



TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

Wardha Road, Nagpur - 441108

Accredited with NAAC A+ Grade & NBA Accredited (EE, ME, CE & ECE)

Approved by AICTE, New Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)



Programme: Bachelor of Computer Applications

Second Year Bachelor of Computer Applications Semester—III

Sr. No.	Course category	Course Name	Course Code	Teaching Scheme (hrs.)		Total credits	% weightage			ESE Duration (hrs.)	TOTAL
				L	P		CT	CA	ESE		
1	DSC	Probability and Statistics	BCA12301	3	-	3	30	10	60	3	100
2	DSC	Data Base Management System	BCA12302	3	-	3	30	10	60	3	100
3	DSC	Data Base Management System Lab	BCA12303	-	4	2	-	25	25	2	50
4	SEC	Python Programming	BCA12304	2	-	2	14	6	30	2	50
5	SEC	Python Programming Lab	BCA12305	-	4	2	-	25	25	2	50
6	SEC	Software Engineering	BCA12306	3	-	3	30	10	60	3	100
7	DSE*	Professional Elective – I	BCA12307-09	2	-	2	14	6	30	2	50
8	DSE*	Professional Elective – I Lab	BCA12310-12	-	4	2	-	25	25	2	50
9	AEC	Liberal Learning Courses II - Lab	BCA12313	-	2	1	-	50	-	-	50
				13	14	20	118	167	315	19	600

Course Category	DSC	SEC	AEC	MDE	VAC	DSE
Credits	8	7	1	0	0	4
Cumulative Summary	28	18	7	2	4	4

PROGRESSIVE TOTAL CREDITS: 43+20=63

* To be selected from the Discipline-Specific Electives - Data Science / Artificial Intelligence and Machine Learning as indicated in the **Appendix – A**

				June, 2026	1.00	Applicable for AY 2026-27
Chairperson	Vice Principal / Director Academics	Director Administration	Principal	Date of Release	Version	



Program: Bachelor in Computer Application Semester – III

Teaching Scheme		BCA12301: Probability and Statistics	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3 Hrs.			ESE	60 Marks
		Total	100 Marks	

Course Objectives:

1.	This course aims to make the students trained to handle randomness scientifically using theory of probability.
2.	This course intends to make the students able to represent the statistical data in a systematic way and analyze it to draw meaningful information from them.
3.	Through plentiful examples and exercises, this course provides the students scope to apply probabilistic and statistical techniques to deal with the real-life problems.

Course Contents

Unit I	Introduction: Basic concepts of Statistics, qualitative and quantitative data, classification of data, construction of frequency distribution, diagrammatic representation of data. Measures of Central Tendency: Arithmetic mean, median and mode—their properties Measures of Dispersion: Range, mean deviation, quartile deviation, variance and standard deviation.
Unit II	Correlation: Definition, scatter diagram, types of correlation, measures—Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient. Regression: Linear regression-fitting by least square method and interpretation.
Unit III	Concepts of probability: Experiment and sample space, events and operations with events, probability of an event, basic probability rules, applications of probability rules, conditional probability. Random Variables: Discrete and continuous random variable, probability distribution of a random variable, probability mass function, probability density function, expectation and variance of a random variable.
Unit IV	Standard Probability Distributions: Binomial probability distribution, Poisson probability distribution, Normal probability distribution. Sampling Distribution: Concept of Population and Sample, parameter and statistic, sampling distribution of sample mean and sample proportion. Statistical Inference: Estimation and Hypothesis Testing (only concept).

Text Books

T.1	Manish Sharma, Amit Gupta, The Practice of Business Statistics, Khanna Book Publishing Company, 2010
T.2	Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor (2000): 10/e, Sultan Chand and Sons.
T.3	Ross Sheldon M., Introduction to Probability and Statistics for Engineers and Scientists, 6th

	Edition, Elsevier, 2021.
Reference Books	
R.1	Pal Nabendu and Sarkar Sahadeb, Statistics: Concepts and Applications, Second Edition, PHI, 2013
R.2	Montgomery Douglas and Runger George C., Applied Statistics and Probability for Engineers, Wiley, 2016.
Useful Links	
1	https://nptel.ac.in/courses/111106112
2	https://nptel.ac.in/courses/111105041

