the **Additive or Multiplicative Model**.

Chapter 3: Seasonal, Cyclical, and Irregular Variations

1. Calculate Seasonal Indices using the **Simple Average Method**.
2. Compute Seasonal Indices using the **Ratio to Moving Average Method**.
3. Interpret Seasonal Variations and identify Cyclical and Irregular components.
4. Perform combined analysis of Trend and Seasonal components.

Chapter 4: Forecasting and Modern Techniques

1. Forecast future values using the **Naïve Forecasting Method**.
2. Forecast values using the **Simple Moving Average Method**.
3. Apply **Simple Exponential Smoothing** for forecasting.
4. Compare forecasted results obtained using different methods.

Tool Used: Python (Pandas & Matplotlib)

DSE303 Professional Elective – V	Machine Learning				
Course Outcomes	CO1:-To understand the Domain of ML and basics techniques used in ML. CO2:-To design and apply various machine learning algorithms for supervised learning. CO3:-To design and apply Explore supervised and unsupervised learning paradigms of machine learning. CO4:-To understand techniques and application of ML in real world scenario.				
Prerequisite:	Basic understanding of linear algebra and statistics.				
Total Hours of Teaching : 60	Lecture	Tutorial	Practical	Total Per Week	Credit Points:-5
	3	0	4	7	
Total Marks: 125	External Exam Theory: 60		Internal : 15		
	Practical Exam:50				
Syllabus Content:					
Unit I: Introduction of Machine Learning(ML) Machine Learning basic concepts, Perspectives and Issues in Machine Learning, Types of Machine Learning, supervised – unsupervised – reinforcement, Data Representations: Numerical representation, Graph representation, Applications of Machine Learning.					15 Hours
Unit II: Machine Learning-Supervised Learning (Regression/Classification) Nearest-Neighbours, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Support Vector Machines, Nonlinearity and Kernel Methods.					15 Hours
Unit III: Unsupervised Learning K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Ensemble Methods (Boosting, Bagging, Random Forests)					15 Hours
Unit IV: Techniques and Applications Scalable Machine Learning, Introduction to Bayesian Learning and Inference, Recent trends in various learning techniques of machine learning and classification methods.					15 Hours
Reference Books/ Text Books: 1 Kevin Murphy,” Machine Learning: A Probabilistic Perspective”, MIT Press, 2012					

2	Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning”, Springer 2009 (freely available online)	
3	EthemAlpaydin, Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series) I, Third Edition, MIT Press, 2014	
4	Tom M Mitchell, —Machine LearningI, First Edition, McGraw Hill Education.	
Machine Learning Lab using Python		
1. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. 2. Print both correct and wrong predictions. 3. Write a program to implement feature scaling & feature standardization of preprocessing & compare its result with KNN algorithm. 4. Write a program to demonstrate the working of the decision tree based ID3 algorithm 5. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 6. Estimate the accuracy of decision classifier on cancer dataset using 5-fold cross validation. 7. Write a program to implement Support vector machine algorithm on sample dataset. 8. Write a program to implement Simple Linear Regression on a sample dataset. 9. Write a program to implement Multi-Variate Linear Regression on a sample dataset. 10. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets 11. Write a program to construct a Bayesian network considering medical data like heart patient or diabetes dataset. 12. Using a dataset with known class labels compare the labeling error of the K-means algorithm. Measure the error by assigning a class label to each example. Assume that the number of clusters is known. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. 13. Write a program to implement feature scaling & feature standardization of preprocessing & compare its result with KNN algorithm. 14. Write a program to demonstrate the working of the decision tree based ID3 algorithm. 15. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample. 16. Estimate the accuracy of decision classifier on cancer dataset using 5-fold cross validation. 17. Write a program to implement Support vector machine algorithm on sample dataset. 18. Write a program to implement Simple Linear Regression on a sample dataset.		

19. Write a program to implement Multi-Variate Linear Regression on a sample dataset. 20. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets	
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Professional Elective (AI &ML)

Course Code	Professional Elective (AI & ML)
DSE301	Neural Network
DSE302	Digital Image Processing
DSE303	Natural Language Processing

Course Code	Course Title	L	T	P	Cr	Theory			Pr.
DSE301	Neural Network					Int	Ext	Total	
		3	0	4	5	15	60	75	50
Neural Network									
Course Outcomes									
CO1 : To understand the fundamentals of Artificial Neural Networks (ANN).									
CO2 : To learn different neural network models and learning methods									
CO3: To implement neural networks using Python.									
CO4: To apply neural networks for classification and prediction problems.									
Unit-1	Introduction to Neural Networks								15
	▪ Introduction to Artificial intelligence and Neural Network ▪ History and evolution of Neural Networks ▪ Learning Types:-Supervised learning, Unsupervised Learning, reinforcement learning ▪ Biological neuron vs Artificial neuron ▪ Basic components of ANN-Neuron, weights, Bias ▪ Activation functions (Binary step, Sigmoid, ReLU, Tanh) ▪ Types of Neural Networks ▪ Applications of Neural Networks								
Unit-2	Perceptron and Multilayer Networks								15
	▪ Single Layer Perceptron ▪ Perceptron Learning Algorithm ▪ Limitations of Perceptron (XOR problem) ▪ Multilayer Perceptron (MLP) ▪ Forward propagation ▪ Backpropagation algorithm ▪ Loss functions								

Unit-3	Training Algorithms • Backpropagation Algorithms • Gradient Descent method • Error calculation and weight update • Feedforward Neural Network • Training and testing process • Overfitting and underfitting	15
Unit-4	Neural Network Applications and Tools • Applications of Neural Network-Pattern Recognition, Image Recognition, Speech Recognition, Medical diagnosis, Prediction Systems • Introduction to Deep Learning • Introduction to Numpy, TensorFlow / Keras • Building ANN model using Python • Simple Neural Network Implementation	15
References		
	PRACTICAL	
	1. Write a python program to perform basic operations using Numpy such as : Creating Arrays, Mathematical operations, Matrix operation 2. Write a python program to implement Binary Step activation function 3. Write a python program to implement Sigmoid activation function and display output for given inputs 4. Write a python program to implement Hyperbolic Tangent(Tanh) activation function. 5. Write a python program to implement Rectified Linear Unit (ReLU) activation function 6. Write a python program to implement Perceptron learning algorithm for AND gate 7. Write a python program to create and train single layer neural network 8. Write a python program to create multilayer neural network using Keras 9. Write a python program to train neural network using Backpropagation algorithms 10. Write a python program to classify data using neural network 11. Write a python program to predict output using neural network	

	12. Write a python program to create ,train and test neural network using Keras
	13. Write a python program to calculate accuracy of neural network model

DSE302 Professional Elective – IV	Digital Image Processing				
Course Outcomes	CO1:- able to enhance the quality of an image using various transformations. CO2:- analyze the transform of an image in spatial domain to frequency domain. CO3:- apply required morphological operations to an image. CO4:- adequate to segment an image using various approaches.				
Prerequisite:	Basic understanding of linear algebra.				
Total Hours of Teaching : 60	Lecture	Tutorial	Practical	Total Per Week	Credit Points:-5
	3	0	4	7	
Total Marks: 125	External Exam Theory: 60		Internal : 15		
	Practical Exam:50				
Syllabus Content:					
Unit-I Introduction: Introduction to digital image processing, Applications of digital image processing, steps in digital image processing: image acquisition, image sampling and quantization, basic relationships between pixels.					15 Hours
Unit-II Image enhancement: grey level transformations, histogram processing, local enhancement, image subtraction, image averaging, spatial filtering: smoothing and sharpening filters, Discrete Fourier transformation, filtering in the frequency domain: smoothing and sharpening filters, image restoration in spatial and frequency domains.					15 Hours
Unit-III Morphological image processing and Image Compression: erosion and dilation, opening and closing, hit-or-miss transformation, and some basic morphological algorithms, Image compression models, error-free compression techniques, lossy compression techniques, JPEG, MPEG.					15 Hours
Unit-IV Image segmentation Point: line and edge detection, gradient operator, edge					15 Hours