	Course Outcomes	CL	Class Sessions
BCA12301.1	Apply statistics concept on of qualitative and quantitative data, measures of central tendency.	3	10
BCA12301.2	Understand correlation and regression techniques, including Karl Pearson's and Spearman's coefficients and linear regression using the least squares method	2	10
BCA12301.3	Apply probability concepts, random variables, and standard probability distributions (Binomial, Poisson, and Normal) to solve real-world problems	3	10
BCA12301.4	Analyze sampling distributions and statistical inference techniques, including hypothesis testing and chi-square tests, to draw valid conclusions about population parameters	4	10



Tulsiramji Gaikwad-Patil College of Engineering and Technology
 Wardha Road, Nagpur-441 108
NAAC Accredited with A+ Grade
 (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program: Bachelor of Computer Application Semester – III

Teaching Scheme		BCA12202: Database Management Systems	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3 Hrs.			ESE	60 Marks
		Total	100 Marks	

Course Objectives:

1.	To Understanding Core Concepts of DBMS.
2.	To Proficiency in Database Design and SQL
3.	To Application of Advanced Database Techniques.

Course Contents

Unit I	<p>Introduction to Databases: Definition of Data, Database, and DBMS, Overview of Database Applications, Advantages and Disadvantages of DBMS, Roles of Database Users and Administrators</p> <p>Data Models: Introduction to Data Models, Types of Data Models (Hierarchical, Network, Relational, Object-oriented), Importance of Data Models in DBMS</p> <p>Database Design: Keys: Primary Key, Candidate Key, Super Key, Foreign Key, Composite Key, Alternate Key, Unique Key, Surrogate Key, Constraints in a table: Primary Key, Foreign Key, Unique Key, NOT NULL, CHECK, Entity-Relationship (ER) Model, Entities and Entity Sets, Attributes and Relationships, ER Diagrams, Key Constraints and Weak Entity Sets, Extended ER Features, Introduction to the Relational Model and Relational Schema</p>
Unit II	<p>Relational Algebra and Calculus: Introduction to Relational Algebra, Operations: Selection, Projection, Set Operations, Join Operations, Division, Tuple and Domain Relational Calculus</p> <p>Structured Query Language (SQL): SQL Basics: DDL and DML, Aggregate Functions (Min(), Max(), Sum(), Avg(), Count()), Logical operators (AND, OR, NOT), Predicates (Like, Between, Alias, Distinct), Clauses (Group By, Having, Order by, top/limit), Inner Join, Natural Join, Full Outer Join, Left Outer Join, Right outer Join, Equi Join</p> <p>Advanced SQL: Analytical queries, Hierarchical queries, Recursive queries, Views, Cursors, Stored Procedures and Functions, Packages, Triggers, Dynamic SQL</p>
Unit III	<p>Normalization and Database Design: Functional Dependencies: Armstrong's Axioms, Definition, Properties (Reflexivity, Augmentation, Transitivity), Types (Trivial, Non-Trivial, Partial and Full Functional Dependency), Closure of Functional Dependencies, Normal Forms (1NF, 2NF, 3NF, BCNF), Denormalization.</p>

Unit IV	<p>Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control, Performance of Locking, Transaction Support in SQL, Introduction to Crash Recovery, 2PL, Serializability, and Recoverability, Introduction to Lock Management, Dealing with Deadlocks</p> <p>Database Storage and Indexing: Data on External Storage, File Organizations and Indexing, Index Data Structures, Comparison of File Organizations, Indexes and Performance Tuning, Guidelines for Index Selection, Basic Examples of Index Selection</p>
Text Books	
T.1	Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, third edition, McGraw – Hill, 2018
T.2	Benjamin Rosenzweig, Elena Rakhimov, “Oracle PL/SQL by Example”, fifth edition, Prentice Hall, 2015
T.3	Brad Dayley, “NoSQL with MongoDB in 24 Hours”, 1st edition, Sams Publishing, 2024
Reference Books	
R.1	Korth, Silbertz, Sudarshan,” Database System Concepts”, Seventh Edition, McGraw - Hill.(2019)
R.2	R.P. Mahapatra, Govind Verma, “Database Management Systems”, Khanna Publishing House, 2025.
Useful Links	
1	https://oracle-base.com/articles/articles
2	https://forums.oracle.com/ords/apexds/domain/dev-community/category/sql_and_pl_sql
3	https://asktom.oracle.com/ords/f?p=100:1:0