linking and boundary detection, thresholding, region-based segmentation, representation schemes like chain codes, polygonal approximations, boundary segments, skeleton of a region, boundary descriptor, regional descriptor.	
Reference Books/ Text Books: 1. Gonzalez, Rafael C. and Woods, Richard E., <i>Digital Image Processing</i>, 4th edition, Pearson Education, 2018. 2. Annadurai, S. and Shanmugalakshmi, R., <i>Fundamentals of Digital Image Processing</i>, 1st edition, Pearson, 2006. 3. Joshi, M. A., <i>Digital Image Processing: An Algorithmic Approach</i>, 2nd edition, PHI Learning, 2020. 1. Jahne, Bernd, <i>Digital Image Processing</i>, 6th edition, Springer, 2005. 2. Chandra, B. and Majumder, D.D., <i>Digital Image Processing and Analysis</i>, 2nd edition, Prentice Hall India Learning Private Limited, 2011.	
Digital Image Processing Lab using Python 1. Implement a program for displaying grey-scale and RGB colour images, with those for accessing pixel locations, and investigate adding and subtracting a scalar value from an individual location. 2. Implement a program to perform the image sampling and quantization technique and display the resulting images. 3. Implement a program to apply histogram equalization to a color image, and apply contrast stretching to the colour example image. Experiment with different parameter values to find an optimum for the visualization of this image. 4. Implement a program to add different levels of salt and pepper and Gaussian noise to images, both in colour and grey-scale. Investigate the usefulness of all filtering for removing different levels of image noise. 5. Write a program for all image restoration techniques. 6. Write a program for the Fourier transform of an image. 7. Write a program for image spatial and sharpening filtering. 8. Implement a program to find the result of erosion, dilation, opening and closing with the below structuring element and choose any image.	

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10. Write a program for all image segmentation techniques

Course Code	Course Title	L	T	P	Credit	Theory			Practical	
DSE 303	Natural Language Processing	3	-	4	5	Int	Uni	Total	Int	Uni
						15	60	75	--	50
Course Outcomes (COs):	CO1: Understand fundamental concepts and applications of NLP. CO2: Analyze syntactic structures using parsing techniques. CO3: Apply semantic analysis and sentiment analysis methods. CO4: Implement basic NLP applications using Python and NLTK.									
Prerequisite	Basic knowledge of Python									
UNIT I	Introduction to NLP: Introduction to Natural Language Processing , Applications and Use Cases of NLP , Components of NLP, Steps in NLP , Words and their Internal Structure ,Lexemes and Morphemes, Inflectional and Derivational Morphology, Morphological Processing, Language Typology, Morphological Typology.									15
UNIT II	Syntax Analysis: Parsing Natural Language , Treebanks and Data-Driven Approaches, Representation of Syntactic Structure ,Dependency Graphs ,Phrase Structure Trees , Shift Reduce Parsing , Chart Parsing ,CYK Algorithm , Hypergraphs ,Ambiguity in Parsing ,Probabilistic Context Free Grammar (PCFG) , Generative Models ,Discriminative Models.									15
UNIT III	Semantic Analysis and Sentiment Processing: Introduction to Semantic Analysis, Lexical Semantics ,Supervised Approaches , Dictionary-Based Approaches ,Unsupervised Approaches , Compositional Semantics ,Semantic Role Labeling, Semantic Parsing ,Emotion and Sentiment Analysis , Affect Lexicons ,Supervised and Semi-supervised Learning of Word Sentiment, Basics of Phonetics , Word Senses and Semantic Relationships , WordNet , Word Sense Disambiguation (Lesk Algorithm, Walker's Algorithm) , Coreference Resolution (Anaphora and Cataphora).									15

UNIT IV	NLP using Python and NLTK Python: Introduction to Python for Data Analysis : NumPy ,Pandas , Matplotlib , Data Cleaning and Visualization , Introduction to Machine Learning (basic concepts) , Introduction to Apache Spark , Spark Architecture Overview , PySpark Basics ,Spark RDD – Transformations and Actions , DataFrames and Spark SQL ,Basic MLlib Algorithms (classification/regression examples) ,Model Evaluation , Applications of Big Data Analytics.	15
Reference Books	1. Handbook of Natural Language Processing Indurkha, N., &Damerau, F. J. CRC Press Taylor and Francis Group 2nd 2010. 2. Speech and Language Processing Martin, J. H., & Jurafsky, D. Pearson Education India 2nd 2013. 3. Foundations of Statistical Natural Language Processing Manning, Christopher and Heinrich, Schutze MIT Press 1st 1997 4. Natural Language Processing With Python Steven Bird, Edward Loper O'Reilly Media 2nd 2016	
Web Resources	1. Stanford NLP Group – Resources, Parsing & NLP Tools https://nlp.stanford.edu/ 2. NLTK Project – Official Documentation (Parsing, Semantics, Sentiment, WSD) https://www.nltk.org/ 3. Universal Dependencies – Treebanks & Dependency Grammar Resourceshttps://universaldependencies.org/ 4. Python Official Documentation – Python Programming Reference https://docs.python.org/3/ 5. Hugging Face – NLP Models, Transformers & Sentiment Analysis https://huggingface.co/docs 6. Industrial NLP Library Documentation https://spacy.io/usage 7. SWAYAM – Natural Language Processing Courses https://nptel.ac.in/courses	

Professional Elective (Full Stack Devp.)

Course Code	Professional Elective (Full Stack Devp.)
DSE301	Web Programming –III Advance Java
DSE302	Web Programming –IV Dot Net Technology
DSE303	Web Programming –V Emerging Web Technology

DSE301 Professional Elective – III	Advance Java				
Course Outcomes	CO1. Understand the concept of JDBC, Servlet and its life cycle. CO2. Design and develop JSP applications using JSP tags. CO3. Develop MVC based Java Applications using Spring and Struts. CO4. Apply Java Technology to develop the Small Applications using JSF and Hibernate.				
Prerequisite:	Basic understanding of programming concepts				
Total Hours of Teaching : 60	Lecture	Tutorial	Practical	Total Per Week	Credit Points:-5
	3	0	4	7	
Total Marks: 125	External Exam Theory: 60		Internal : 15		
	Practical Exam:50				
Syllabus Content:					
Unit I JDBC and Servlets JDBC: Driver, Database Connection Steps, DriverManager Class, Statement Interface, ResultSet Interface, Transactions, Batch Processing, RowSet Interface, CRUD operations Servlets: Using IDE’S NetBeans/Eclipse for Java Development, Servlet Overview Life cycle of Servlet, Handling Web Form Data in Servlets., Dynamically including Content in Servlets, Session Tracking – Cookies, Session ID, Hidden Form Field, URL Rewriting,, HTTP Session, Servlet Filters, Accessing Databases using Servlets.					15 Hours
Unit II JSP Basics of JSP, Life cycle of JSP, JSP API,JSP in Eclipse and other IDE's, Life cycle of JSP Page. Scripting elements, scriptlet tag, expression tag, declaration tag, Implicit Objects, Directive Elements, Action Elements , MVC in JSP, Custom tags					15 Hours
Unit III Spring , Struts and Gwt Spring: Spring Framework, IoC container, Dependency Injection,					15 Hours

Spring AOP, Building ,Building simple Spring Applications, Struts: Struts Features, Introduction to Struts, Overview of Model, View, Controller (MVC) design pattern, Struts Framework applies MVC, Request handling in Struts, Struts configuration files, Simple Strut Application, GWT: Overview of GWT, Components of GWT, Introduction to GWT applications.	
Unit IV JSF and Hibernate JSF: JSF Features, JSF for Web Application, JSF components, JSF Tags, Life Cycle &Architecture, JSF Renderers, JSF HTML Tag Reference, Creating JSF applications. Hibernate: Introduction to O-R Mapping, Hibernate Basics, Hibernate Architecture, Hibernate Configurations, POJO (Plain Old Java Classes) classes and O/R Mapping ,Creating Hibernate Applications.	15 Hours
Reference Books/ Text Books: 1.JDBC, Servlets, and JSP Black Book, , K. Santosh Kumar, Dreamtech Press India Pvt. Ltd, 2. Beginning Java 8 APIs, Extensions and Libraries: Swing, JavaFX, JavaScript, JDBC and Network Programming APIs, 1st Edition, KishoriSharan, Apress 3. Enterprise JavaBeans, Fourth Edition, O'Reilly, 2004 4. Beginning JSP, JSF and Tomcat web development, GiulioZambon, Apress, 2007 5. Beginning Hibernate 3rd Edition, Joseph Ottinger, Jeff Linwood, Apress 6. Spring in Action 3rd edition , Craig walls, Manning Publication 7. Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication 8. Java Server Faces in Action, Kito D. Mann, Manning Publication 9. JSF2.0 CookBook, Anghel Leonard, PACKT publication	
Advance Java Practical Lab	
1. Implement TCP Server for transferring files using Socket and Server Socket. 2. Implement cookies to store first name and last name using Java server pages. 3. Implement the shopping cart for users for the online shopping. Apply the concept of session. 4. Implement student registration form with enrollment number, first name, last name, semester, contact number. Store the details in database. Also implement search, delete and modify facility for student records.	