	Course Outcomes	CL	Class Sessions
BCA12202.1	Understand the concept of Data Models evaluate the importance of data models in database design	2	10
BCA12202.2	Apply database design principles by constructing ER diagrams, identifying keys and constraints, and developing relational schemas for real-world problems.	3	10
BCA12202.3	Apply the process of normalization and evaluate the need for denormalization in terms of performance and data integrity.	4	10
BCA12202.4	Design Database Schema and Identify and apply different types of keys	3	10



Tulsiramji Gaikwad-Patil College of Engineering and Technology
 Wardha Road, Nagpur-441 108
NAAC Accredited with A+ Grade
 (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program: Bachelor of Computer Application Semester – III

Teaching Scheme		BCA12203: Database Management Systems Lab	Examination Scheme	
Lecture	2 Hrs./Week		CT-I	-
Tutorial	-		CT-II	-
Total Credits	1		CA	25 Marks
Duration of ESE: 3 Hrs.			ESE	25 Marks
		Total	100 Marks	

Course Objectives:

1.	To Understanding Core Concepts of DBMS.
2.	To Proficiency in Database Design and SQL
3.	To Application of Advanced Database Techniques.

Course Contents

1	Create the above tables: Consider the following Schema Supplier(SID, Sname, branch, city, phone) Part(PID, Pname, color, price) Supplies(SID, PID, qty, date_supplied)
2	1. Insert at least 10 records in tables supplier, part and supplies 2. Use truncate to delete the contents of supplies table 3. Remove the part table from database 4. Find the name of supplier whose name starts with 'V' and ends with 'A' 5. Change the city of all suppliers to 'BOMBAY'
3	1. Create the supplier table with Primary Key Constraint 2. Create supplies table with Foreign key Constraint 3. Create a part table with UNIQUE Constraint 4. Create supplier Table with Check Constraints 5. Create Supplier table with Default Constraint
4	1. Create Savepoints 2. Rollback to SavePoints 3. Use Commit to save on 1. Find the minimum, maximum, average and sum of costs of parts 2. Count the total number of parts present
5	Queries on GROUP BY, HAVING AND ORDER BY Clauses 1. Display total price of parts of each color 2. Find the branch and the number of suppliers in that branch for branches which have more than 2 suppliers 3. Find all parts sorted by pname in ascending order and cost in descending order 4. Find the branch and the number of suppliers in that branch

6	<ol style="list-style-type: none"> 1. Write a recursive query to show the equivalent of level, connect_by_root and connect_by_path 2. Use recursion to retrieve the employee table and display the result in depth first order showing id, parent_id, level, root_id, path and leaf.
7	<ol style="list-style-type: none"> 1. Find the pname, phoneno and cost of parts which have cost equal to or greater than 200 and less than or equal to 600. 2. List the suppliers who supplied parts on '1st may2000', '12 JAN 2021', '17 dec 2000', '10 Jan 2021'
8	<ol style="list-style-type: none"> 1. Perform Inner join on two tables 2. Perform Natural Join on two tables 3. Perform Left Outer Join on tables 4. Perform Right Outer join on tables 5. Perform Full Outer Join on tables
9	<ol style="list-style-type: none"> 1. To display the supplier names who have supplied 'green' part with cost 500 Rupees AND 'red' part with cost 400 Rupees. 2. To Display the name of suppliers who have supplied all parts that are 'red' in color.
10	<ol style="list-style-type: none"> 1. Write a PL/SQL Code to add two numbers 2. Write a PL/SQL code for Fibonacci series 3. Write a Program using TRIGGER on UPDATE

Text Books

T.1	Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", third edition, McGraw – Hill, 2018
T.2	Benjamin Rosenzweig, Elena Rakhimov, "Oracle PL/SQL by Example", fifth edition, Prentice Hall, 2015
T.3	Brad Dayley, "NoSQL with MongoDB in 24 Hours", 1st edition, Sams Publishing, 2024

Reference Books

R.1	Korth, Silbertz, Sudarshan," Database System Concepts", Seventh Edition, McGraw - Hill.(2019)
R.2	R.P. Mahapatra, Govind Verma, "Database Management Systems", Khanna Publishing House, 2025.