5. Write a Servlet program to print system date and time. 6. Design a web page that takes the Username from user and if it is a valid username prints “Welcome Username”. Use JSF to implement. 7. Write Hibernate application to store customer records and retrieve the customer record including name, contact number, address. 8. Write an application to keep record and retrieve record of student. The record includes student id, enrollment number, semester, SPI. Use MVC architectures.	
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DSE302	Web Programming –IV Dot Net Technology				
Course Outcomes	By the end of this course, students should be able to: CO1. To learn fundamentals of. net framework CO2. To enrich knowledge about Windows Forms, Controls and ASP.NET based applications. CO3. To acquire skills to create web-based applications and Reports using.net technologies				
Prerequisite :	Basic understanding of programming concepts				
Total Hours of Teaching : 60	Lecture 3	Tutorial 0	Practical 4	Total Per Week 7	Credit Points:-5
Total Marks: 125	External Exam Theory: 60		Internal : 15		
	Practical Exam:50				
Syllabus Content:					
Unit I – Introduction to .NET & Web Basics • Introduction to Web Technologies (HTTP, Web Servers, Browsers) • Overview of .NET Framework / .NET Core • CLR (Common Language Runtime) • Introduction to C# programming • ASP.NET architecture • Web Forms vs MVC (basic concept)					15 Hours
Unit II – ASP.NET Web Forms & Controls • Web Forms architecture • Server controls (Label, TextBox, Button, DropDownList) • Validation controls • State management (ViewState, Session, Cookies) • Master Pages • Event handling					15 Hours
Unit III – Database Connectivity • Introduction to ADO.NET • Connection, Command, DataReader • DataAdapter and DataSet • CRUD operations (Create, Read, Update, Delete)					15 Hours

• Connecting ASP.NET with SQL Server • Grid View control	
Unit IV – Advanced Concepts & Deployment • ASP.NET MVC basics • Authentication and Authorization • Exception handling • Web services (Introduction) • Deployment of web applications • Introduction to .NET Core	15 Hours
References	
Web Programming –IV Dot Net Technology Practical	
1. Write a C# program to demonstrate basic input and output operations. 2. Write a C# program to perform arithmetic operations using operators. 3. Write a C# program using conditional statements (if-else, switch). 4. Write a C# program using loops (for, while, do-while) 5. Create a simple ASP.NET Web Form and display “Hello World”. 6. Create a Web Form using server controls (Label, TextBox, Button). 7. Create a Web Form to accept user input and display it on button click (Event handling). 8. Create a Web Form using DropDownList control and display selected value. 9. Create a form using validation controls (RequiredFieldValidator, RangeValidator). 10. Demonstrate state management using ViewState. 11. Create and use Master Page in ASP.NET Web Forms 12. Create a database and table in Microsoft SQL Server. 13. Write a program to connect ASP.NET with SQL Server using ADO.NET. 14. Perform Insert operation (Create) using ASP.NET form. 15. Perform Select operation (Read) and display records using GridView. 16. Perform Update ,delete operation using ASP.NET. 17. Use DataReader to fetch and display data. 18. Use DataAdapter and DataSet to retrieve data.	

19. Create a simple ASP.NET MVC application. 20. Demonstrate authentication using login form. 21. Write a program to demonstrate exception handling (try-catch).	
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Course Code	Course Title	L	T	P	Credit	Theory			Practical	
DSE 303	Emerging Web Technology	3	-	4	5	Int	Uni	Total	Int	Uni
						15	60	75	--	50
Course Outcomes (COs):	CO1: Develop dynamic Single Page Applications using AngularJS. CO2: Build server-side applications using Node.js and asynchronous programming concepts. CO3: Design and implement RESTful APIs with Express.js and MongoDB CO4: Implement authentication, authorization, and deploy full-stack web applications. +									
Prerequisite	Basic knowledge of HTML, CSS, JavaScript, and fundamental web development concepts.									
UNIT I	Frontend Development : Introduction to AngularJS,Features and advantages,Setting up development environment,AngularJS application structure and file organization,Creating first AngularJS application,Expressions and data binding,One-way and two-way data binding,Directives (ng-model, ng-repeat, ng-if),Creating custom directives,Controllers and Scope,Modules and Dependency Injection,Filters and custom filters. SPA Development:Routing and navigation,Creating Single Page Applications (SPA),Nested views and routing,Form validation.								15	
UNIT II	Backend Development using Node.js: Introduction to Server-Side JavaScript : Introduction to Node.js,Architecture of Node.js applications,Advantages of Node.js,Synchronous vs Asynchronous programming,Callback functions,Promises and async/await. Node.js Modules: Functions and Buffer,Module system,Core Modules and Local Modules,module.exports,NPM (Node Package Manager),Installing packages locally and globally Managing dependencies in package.json.								15	

	File System & Events: fs.readFile,Writing files (sync & async),Opening and deleting files,Event Emitters,Binding functions to events.	
UNIT III	Database & REST API Development : Express Framework: Introduction to Express.js,Routing,Middleware,Designing REST APIs RESTful API Design: REST principles,HTTP methods (GET, POST, PUT, DELETE),Status codes,JSON data handling. MongoDB Integration: Introduction to MongoDB,Connecting MongoDB with Node.js,Designing schema using Mongoose,CRUD operations,Updating and deleting records.	15
UNIT IV	Authentication & Deployment: Authentication: Introduction to JWT,JSON Web Token Authentication in Node.js,Creating Authentication Application,,Login and Registration APIs,Protecting routes using middleware. Security Concepts: Password hashing (bcrypt concept),Role-based access. Deployment: Preparing application for production,Environment variables,Deployment strategies,Deployment using:Render,Vercel.	15
Reference Books	1. Pro AngularJS – Adam Freeman, Apress Publication. 2. Node.js Web Development – David Herron, Packt Publishing. 3. Beginning Node.js, Express & MongoDB Development – Greg Lim, Independently Published. 4. Node.js Design Patterns – Mario Casciaro & Luciano Mammino, Packt Publishing. 5. RESTful Web APIs – Leonard Richardson & Mike Amundsen, O’Reilly Media. 6. Web Security for Developers – Malcolm McDonald, No Starch Press.	
Web Resources	1) AngularJS Official Docs – https://code.angularjs.org 2) Node.js Official Docs – https://nodejs.org	

	3) Express.js Documentation – https://expressjs.com 4) MongoDB Documentation – https://mongodb.com/docs 5) JWT – https://jwt.io 6) Render / Vercel Deployment Docs	
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Emerging Web Technology Lab

1. Downloading and Installing Angular-Js
2. Develop an AngularJS program that allows the user to enter their first name and last name and display their full name using two-way data binding.
3. Develop an AngularJS application that displays a list of shopping items. Allow users to add and remove items from the list using directives and controllers.
4. Develop an AngularJS application that performs basic arithmetic operations (addition, subtraction, multiplication, division) based on user input.
5. Develop an AngularJS application that calculates factorial and square of a number based on user input.
6. Develop an AngularJS application that displays details of students and their CGPA. Allow users to view the total number of students. Note: Student details may be predefined in the program.
7. Develop an AngularJS to-do list application that allows users to add, edit, and delete tasks. Note: Default tasks may be included in the program.
8. Develop an AngularJS Single Page Application (SPA) using routing with multiple views (Home, About, Contact) and implement form validation.
9. Develop a Node.js program to create a simple HTTP server that handles GET and POST requests and returns JSON response.
10. Develop a Node.js program to demonstrate asynchronous programming using callback functions, Promises, and async/await.
11. Develop a Node.js application using modules and npm. Create a custom module and export functions using module. exports.
12. Develop an Express.js application to create RESTful API endpoints (GET, POST, PUT, DELETE) for managing user data.
13. Develop a Node.js and MongoDB application to perform CRUD operations using Mongoose.
14. Develop a Node.js application to implement user registration and login using JSON Web

Token (JWT) authentication.