Useful Links

1	https://oracle-base.com/articles/articles
2	https://forums.oracle.com/ords/apexds/domain/dev-community/category/sql_and_pl_sql
3	https://asktom.oracle.com/ords/f?p=100:1:0



Tulsiramji Gaikwad-Patil College of Engineering and Technology
 Wardha Road, Nagpur-441 108
NAAC Accredited with A+ Grade
 (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program: Bachelor in Computer Application Semester – II

Teaching Scheme		BCA12304: Python Programming	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3 Hrs.			ESE	60 Marks
		Total	100 Marks	

Course Objectives:

1. Develop modular Python programs.
2. Apply suitable Python programming constructs, built-in data structures using Python libraries to solve a problem.
3. Understand basic Data visualization and File handling in Python.

Course Contents

Unit I	Introduction: History and Application areas of Python; Structure of Python Program; Identifiers and Keywords; Operators and Precedence; Basic Data Types and type conversion; Statements and expressions; Input/ Output statements. Strings: Creating and Storing Strings, Built-in functions for strings; string operators, String slicing and joining; Formatting Strings. Control Flow Statements: Conditional Flow statements; Loop Control Statements Nested control; Flow; continue and break statements, continue, Pass and exit.
Unit II	Functions: Built-In Functions, Function Definition and call; Scope and Lifetime of Variables, Default Parameters, Command Line Arguments; Lambda Functions; Assert statement; Importing User defined module; Mutable and Immutable objects: Lists, Tuples and Dictionaries; Commonly used Functions on Lists, Tuples and Dictionaries. Passing Lists, Tuples and Dictionaries as arguments to functions. Using Math and Numpy module for list of integers and arrays.
Unit III	Files: Types of Files; Creating, Reading and writing on Text and Binary Files ;The Pickle Module, Reading and Writing CSV Files. Reading and writing of csv and JSON files. Exception Handling: Try-except-else-finally block, raise statement, hierarchy of exceptions, adding exceptions. Data visualization: Plotting various 2D and 3D graphics; Histogram; Pi charts; Sine and cosine curves

Text Books

T.1	Venkatesh, Nagaraju Y, Introduction to Python Programming, Khanna Publishing House, 2021..
T.2	Jeeva Jose, Introduction to Computing & Problem Solving With PYTHON, Khanna Publishing House, 2023..
T.3	Sheetal Taneja & Naveen kumar: Python Programming a Modular approach – A Modular approach with Graphics, Database, Mobile and Web applications, Pearson, 2017

Reference Books

R.1	Think Python, by Allen Downey, 2nd edition, 2015, O'Reilly. https://drive.google.com/file/d/1p9Pul6d5UvnQrO9-Q-LE2_p4YvMk5cIg/view
-----	--

R.2	An introduction to Python for absolute beginners, by Bob Dowling, Cambridge Univ.
R.3	Introduction to Computation and Programming using Python, by John Guttag, 2nd edition, 2016, PHI India.
Useful Links	
1	https://www.learnpython.org/
2	https://www.w3schools.com/python/default.asp

	Course Outcomes	CL	Class Sessions
BCA12304.1	Understand the Python fundamentals including program structure, identifiers and input/output statements to develop simple Python programs.	2	9
BCA12304.2	Implement string operations and control flow statements to solve computational problems logically.	3	9
BCA12304.3	Apply file handling, exception handling, and external modules to process data and create visualizations using 2D/3D plots and charts.	3	9



Tulsiramji Gaikwad-Patil College of Engineering and Technology
 Wardha Road, Nagpur-441 108
NAAC Accredited with A+ Grade
 (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program: Bachelor in Computer Application Semester – II

Teaching Scheme		BCA12305: Python Programming Lab	Examination Scheme	
Practical	4 Hrs./Week		CT-I	-
Tutorial	-		CT-II	-
Total Credits	2		CA	25 Marks
Duration of ESE: 2 Hrs.			ESE	25 Marks
		Total	50 Marks	

Course Objectives:

- To implement and analyze fundamental linear and nonlinear data structures.
- To apply searching and sorting algorithms to solve computational problems.
- To develop recursive solutions and utilize stack and queue operations.
- To construct and traverse trees and graphs programmatically.