15. Develop a Node.js application to implement password hashing using bcrypt and role-based authorization to protect routes.
16. Develop a full-stack application by integrating AngularJS frontend with Node.js, Express, and MongoDB backend. Implement CRUD operations with authentication and deploy the application on Render or Vercel

Course Code	Course Title	L	T	P	Credit	Theory			Practical
SEC301	Quantitative Techniques	1	2	0	3	Int	Ext	Total	---
						15	60	75	
Course Outcomes	CO1: To understand fundamental quantitative aptitude skills.								
	CO2: To understand fundamental logical reasoning skills.								
	CO3: To solve questions in various competitive exams, entrance tests and interview rounds using quantitative and logical reasoning.								
Unit I	Quantitative Aptitude : Arithmetic : Percentages, Profit & Loss, Simple & Compound Interest, Ratio & Proportion, Averages, Mixtures & Alligations, Time & Work, Pipes & Cisterns, Time, Speed & Distance (including Boats & Streams, Trains). Algebra: Quadratic Equations, Linear Equations, Logarithms, Polynomials, Inequalities, Progressions (AP, GP, HP) Number System: LCM & HCF, Divisibility Rules, Fractions, Decimals, Surds & Indices, Remainder Theorem. Geometry & Mensuration: Triangles, Circles, Polygons, Lines & Angles, Area, Perimeter, Volume, Surface Area.. Miscellaneous: Simplification & Approximation, Number Series, Clock & Calendar Problems, Data Sufficiency.								15 hrs.

Unit II	Verbal Reasoning Syllabus (Words/Text-Based) Analogy: Semantic, Symbolic/Number, and Figural Analogy. Classification: Semantic, Symbolic/Number, and Figural Classification. Coding-Decoding: Letter, Number, and Symbol Coding. Series: Number Series, Alphabetical Series Logical Reasoning: Syllogisms, Statement-Conclusion, Assertion-Reasoning. Relationships: Blood Relations, Directions, Ranking, and Time Sequences. Word Formulation: Dictionary-based words, Jumbled Words, and Word Building. Data Sufficiency & Decision Making: Analyzing text to solve problems.	15 hrs.
Unit III	Non-Verbal Reasoning Syllabus (Image/Pattern-Based): Spatial Orientation/Visualization: Understanding 3D objects in 2D space. Series & Analogy: Finding patterns in figures (Figural Series). Mirror/Water Images: Detecting, recognizing, and interpreting reflections. Embedded Figures: Locating hidden figures within larger diagrams. Figure Classification: Identifying the odd figure out. Dice & Cube Problems: Determining views of dice.	15 hrs.
Reference Books	1. R.S. Aggarwal, Quantitative Aptitude, S. Chand & Company, New Delhi, 2012 2. Govind Prasad Singh and Rakesh Kumar, Text Book of Quickest Mathematics (for all Competitive Examinations), Kiran Prakashan, 2012. 3.R.S. Aggarwal, Objective Arithmetic, S. Chand & Company, New Delhi, 2005. 4.Dr. Lal, Jain, Dr. K. C. Vashistha, "U.G.C.- NET/JRF/SET Teaching &	

	Research Aptitude”, Upkar Prakashan, 2010. 5.“UGC NET/SLET: Teaching & Research Aptitude”, Bright Publications, 2010 on, and effective communication in academic contexts.	
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SEC302	Internship / Capstone Project	Credit-4	Total Marks:100
		External:80	Internal:20
Course outcomes	1. Apply structured methodologies to design, code, test, and deploy a fully functional software product. 2. Construct and manage databases using SQL queries, ER modelling, and normalization techniques to meet specific project needs. 3. Identify, analyse, and research new technologies, frameworks, or tools to solve specific project challenges. 4. Prepare detailed technical reports, requirement specifications, user manuals, and project documentation.		
Guidelines for Internship/ Capstone Project	Internship / Capstone Project Purpose • Apply theoretical knowledge to a real-world IT problem • Gain hands-on experience in software development / IT operations • Develop skills in analysis, design, implementation, and documentation Duration (Typical) • Project: 3–6 months (Fifth semester) Types Allowed for BCA Capstone Project/ Internship • Web Application (PHP, Java, Python, MERN, Django, etc.) • Mobile Application (Android / Flutter) • Desktop Application (Java, .NET, Python) • Data Analytics / ML (basic level) • Cloud-based / Cybersecurity (basic)		

- Testing / QA

Standard Capstone Project Report Format

A. Front Pages

1. Cover Page

- Project Title
- Student Name
- Roll Number / Registration Number
- Course: BCA
- Guide Name
- College & University Name
- Academic Year

2. Certificate

- Principal/ Guide/ Examiner / HOD / Company (if internship-based)

3. Declaration

- Original work statement (signed by student)

4. Acknowledgement

B. Main Chapters

Chapter 1: Introduction

- Background of the problem
- Existing system and its Limitations
- Objective of the project
- Scope of the project

Chapter 2: System Study / Proposed System

- Software Development Model
- Feasibility study

Chapter 3: Requirement Analysis

- Functional Requirements
- Non-Functional Requirements
- Hardware & Software Requirements

Chapter 4: System Design

- System Architecture Diagram / DFD
- UML Diagrams (if applicable)
 - Use Case Diagram

- Class Diagram
- Sequence Diagram
- Database Design (ER Diagram)

Chapter 5: Implementation

- Module-wise Screenshots of Input & Output design
- Reports
- Code snippets (important parts only)

Chapter 6: Testing

- Testing methodology

Chapter 7: Conclusion & Future Scope

- Summary of work
- Limitations
- Learning outcomes
- Possible enhancements

C. End Sections

- **References** (IEEE / APA format)
- **Appendix**
 - Source code (optional)
 - Internship Completion Certificate (if applicable)
 - Academic Guide and Student Meet Record

SEC303	Major Project	Credit-4	Total Marks:100
		External:80	Internal:20
Course outcomes	• Demonstrate practical application of programming and software development skills • Integrate knowledge from subjects like DBMS, Networking, Software Engineering, Web Development, etc. • Develop problem-solving and system design abilities • Prepare students for industry-level development practices		
Project Type & Scope	☒ Acceptable Project Types • Web-based applications (E-commerce, ERP, LMS, CRM, etc.) • Mobile applications (Android/iOS) • Desktop applications • Data analytics or AI/ML-based systems • IoT-based systems (if hardware knowledge available) • Cloud-based solutions ✗Not Acceptable • Mini projects reused from 1st/2nd year • Purely theoretical research without implementation • Copied or downloaded source code projects • Downloaded Projects From chatgpt or other AI tools		
Team Structure	• Usually 2–4 students per group • Each member must contribute significantly • Roles can be divided as: ○ Frontend Developer ○ Backend Developer ○ Database Manager ○ Documentation & Testing Lead		
Project Phases	Phase 1: Project Proposal Include:		

- Title
 - Problem Statement
 - Objectives
 - Proposed Technology Stack
 - System Overview
 - Feasibility Study
 - Timeline (Gantt Chart)
-

Phase 2: Requirement Analysis

- Functional Requirements
 - Non-functional Requirements
 - User Requirements
 - System Constraints
-

Phase 3: System Design

- DFD (Data Flow Diagram)
 - ER Diagram
 - Use Case Diagram (if applicable)
 - Database Schema Design
 - Architecture Diagram
-

Phase 4: Development

- Frontend Development
 - Backend Development
 - Database Integration
 - API Integration (if required)
-

Phase 5: Testing

- Unit Testing
 - Integration Testing
 - System Testing
 - Test Cases Documentation
-

Phase 6: Deployment

- Localhost / Live Hosting (optional but recommended)
 - User Manual Preparation
-

Project Documentation Format

A. Front Pages

1. **Cover Page**
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 - Guide Name
 - College & University Name
 - Academic Year
 2. **Certificate**
 - Principal/ Guide/ Examiner / HOD / Company (if internship-based)
 3. **Declaration**
 - Original work statement (signed by student)
 4. **Acknowledgement**
-

B. Main Chapters

Chapter 1: Introduction

- Background of the problem
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- Scope of the project

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- UML Diagrams (if applicable)
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 - Class Diagram
 - Sequence Diagram
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Chapter 5: Implementation

- Module-wise Screenshots of Input & Output design
- Reports
- Code snippets (important parts only)

Chapter 6: Testing

- Testing methodology

Chapter 7: Conclusion & Future Scope

- Conclusion
- Limitations
- Possible enhancements

C. End Sections

- **References** (IEEE / APA format)
- **Appendix**
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BCA III - SEMESTER VI

S. No.	Course Code	Course Title	L	T	P	Credit	Theory			Practical
							Internal	External	Total	
1	CC301	Generative AI	2	0	4	4	10	40	50	50
2	CC302	Entrepreneurship and Startup Ecosystem	1	1	0	2	10	40	50	
3	DSE304*	3.4 Big Data Analytics (Data Science) 3.4 Deep Learning for Computer Vision AI &ML) 3.4Web Content Management (Full Stack Devp.)	3	0	4	5	15	60	75	50
4	DSE305*	3.5Exploratory Data Analysis (Data Science) 3.5 Predictive Analysis(AI &ML) 3.5 Web Application Security (Full Stack Devp.)	3	0	4	5	15	60	75	50
5	AEC301	Soft Skills	2	0	0	2	10	40	50	
6	SEC304	Major Project [Initiated in 5th Semester]	0	0	8	4	20	80	100	
TOTAL						22			400	150
Total Marks										550

Course Code	Cours Title	L	T	P	Credit	Theory			Practical	
						Int	Uni	Total	Int	Uni
CC301	Generative AI	2	0	4	4	Int	Uni	Total	Int	Uni
						10	40	50	--	50
Course Outcomes(COs):	CO1: To identify fundamental AI techniques required for Generative AI. CO2: Analyze major generative AI techniquesfor analyzing and creating contents CO3: Apply generative AI techniques for processing and creating contents.									
Prerequisite									Hrs.	
UNITI	Foundations of Generative AI Supervised, Unsupervised learning, neural network fundamentals, loss functions, and optimization, LSTM, History of NLP, Working of NLP								5	
UNITII	Generative AI models Variational Autoencoders (VAEs), Autoencoders, Generative Adversarial Networks, GAN Models, Transformers, Recurrent Neural Networks (RNNs), Large Language Models: BERT models, GPT models, Post ChatGPT models, Prompt engineering, Role of prompts in guiding AI models.								15	
UNITIII	Applications of Generative AI Content Generation, Image Generation, Creative Writing, Data Analysis and Visualization, Applications of Analytics in real world: Retail Analytics, HR Analytics, Sports Analytic create course objectives for above syllabus unit wise.								10	
TextBooks/ReferenceBooks	1. Deep Learning-Authors: Ian Goodfellow, Yoshua Bengio, Aaron Courville’Edition: 1st Edition,Publisher: MIT Press,Year: 2016 2. Pattern Recognition and Machine Learning-Author: Christopher M. Bishop,Edition: 1st Edition,Publisher: Springer,Year: 2006 3. Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play Author: David Foster,Edition: 2nd Edition,Publisher: O'Reilly Media,Year: 2022 4. Generative Adversarial Networks: Projects for Image Generation and Data									

	Augmentation-Author: Jason Brownlee, Edition: 1st Edition, Publisher: Packt Publishing Year: 2019 5. Transformers for Natural Language Processing-, Author: Denis Rothman, Edition: 2nd Edition, Publisher: Packt Publishing, Year: 2021 6. Natural Language Processing with Python-Authors: Steven Bird, Ewan Klein, Edward Loper, Edition: 1st Edition, Publisher: O'Reilly Media, Year: 2009 7. Speech and Language Processing-Authors: Daniel Jurafsky, James H. Martin, Edition: 3rd Edition (Draft), Publisher: Prentice Hall, Year: 2023 8. Generative AI with Python and TensorFlow 2-Author: Joseph Babcock, Edition: 1st Edition, Publisher: Packt Publishing, Year: 2021
Lab Work	1. Program to Convert all letters of the string to one case(either lower or upper case), 2. Program to remove punctuations, other formalities of grammar, 3. Program to remove white spaces. 4. Program to Implement the Bag of Words (BoW) Model 5. Program for N-Gram Language Modelling with NLTK 6. Program to implement TF-IDF (Term Frequency-Inverse Document Frequency) 7. Program for Machine Translation with Transformer in Python 8. Program for Text Classification using scikit-learn in NLP 9. Program for Sentiment Analysis with an Recurrent Neural Networks (RNN) 10. Program to build a Rule-Based Chatbot with Natural Language Processing

Course Code	Course Title	L	T	P	Credit	Theory			Practical
CC302	Entrepreneurship and Startup Ecosystem	1	1	0	2	Int 10	Ext 40	Total 50	---
Course Outcomes	CO1:<i>Identify and analyze</i> entrepreneurial opportunities and <i>develop</i> basic technology-based startup models using appropriate tools. CO2:<i>Explain and apply</i> concepts of startup ecosystem, funding mechanisms, legal frameworks, and digital technologies in startup development.								
Unit I	Fundamentals of Entrepreneurship & Startup Basics Introduction to Entrepreneurship – Meaning, Types, Role in Economic Development, Entrepreneurial Mindset – Innovation, Creativity, Leadership & Risk Management, Idea Generation & Opportunity Identification – Design Thinking, SWOT Analysis, Startup Concepts – Startup Lifecycle, Lean Startup, Business Model Canvas, Technology-Based Entrepreneurship – IT Startups, SaaS, Mobile/Web App Businesses, MVP Development & Importance of UI/UX, Product vs Service-Based Tech Startups								15 hrs.
Unit II	Startup Ecosystem, Funding & Digital Business Startup Ecosystem – Role of Government, Incubators & Accelerators, Startup India Initiative & Institutional Support, Funding Sources – Bootstrapping, Angel Investors, Venture Capital, Crowd funding, Legal & IPR Basics – Company Registration, Patent, Trademark, Copyright, Digital Business Models – E-Commerce, Digital Marketing, SEO, Cloud Computing & Cyber security for Startups, Emerging Tech Trends – AI, FinTech, EdTech, Gig Economy								15 hrs.
Reference Books	1. Entrepreneurship Development and Small Business Enterprises – Poornima M. Charantimath, Pearson Education. 2. Entrepreneurship – Robert D. Hisrich, Michael Peters & Dean Shepherd, McGraw Hill Education. 3. The Lean Startup – Eric Ries, Crown Business. 4. Zero to One – Peter Thiel with Blake Masters. 5. The Startup Owner's Manual – Steve Blank & Bob Dorf. 6. Government of India – Startup India Official Learning Resources & Portal.								

Professional Elective (Data Science)

Course Code	Professional Elective (Data Science)
DSE304	Big Data Analytics
DSE305	Exploratory Data Analysis

Course Code	Course Title	L	T	P	Credit	Theory			Practical	
DSE 304	Big Data Analytics	3	-	4	5	Int	Uni	Total	Int	Uni
						15	60	75	--	50
Course Outcomes (COs):	CO1: Understand Core Concepts of Big Data. CO2: Describe and implement Hadoop ecosystem tools (HDFS, MapReduce, Hive, Pig). CO3: Compare NoSQL models and perform basic operations using Cassandra. CO4: Apply Python and Apache Spark tools (NumPy, Pandas, PySpark, MLlib) for Big Data analytics and basic machine learning tasks.									
Prerequisite	Basic knowledge of Python									
UNIT I	Understanding Big Data: Introduction to Big Data: Definition and Need of Big Data, Sources of Big Data, Characteristics (4Vs), Evolution of Big Data, Structure of Big Data (Structured, Semi-structured, Unstructured), Big Data Life Cycle – Batch vs Real-Time processing, Data Warehouse Vs Big Data, Applications of Big Data, Benefits, Challenges: Privacy, Security, Compliance and Visualization.								15	
UNIT II	Overview of Hadoop: Introduction to Hadoop – Hadoop Architecture, Hadoop Daemons Features of Hadoop, Introduction to HDFS, HDFS Architecture, HDFS Operations, Introduction to MapReduce –,MapReduce Architecture, Simple MapReduce Examples , Limitations of HDFS Overview of Hadoop Ecosystem , Introduction to HBase , Introduction to Pig , Introduction to Hive , Basic HiveQL (DDL & simple queries).								15	