Sr. No.	List of Practical
1	Develop a program to find whether a number is a prime number.
2	Develop a program to print m raise to power n, where m and n are read from the user.
3	Implement a program having a parameterised function that returns True or False depending on whether the parameter passed is even or odd..
4	Design a program to print the summation of the following series up to n terms:1-2+3-4+5- 6+7 - - - - - - - -n.
5	Create a menu driven program to perform the following operations on strings using string built in functions. a. Find the frequency of a character in a string.
6	Construct a program that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string, then it should return -1.
7	Develop a program that reads a text file and counts the number of words, characters, and lines present in the file.
8	Build a function that reads a file file1 and copies only alternative lines to another file file2. Alternative lines copied should be the odd numbered lines
9	Demonstrate a Python program to handle a Zero Division Error exception when dividing a number by zero
10	Implement a program to read a file and display only those lines that contain a specific keyword entered by the user.

Text Books	
T.1	Think Python: How to Think Like a Computer Scientist by <i>Allen B. Downey</i>
T.2	Python Crash Course by <i>Eric Matthes</i> .
Reference Books	
R.1	Learning Python (O'Reilly) by Mark Lutz
R.2	Introduction to Computation and Programming Using Python by <i>John Guttag (MIT)</i>
Useful Links	
1	geeksforgeeks.org in Bing
2	programiz.com in Bing
3	pynative.com in Bing

	Course Outcomes	CL	Class Sessions
BCA12304.1	Understand Python Fundamentals	2	8
BCA12304.2	Apply String and Control Flow Operations	3	8
BCA12304.3	Develop Modular and Data- Driven Programs	5	8



Program: Bachelor in Computer Application Semester-III

Teaching Scheme		BCA12306: Software Engineering	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	15 Marks
Tutorial	-		CT-II	15 Marks
Total Credits	3		CA	10 Marks
Duration of ESE: 3Hrs.			ESE	60 Marks
		Total	100 Marks	

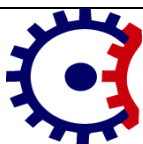
Course Objectives:

1. To Acquire a comprehensive understanding of the software development lifecycle and its application in contemporary software engineering practices.
2. To Develop proficiency in project management methodologies and strategic decision-making for successful software project execution.
3. To Master the art of software design, development, and testing to produce robust and efficient software solutions.
4. To understand **software quality management, release management, and maintenance practices** for sustaining software products..

Course Contents

Unit I	<p>The evolving role of software, changing nature of software, layered technology, a process framework, Process models: The waterfall model, incremental process models, evolutionary process models, the unified process.</p> <p>Agile software development: Agility Principles, Agile methods, Plan-driven and agile development, Extreme programming, Scrum, A Tool Set for the Agile Process.</p>
Unit II	<p>Software Requirements Engineering: Functional and non-functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.</p> <p>Risk management: Reactive Vspro active risk strategies, software risks, risk Identification, risk projection, risk refinement, RMMM, RMMM plan.</p> <p>Project planning- Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques.</p>
Unit III	<p>Design: Design process and design quality, design concepts, the design model, software architecture, data design, architectural design, Basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams.</p> <p>Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.</p> <p>Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.</p>

Unit IV	<p>Quality Management: Quality concepts, software quality assurance, software reviews, formal Technical reviews, statistical software quality assurance, software reliability.</p> <p>Release Management: Release planning, development and build plans, release strategies, risk management, and post-deployment monitoring.</p> <p>Product sustenance: Maintenance, updates, End of life, migration strategies.</p>
Text Books	
T.1	Software Engineering, N.S.Gill, Khanna Publishing House, 2023
T.2	Software Engineering, Ian Somerville ,9th edition ,Pearson education.
T.3	Software Engineering A practitioner's Approach, 8th edition, Roger S Pressman, Bruce R. Maxim. McGraw Hill Education, 2015.
Reference Books	
R.1	Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007
R.2	Software Engineering: Principles and Practice Hansvan Vliet
Useful Links	
1	https://archive.nptel.ac.in/courses/106/102/106102132/
2	https://onlinecourses.nptel.ac.in/noc21_cs72/preview



Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441108
NAAC Accredited with A+ Grade
(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program: Bachelor's in Computer Application Semester-III

Teaching Scheme		Stream: <i>Full Stack Programming</i> BCA12307: Web Technology - I	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	7 Marks
Tutorial	-		CT-II	7 Marks
Total Credits	2		CA	6 Marks
Duration of ESE: 3Hrs.			ESE	30 Marks
		Total	50 Marks	

Course Pre-requisites: Basic programming knowledge, HTML Programming

Course Objectives:

1. To learn the role of JavaScript in full-stack development. Components of a browser. Understand the DOM concept and learn Web APIs. Learn to run JavaScript for interactivity.
2. To learn JavaScript as a programming language. Understand JavaScript Objects.
3. To learn JavaScript Scope and Closure, the asynchronous running of JavaScript. Understand callbacks, promises, and generators. Finding JS Errors and Debugging.

Course Contents

Unit I	Introduction to JavaScript: Client-Server paradigm. Role of JavaScript in Full Stack Development. Components of a browser, the JavaScript Engine, and running JavaScript functions using JS Engine. Document Object Model and how JavaScript is used in HTML. Inner JavaScript functions, External JavaScript functions. Built-in JavaScript functions. HTML Web APIs – Web workers and Web Storage.
Unit II	Datatypes and Variables in JavaScript. Understanding dynamically typed variables. Different types of operators and statements in JavaScript: Assignment, Branching, and Looping statements. Writing simple functions using JavaScript. JavaScript Objects: Object Properties, Object Methods. JavaScript Data Structures (Arrays, Sets, Maps).
Unit III	Java Script Scope and Closure: Lexical scope, function vs block scope. Dynamic scope, scope closure Java Script Async and Performance: JS Asynchrony, Callbacks, Promises and Generators JS Errors and Debugging: Using browser inspect feature.

Text Books

T.1	Head First JavaScript Programming by Eric Freeman & Elisabeth Robson: O'Reilly publication
T.2	A Smarter Way to Learn JavaScript by Mark Myers
T.3	JavaScript from Beginner to Professional by Laurence Svekis – Packt Publication

Reference Books	
R.1	Eloquent JavaScript, 3rd Edition: A Modern Introduction to Programming Paperback – 1 January 2018, by Marijn Haverbeke
R.2	Mastering JavaScript: A Complete Programming Guide Including jQuery, AJAX, Web Design, Scripting and Mobile Application (Paperback - 2019) – By Michael B White
Useful Links	
1	https://www.w3schools.com/js
2	https://www.programiz.com/javascript

	Course Outcomes	CL	Class Session
CO1	Understand the working of JavaScript and its role in full-stack development.	2	10
CO2	Apply JavaScript concepts of data types, variables, operators, and control statements to develop simple programs and functions.	3	10
CO3	Implement advanced JavaScript concepts including scope, closures, asynchronous programming (callbacks, promises), and debug programs using browser tools.	3	10



Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441108
NAAC Accredited with A+ Grade
(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program : Bachelor in Computer Application Semester-III

Teaching Scheme		Artificial Intelligence BCA12308 : Feature Engineering	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	7 Marks
Tutorial	-		CT-II	7 Marks
Total Credits	2		CA	6 Marks
Duration of ESE: 2Hrs.			ESE	30 Marks
		Total	50 Marks	

Course Objectives:

1.	Explain the concept of feature engineering in machine learning.
2.	Analyze how different data types influence feature engineering techniques.
3.	Implement Feature Engineering Techniques.
4.	Improve model accuracy through effective feature engineering.