UNIT III	Introduction to NoSQL : Need for NoSQL , Types of NoSQL Databases , Key-Value Model , Document Model , Column Family Model ,Graph Databases, Schema-less Databases, Basic Distribution Concepts ,Introduction to CAP Theorem , Consistency Models, Introduction to Cassandra , Cassandra Data Model – Basic CRUD Operations ,Simple Examples.	15
UNIT IV	Big Data Analytics with Python: Introduction to Python for Data Analysis : NumPy ,Pandas , Matplotlib , Data Cleaning and Visualization , Introduction to Machine Learning (basic concepts) , Introduction to Apache Spark , Spark Architecture Overview , PySpark Basics ,Spark RDD – Transformations and Actions , DataFrames and Spark SQL ,Basic MLlib Algorithms (classification/regression examples) ,Model Evaluation , Applications of Big Data Analytics.	15
Reference Books	1“Professional Hadoop Solutions”, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich Wiley, ISBN: 9788126551071, 2015. 2. “Understanding Big data”, Chris Eaton, Dirkderoos. McGraw Hill, 2012. 3. BIG Data and Analytics, Sima Acharya, Subhashini Chhellappan, Willey 4. Tom White, Hadoop: The Definitive Guide, O’Reilly, 3rd edition 5. “Oracle Big Data Handbook”, Tom Plunkett, Brian Macdonald ,Oracle Press, 2014. 6. Hadoop in Practice, Alex Holmes, manning 1st edition. 7. “Oracle Big Data Handbook”, Tom Plunkett, Brian Macdonald ,Oracle Press, 2014. 8. “Big Data and Business analytics”, JyLiebowitz, CRC press, 2013	
Web Resources	1. https://www.ibm.com/topics/big-data 2. https://learn.microsoft.com/en-us/azure/architecture/data-guide/ 3. NPTEL – Big Data Analytics Courses https://nptel.ac.in/courses 4. Apache Hadoop Official Documentation https://hadoop.apache.org/docs/ 5. MongoDB Documentation https://www.mongodb.com/docs/ 6. DataStax Cassandra Documentation	

	https://docs.datastax.com/ 7. Apache Spark Documentation https://spark.apache.org/docs/latest/	
Big Data Analytics Practical		
1. Install Hadoop and Understand Its Modes. Install Hadoop; understand Standalone and Pseudo-distributed modes; configure basic files and start/stop services. 2. HDFS File Operations. Create directories; upload, download, view and delete files using HDFS commands. 3. Matrix Multiplication using MapReduce. Write and run a simple Matrix Multiplication program using Hadoop MapReduce. 4. Word Count using MapReduce. Run the Word Count program to understand Map and Reduce phases. 5. Install and Configure Cassandra. Start Cassandra; open CQL shell; create a keyspace. 6. Cassandra CRUD Operations. Create tables; insert, select, update and delete records. 7. Composite Key and Collections in Cassandra. Create table with composite primary key; use LIST, SET or MAP data types. 8. Basic Distribution Concepts in Cassandra. Observe replication factor and simple consistency level commands. 9. Python Data Analysis. Use NumPy and Pandas to create arrays; load CSV file; filter and analyze data. 10. Data Visualization. Create Line, Bar, Pie and Histogram charts using Matplotlib. 11. PySpark RDD Operations. Create RDD; apply map and filter; use collect and count functions. 12. Spark DataFrame and MLlib. Load CSV into DataFrame; run simple queries; implement basic Linear Regression or Classification model.		

Course Code	Course Title	L	T	P	Cr	Theory			Pr.
						Int	Ext	Total	
DSE305*	Professional Elective – VII Exploratory Data Analysis	3	0	4	5	15	60	75	50
Exploratory Data Analysis									
Course Outcomes									
CO1: Create and manipulate NumPy arrays to perform data analysis									
CO2: Use Pandas methods to import, export, and preprocess data from various sources									
CO3: Perform basic data manipulation tasks, including data cleaning, filtering, sorting, merging on Pandas objects.									
CO4: Analyze and visualize data using grouping, aggregation operations and matplotlib function.									
Unit-1	Creating and Manipulating NumPy arrays: Creating arrays, indexing and slicing, mathematical operations with NumPy arrays.								15
Unit-2	Data Manipulation with Pandas: Series and DataFrame objects, importing and exporting data from various file formats into pandas DataFrame, Data selection and filtering- indexing, slicing, conditional filtering using Boolean indexing, Data Cleaning- handling missing data in Pandas. Data Manipulation-sorting, reshaping, merging								15
Unit-3	Grouping and Aggregation with Pandas: Grouping data using Pandas, applying aggregation functions such as sum, mean, count etc. to grouped data using pivot tables and cross tabulation for data summarization								15
Unit-4	Data Visualization with Matplotlib: Introduction to Matplotlib to plot data. Plots-Line plots, scatter plots and bar plots, Visualizing distributions using histogram and box plots. Customizing plot aesthetics and adding annotations								15
References	1. Python Data Science Handbook:Essential tools working with data, VanderPlas. J., O'Reilly Media Inc. 2nd Edition. 2. Python forData Analysis:Data Wrangling with Panda, Numpy & Jupyter, Wes McKinney, O'Reilly Media Inc. 2nd Edition, 2018 3. Hands-On Data Analysis with Pandas, Molin S., Packt Publishing, 2019 4. Data Visualization Essentials Guide: Become a Data Visualization Expert by Building Strong Proficiency in Pandas, Matplotlib, Seaborn, Plotly, Numpy and Bokeh, Rahman K., BPB 2021 5. Pandas for Everyone:Python Data Analysis, Chen D.Y., Pearson, 2018.								
	EXPLORATORY DATA ANALYSIS PRACTICAL LAB 1. Write a program using the NumPy library to Generate a 5 X 2 integer array with values ranging from 50 to 100. Reshape the resulting array to a size of 10 X 1. 2. Create a one dimensional array with values ranging from 50 to 100. Calculate various statistical measures such as minimum, maximum, mean, median,								

	standard deviation. 3. Create a one dimensional array with values ranging from 1 to 50. Calculate number of unique values, count of unique values, and the frequent value in the array. 4. Create 5 X 5 identity matrix where all the diagonal elements are set to the value 5. CASE1: Consider a dataset containing the heights (in centimeters) and weights(in kilograms) of 20 individuals. Perform various operations using the NumPy library and analyze the data. 5. Create separate NumPy array called “height” and “weight” with relevant values 6. Create a new NumPy array called “combined” by stacking the heights and weights arrays such that the shape of the resulting array is 20 X 2. 7. Calculate and print the mean height and weight of the individuals in the dataset. 8. Find and print the index of the shortest and tallest individuals in the dataset. 9. Sort the array based on height on the individuals 10. Retrieve records of the individuals having weight below 70 kg. CASE2: Consider the iris dataset from the Sklearn library to generate various visual representations of the data using the Matplotlib with proper legends and labels. 11. Create a scatter plot to visualize the relationship between petal length and petal width for different instances of iris flowers. 12. Generate histograms to display the data distribution of each of the attributes in the iris dataset. 13. Plot a pie chart to illustrate the frequency count of each flower type in the iris dataset. 14. Prepare dataset based on stock market and perform various operations and plot the graph 15. Prepare dataset based on banking data and perform various operations with graph.
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Professional Elective (AI &ML)

Course Code	Professional Elective (AI &ML)
DSE304	Deep Learning for Computer Vision
DSE305	Predictive Analysis

Course Code	Course Title	L	T	P	Cr	Theory			Pr.
DSE304	Deep Learning for Computer Vision					Int	Ext	Total	
		3	0	4	5	15	60	75	50
Course Outcomes- CO1: Implement basic image processing operations CO2: Understand the basic concept of deep learning CO3: Design and implement CNN and RNN and deep generative model CO4: Understand the role of deep learning in computer vision applications and design and implement deep generative model.									
Unit-1	Computer vision basics Introduction to image formation, capture and representation, linear filtering, correlation, convolution. Visual features and representation: Edge, blobs, corner detection, visual features extraction, bag-of-words, VLD, RANSAC, hough transform.								15
Unit-2	Introduction to Deep Learning Deep feed forward neural networks-gradient descent-back propagation and other differentiation algorithms-vanishing gradient problem-mitigation-rectifies linear unit (ReLU)-heuristics for avoiding bad local minima-heuristics for faster training-nesterov accelerated gradient descent-regularization for deep learning-dropout-adversarial training-optimization for training deep models.								15
Unit-3	Visualization and understanding CNN (and RNN) Convolutional neural networks (CNN): introduction to CNNs: evolution of CNN architectures: alexNet, ZFNet, VGG. Visualization of Kernels: Backprop-to-image/deconvolution methods: deep dream, hallucination,								15

	neural style transfer, CAM, Gard-CAM. (Introduction to RNN, R-CNN, Fast R-CNN, CNNs for segmentation: FCN, Segnet.	
Unit-4	Deep generative models Deep generative models: review of (popular) deep generative models: GANs, VAEs. Variants and applications of generative models in vision : Applications: image editing, inplaining, super resolution, 3D object generation, security. Recent trends: self-supervised learning, reinforcement learning in vision.	15
References	1. Deep Learning for Computer Vision, Rajalingappaa Shanmugamani, Packet Publishing, 2018 2. Computer Vision: A Modern approach, David Forsyth, Jean Ponce, 202 3. Modern computer Vision with PyTorch, V.Kishore Ayyadevara, Yeashwnth Reddy, 2020 4. Computer vision:algorithms and Applications, Richard Szeliski, 2010 Text books: 1. Deep Learning, Ian Goodfellow Yoshua Bengio Aaron Courville, MIT Press, 2017 2. Convolutional Neural Netoworks in Visual computing, Ragav Venkatesan, Baoxin Li, CRC Press, 2018 https://www.scribd.com/document/824194156/AL3502DEEP-LEARNING-FOR-VISIONL-T-P-C	
	PRACTICAL 1. Implementation of basic image processing operations including feature representation and feature extraction. 2. Implementation od simple neural network 3. Study of pre-trained deep neural network model for images 4. CNN for image classification 5. CNN for image segmentation 6. RNN for video processing 7. Implementation of deep generative model for image editing	

DSE305 Professional Elective – V	Predictive Analysis				
Prerequisite:	To Understand basics of Predictive Analysis.				
Total Hours of Teaching : 60	Lecture	Tutorial	Practical	Total Per Week	Credit Points:-5
	3	0	4	7	
Total Marks: 125	External Exam Theory: 60		Internal : 15		
	Practical Exam:50				
Course Outcomes At the end of course, the student will be able to: CO1:: describe logic building for problem solving CO2: identify the chi-squared statistical test CO3: apply three levels of model maintenance to prevent model deterioration. CO4:: appraise new independent variables for modeling purposes					
Syllabus Content:					
Unit I Introduction to Analytics: introduction to Analytics in decision making, game changers & innovators, predictive analytics, Simple Linear Regression (SLR): overview, introduction to regression, model development, model validation, demo using excel. Multiple Linear Regression (MLR): multiple linear regression, estimation of regression parameters, model diagnostics, derived & interaction variables.					15 Hours
Unit II Logistic Regression: discrete choice models, logistic regression, MLE estimation of parameters, logistic model interpretation.					15 Hours
Unit III Decision Trees and Unstructured Data Analysis: introduction to decision trees, chi-square automatic Interaction detectors(CHAID), classification and regression Tree (CART), analysis of unstructured data.					15 Hours

Unit IV Forecasting and Time Series Analysis: forecasting, time series analysis, exponential smoothing techniques, forecasting accuracy, moving average models.	15 Hours
Reference Books/Text Books: 1. MASTERING PREDICTIVE ANALYTICS WITH R by JAMES D. MILLER, RUI MIGUEL FORTE, PACKT PUBLISHING. 2. MODELING TECHNIQUES IN PREDICTIVE ANALYTICS WITH PYTHON AND R: A GUIDE TODATA SCIENCE by THOMAS W MILLER, PEARSON. 3. MARKETING DATA SCIENCE: MODELING TECHNIQUES IN PREDICTIVE ANALYTICS WITH R AND PYTHON by THOMAS W MILLER, PEARSON.	
Predictive Analysis Lab	
List of Practical's / Experiments: 1. Demonstration to implement analytics. 2. Demonstration to implement simple linear regression. 3. Demonstration to implement multiple linear regression 4. Demonstration to implement linear regression. 5. Demonstration to implement chi-square Test. 6. Demonstration to implement unstructured data analysis. 7. Demonstration to implement moving average models. 8. Demonstration to implement time series analysis. 9. Demonstration to implement forecasting. 10. Demonstration to implement exponential smoothing techniques	

Professional Elective (Full Stack Devp.)

Course Code	Professional Elective (Full Stack Devp.)
DSE304	Web Programming –VI Web Content Management
DSE305	Web Programming –VII Web Application Security

Web Programming – VI Web Content Management DSE 304*						
Course Outcomes:	After completing this course, students will be able to:-					
	CO1: Understand the concept, architecture, and importance of Web Content Management Systems (CMS).					
	CO2: Analyze different types of web content and manage content lifecycle efficiently.					
	CO3: Apply CMS tools for creating, editing, publishing, and maintaining web content.					
CO4: Implement content security, user roles, and performance optimization techniques.						
Total Hours of Teaching : 45		Lecture	Tutorial	Practical	Total Per Week	Credit Points : 05
		3	0	4	5	
Total Marks :75		External Exam Theory : 60				Internal : 15
Practical : 50		External Exam. Practical:50				
Syllabus Content:						
Unit: I	Basics of Web Content Management Concept of Web Content: Definition and meaning of web content, Types of web content – Text, Image, Audio, Video. Introduction to Web Content Management System (CMS): Definition, Need and Importance of CMS. Traditional Website vs CMS-based Website. Static Content vs Dynamic Content. Content Publishing Process and Web Content Lifecycle. Applications of Web Content Management: Educational Websites, E-Governance Portals, Business Websites, E-commerce Platforms.					15 Hours

Unit: II	CMS Architecture and Design CMS Architecture: Front-end and Back-end architecture. Core Components of CMS: Content Repository, Templates, Themes, Plugins, Database. User Roles and Permissions: Admin, Editor, Author, Subscriber. Workflow Management in CMS. Version Control and Content Revision. Practical Applications: Academic Website Content Management, Department Website Structure.	15 Hours
Unit: III	Open Source CMS Platforms Introduction to Open Source CMS. Overview of Popular CMS Platforms: • WordPress • Joomla • Drupal Installation and Basic Configuration of CMS. Introduction to Elementor Plugin: Role of Elementor as a page builder plugin in WordPress for creating and managing web content using drag-and-drop interface, Theme and Template Management, Plugins and Extensions Management, Media Management and Menu Creation, Comparison of CMS Platforms.	15 Hours
Unit: IV	CMS Security and Advanced Features CMS Security Issues and Threats, User Authentication and Authorization, Backup and Restore Techniques, Performance Optimization in CMS, SEO Basics in CMS, Website Maintenance and CMS Updates. Future Scope of Web Content Management: CMS in Digital Marketing, Enterprise Content Management, Headless CMS, Role of CMS in Modern Web Applications.	15 Hours
Text Books:	1. Web Content Management — Bob Boiko, Wiley Comprehensive guide to content management concepts and systems. 2. Web Content Management: Systems, Features, and Best Practices — Deane Barker, O'Reilly Practical understanding of CMS design and implementation. 3. WordPress for Beginners — Packt Publishing Hands-on guide for CMS-based website development. 4. Professional Content Management Systems — Wiley Industry-oriented CMS practices and applications.	
Reference Books:	1. Content Management Bible — Bob Boiko (Wiley) Authoritative reference on CMS concepts and enterprise solutions. 2. Managing Web Content — Deane Barker Focuses on practical content strategy and implementation. 3. Drupal, Joomla and WordPress — Packt Publishing Comparative study of popular open-source CMS platforms. 4. Headless CMS and Modern Web Development — Springer	

Web Content Management – Lab Problems

Open Source CMS Platforms

1. Install WordPress on a local server using XAMPP and explain the installation steps.
2. Install Joomla on a local server and describe its basic configuration process.
3. Create multiple pages and posts in WordPress and differentiate between them.
4. Create categories and assign posts to appropriate categories in WordPress.
5. Design and create a navigation menu using pages and categories in WordPress.
6. Install a free WordPress theme and customize its layout, header, and footer.
7. Explain the role of plugins in WordPress and install any two useful plugins.
8. Configure a plugin in WordPress and explain its functionality.
9. Upload and manage media files (images, audio, and video) using the CMS media library.
10. Explain the CMS architecture with reference to front-end and back-end components.
11. Compare WordPress, Joomla, and Drupal based on features and use cases.
12. Create a basic academic or departmental website using an open-source CMS.
13. To create a responsive web page using the Elementor plugin by applying various drag-and-drop controls in WordPress.

Security and Maintenance

1. Explain common security issues and threats in Content Management Systems.
2. Implement user authentication in WordPress and create different user roles.
3. Assign and manage user permissions for Admin, Editor, Author, and Subscriber roles.
4. Install and configure a security plugin to protect a WordPress website.
5. Explain the importance of regular website backups in CMS.
6. Perform website backup and restore operations using a WordPress plugin.
7. Explain performance optimization techniques used in CMS-based websites.
8. Optimize WordPress website speed using caching or performance plugins.
9. Explain the role of updates in CMS maintenance (core, themes, and plugins).
10. Apply basic SEO settings in WordPress using an SEO plugin.
11. Explain password security and access control mechanisms in CMS.
12. Describe best practices for maintaining a secure and optimized CMS website.