Course Contents

Unit I	Introduction to Feature Engineering: Importance of Features in Machine Learning. Data types and features: Numerical, Categorical, Ordinal, Discrete, Continuous, Interval and Ratio.
Unit II	Basic Feature Preprocessing: Handling Missing Data, Data Cleaning, Feature Scaling, Normalization, and Transformation. Feature Engineering Techniques for Numerical Data: Binning and Discretization, Polynomial and Interaction Features.
Unit III	Categorical Data Techniques: One Hot Encoding, Label Encoding. Feature extraction vs. feature selection, Steps in feature selection Feature Selection Methods: Filter, Wrapper, and Hybrid. Feature Reduction: Introduction and application of Principal Components Analysis.

Text Books

T.1	M.C. Trivedi, Data Science and Data Analytics Using Python Programming, Khanna Publishing House, 2024
T.2	Zheng, Alice, & Casari, Amanda. (2018). Feature engineering for machine learning: Principles and techniques for data scientists. O'Reilly Media, Inc.


Reference Books

R.1	Duda, R. O., Hart, P. E., Stork, D (2007). Pattern classification (2Ed), John Wiley & Sons, ISBN-13: 978-8126511167.
R.2	N. Bhaskar, Vasundhara, Machine Learning, Khanna Publishing House, 2024.

Useful Links

1	https://www.datacamp.com/tutorial/feature-engineering?utm_source
2	https://www.learndatasci.com/tutorials/intro-feature-engineering-machine-learning-python/?utm_source

	Course Outcomes	CL	Class Session
CO1	Understand the importance of features in machine learning and differentiate between various types of data and features.	1	10
CO2	Apply basic feature preprocessing techniques such as handling missing data, data cleaning, and feature scaling and normalization.	3	10
CO3	Implement feature engineering techniques for numerical data, including binning, discretization, polynomial and interaction features, and log transformation.	4	10

Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441108 NAAC Accredited with a +Grade (An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)	
---	---

Program: Bachelor in Computer Application Semester-III

Teaching Scheme		BCA12309: Basics of Data Analytics using Spreadsheet	Examination Scheme	
Lecture	3 Hrs./Week		CT-I	7 Marks
Tutorial	-		CT-II	7 Marks
Total Credits	2		CA	6 Marks
Duration of ESE: 3Hrs.			ESE	30 Marks
		Total	50 Marks	

Course Objectives:

1. Understand the basics of data analytics and its applications.
2. Develop proficiency in using spreadsheet software for data manipulation and analysis.
3. Build and use spreadsheet models for decision making & Communicate data insights effectively

Course Contents

Unit I	Introduction to Data Analytics: Understanding data and its types (structured, unstructured, semi-structured)-What is Data Analytics- Types of data Analytics-Importance of Data Analytics- Applications of Data Analytics.
Unit II	Data, Ethics, and Industry: Case Studies Data Collection Methods - Different Data Sources & format - Data Cleaning and Transformation - Handling Missing Data and Outliers. - Ethical considerations in data analytics. - Real-world Applications of Data Analytics- Industry-specific applications (finance, marketing, operations) - Case Study Note: Case study is for discussion not to be considered for evaluation.
Unit III	Data Analysis and Visualization: Introduction to Data Analysis Process, Exploratory Data Analysis (EDA) , Measures of Central Tendency: (Mean, Median, Mode) Measures of Dispersion: Standard Deviation Basic Statistical Concepts: Correlation, Introduction to Probability Data Visualization: Bar Chart , Line Graph , Pie Chart, Histogram, Scatter Plot

Text Books

T.1	“Beginner's Guide for Data Analysis using R Programming” by Jeeva Jose, Khanna Publishing House, 2024.
T.2	“Data Analytics” by V.K. Jain, Khanna Book Publishing Company, 2024
T.3	“Excel Data Analysis For Dummies" by Stephen L. Nelson and E. C. Nelson, John Wiley & Sons; 3rd edition, 2016

Reference Books

R.1	"Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach, John Wiley & Sons, 25 Sept 2018
R.2	"Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics" by Cliff T Ragsdale, Cengage learning asia pet. 2015

	Course Outcomes	CL	Class Session
CO1	Understand the Basics of Data Analytics using Spreadsheet	2	9
CO2	Apply data types and basic concepts of data analytics. Understand its importance and applications.	3	9
CO3	Prepare datasets for analysis using appropriate preprocessing methods.	3	9