Tool Used:

CMS Platforms (WordPress / Joomla), XAMPP, PHP, MySQL

DSE305 Professional Elective – VII	Web Application Security				
Course Outcomes	At the end of course, the student will be able to: CO1: Understand the concepts of Web Security. CO2:Understand the Web architecture and applications CO 3:Understand how common mistakes can be bypassed and exploit the applications CO4:Identify common web application vulnerabilities and their mitigation				
Prerequisite:	To Understand basics of Security in web Applications.				
Total Hours of Teaching: 60	Lecture	Tutorial	Practical	Total Per Week	Credit Points:-5
	3	0	4	7	
Total Marks: 125	External Exam Theory: 60		Internal : 15		
	Practical Exam:50				
Syllabus Content:					
UNIT-I Introduction: Introduction to Web Security. Architecture of web security. Security issues related to web development. Basics of security Risk, Threats, Vulnerability And Security Attacks.					15 Hours
UNIT-II Web Application Security: Cross Site Scripting Attacks (XSS) and their types. Prevention and Mitigation of XSS attacks. Sanitizing and Validating User Input. Client side encoding, blacklisting and white listing inputs.					
UNIT-III Content Security and Credential Management: What is content security? Default directives and wild cards. Security threat due to inline code and eval() functions. Concept of nonce attribute and script hash. Broken Authentication and Session Management. Strength, use and storage of passwords.					15 Hours

Hashing. Password recovery.	
UNIT-IV Session Management: Session and types of session attacks. basics of Open Web Application Security Project (OWASP). Two factor Authentication(2FA) and OTP's.	15 Hours
Reference Books/Text Books: 1. Web Security: For Developers Real Threats, Practical Defense Copyright © 2020 by Malcolm McDonald. 2. Web Security, Privacy and Commerce Simson G Arfinkel, Gene Spafford, O'Reilly. 3. Web Security: Application Model & Same-Origin Policy, Matt Fredrikson, Carnegie Mellon University. 4. Web Security, Privacy, and Commerce by Simson Garfinkel with Gene Spafford, Nov 2001, 2nd Edition, O'reilly.	
Practical	
1.Demostration of cross side Scripting Attack (XSS). 2.Demostration of Reflected XSS. 3.Demostration of stored XSS. 4.Demostration of Dom Based XSS. 5.Demostration on session management. 6.Demostration on storageand recovery of password 7.Demostration of basics of Open Web Application Security Project (OWASP) 8.Demostration of 2 factor authentication. 9.Demostration of OTP. 10.Demonstration of types of session attacks.	

AEC301	Soft Skills	Credit-2	Total Marks:50
		External:40	Internal:10
Course Outcomes	Students of this course will be able to : 1. Comprehending the Value of a Professional Mindset 2. Enunciating and Adapting the Myriad Facets of One's Personality		
Unit 1	Soft Skills: Introduction and Importance; Difference between Hard skills and Soft Skills; Need of Soft Skills at the Workplace; Soft Skills for Professional Excellence: Communication Skills, Critical Thinking and Creative Problem Solving Skills, Conflict Management, Collaborative Team Work, Working on Attitude-aggressive, assertive and submissive, Leadership skill, Time Management; Stress Management, Resilience	15 Periods	
Unit 2	Personality Development: Introduction and Importance; Discovering Oneself, SWOT Analysis; Building Self- Esteem & Self-Confidence, Developing Interpersonal Relationships- ways to build Strong Inter Relationships; Work ethics –Good Manners and Etiquette- Professional Etiquette, Email Etiquette and Telephonic Etiquette, Dressing, Grooming and Body Language; Group Discussion- Expectations of the Panel, Do's & Don'ts in a Group Discussion; Resume Building; Facing The Personal Interview	15 Periods	
	Reference Books: 1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi. Tata McGraw-Hill 1988. 2. Heller, Robert. Effective leadership. Essential Manager series. Dk Publishing, 2002 3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003		

	4. Lucas, Stephen. Art of Public Speaking. New Delhi. Tata - Mc-Graw Hill. 2001 5. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004). 6 Dr.K.K. Ramachandran and Dr.K.K. Karthick, From Campus to Corporate, Macmillan Publishers India Limited, New Delhi,2010. 7. Smith, B . Body Language. Delhi: Rohan Book Company. 2004 8. Essentials of Business Communication - Rajendra Pal and J. S. Korlhalli - Sultan Chand & Sons, New Delhi. 9. Personality Development and Career management: By R.M.Onkar (S Chand Publications) 10. Managing Soft Skills For Personality Development---B.N. Ghosh--- McGraw Hill Education 11.Personality Development, Interpersonal Skills and Career Management---Dr. C.S.G. Krishnamacharyulu and Dr.Lalitha Ramakrishnan ---- Himalaya Publishing House Pvt.Ltd. 12.Personality Development –R.C. Bhatia--- Ane Books Pvt.Ltd. 13.Soft Skills: An Integrated Approach to Maximise Personality --- Gajendra Singh Chauhan---Wiley Publisher.	
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SEC304	Major Project	Credit-4	Total Marks:100
		External:80	Internal:20
Course outcomes	• Demonstrate practical application of programming and software development skills • Integrate knowledge from subjects like DBMS, Networking, Software Engineering, Web Development, etc. • Develop problem-solving and system design abilities		

	• Prepare students for industry-level development practices
Project Type & Scope	☒ Acceptable Project Types • Web-based applications (E-commerce, ERP, LMS, CRM, etc.) • Mobile applications (Android/iOS) • Desktop applications • Data analytics or AI/ML-based systems • IoT-based systems (if hardware knowledge available) • Cloud-based solutions ☒ Not Acceptable • Mini projects reused from 1st/2nd year • Purely theoretical research without implementation • Copied or downloaded source code projects • Downloaded Projects From chatgpt or other AI tools
Team Structure	• Usually 2–4 students per group • Each member must contribute significantly • Roles can be divided as: ◦ Frontend Developer ◦ Backend Developer ◦ Database Manager ◦ Documentation & Testing Lead
Project Phases	Phase 1: Project Proposal Include: • Title • Problem Statement • Objectives • Proposed Technology Stack • System Overview • Feasibility Study • Timeline (Gantt Chart) Phase 2: Requirement Analysis • Functional Requirements • Non-functional Requirements

- User Requirements
 - System Constraints
-

Phase 3: System Design

- DFD (Data Flow Diagram)
 - ER Diagram
 - Use Case Diagram (if applicable)
 - Database Schema Design
 - Architecture Diagram
-

Phase 4: Development

- Frontend Development
 - Backend Development
 - Database Integration
 - API Integration (if required)
-

Phase 5: Testing

- Unit Testing
 - Integration Testing
 - System Testing
 - Test Cases Documentation
-

Phase 6: Deployment

- Localhost / Live Hosting (optional but recommended)
 - User Manual Preparation
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Project Documentation Format

A. Front Pages

5. Cover Page

- Project Title
- Student Name
- Roll Number / Registration Number
- Course: BCA
- Guide Name
- College & University Name
- Academic Year

6. Certificate

- Principal/ Guide/ Examiner / HOD / Company (if internship-based)

7. Declaration

- Original work statement (signed by student)

8. Acknowledgement

B. Main Chapters

Chapter 1: Introduction

- Background of the problem
- Existing system and its Limitations
- Objective of the project
- Scope of the project

Chapter 2: System Study / Proposed System

- Software Development Model
- Feasibility study

Chapter 3: Requirement Analysis

- Functional Requirements
- Non-Functional Requirements
- Hardware & Software Requirements

Chapter 4: System Design

- System Architecture Diagram / DFD
- UML Diagrams (if applicable)
 - Use Case Diagram
 - Class Diagram
 - Sequence Diagram
- Database Design (ER Diagram)

Chapter 5: Implementation

- Module-wise Screenshots of Input & Output design
- Reports
- Code snippets (important parts only)

Chapter 6: Testing

- Testing methodology

Chapter 7: Conclusion & Future Scope

- Conclusion
 - Limitations
 - Possible enhancements
-

C. End Sections

- **References** (IEEE / APA format)
- **Appendix**
 - Source code (optional)
 - Internship Completion Certificate (if applicable)
 - Academic Guide and Student Meet Record