Program: Bachelor's in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCA12310	Web Technology – 1 - Lab	-	-	4	2

Pre-Requisites: DOM Concepts, Functioning of a Browser, OOPs Programming Concepts

Course Objectives:

1. To understand Browser components and the function of the JavaScript Engine. Learn JavaScript data types, statements, and operators. Apply the knowledge to develop programs using an IDE
2. To understand JS objects and JS functions. Learn to manipulate JS objects and DoM objects using JavaScript
3. To learn JavaScript event programming to manipulate the DOM and JavaScript Objects using event handlers
4. To understand and apply the built-in Web APIs on a browser

Sr. No.	List of Experiments
1	<u>Basic JavaScript Programming:</u> Build an HTML page with an input for text and a submit button. Write a JavaScript to find if the input is a Number or a String.
2	<u>Basic JavaScript Programming:</u> a) Write a JavaScript to find the minimum and maximum elements of an Array of 10 integers. Display the original array and the Min and Max values on an HTML page that internally refers to JavaScript. Use a button to display the results when it is clicked. DataArray = [10, 5, 27, 45, 77, 78, 3, 5, 21, 53] Sort the array and display the sorted array on the HTML page.
3	<u>Manipulating DOM (Access DOM attributes):</u> a) Build an HTML page for registration with inputs 'UserId', 'Password', and Confirm Password. It should also have a 'Submit' button and a 'Reset' button. Verify the following for UserId, Password, and Confirm Password, and display the messages accordingly using JavaScript. <ul style="list-style-type: none">• UserId is blank – "UserId is required."• Password is blank – "Password is required."• Password should have at least 8-characters, The First character should not be numeric, there should be at least one special character, there should be at least one numeric, and there should be at least one uppercase and one lowercase – else the message should be "Invalid password."• Confirm Password: Both Password and Confirm Password should be the same – else "Confirm password does not match the entered password"
4	<u>Change Attribute of DOM Objects:</u> Change the Color of the displayed string "The signal color is Red/Green/Yellow" when different buttons labelled "Red", "Green", and "Yellow" are pressed.

5	<p>Array Difference: Remove elements present in Array1 from Array2.</p> <p>Array1 = [1, 2, 4]</p> <p>Array2 = [1, 3, 4, 2, 7, 8, 4, 7, 1, 0]</p>
6	<p><u>Event Programming to Perform Logic:</u></p> <ul style="list-style-type: none"> Build an HTML page with a Textbox (Multiline). Users can enter up to 100 characters. On the keypress event, calculate the number of characters. Display the number of characters below the textbox. Display an alert message (Number of characters > 100) in Red.
7	<p><u>Using Built-in HTML-JavaScript Web APIs:</u></p> <p>Build a web page. Use a web worker that increments a counter every 30 sec. Find the value of the web worker on clicking a button on the page labeled “Get Counter Value.”</p>
8	<p><u>Using Built-in HTML JavaScript Web APIs:</u> Build a web page using client-side storage API (sessionStorage and localStorage). Keep the value of “Number of times the web page is accessed” in localStorage and in sessionStorage. Display the values on loading the web page.</p>
9	<p><u>String Data Processing: Reverse String:</u> Create a function to reverse a given string.</p>
10	<p><u>String Data Processing: Palindrome:</u> Check if a given string is a palindrome.</p>
Text Books	
1	JavaScript: JavaScript Programming for Absolute Beginner’s: Ultimate Guide to JavaScript Coding, JavaScript Programs and JavaScript Language, William Sullivan, 2017, Pragmatic Solutions
2	Rediscovering JavaScript, Venkat Subramaniam, The Pragmatic Bookshelf, 2018
Reference Books	
1	JavaScript: The Definitive Guide: David Flanagan, O`Reilly Publications
Useful Links	
1	W3Schools.com/javascript
2	www.geeksforgeeks.org

	Course Outcomes	CL	Lab Sessions
CO1	Understand the working of JavaScript and its role in full-stack development.	2	2
CO2	Apply JavaScript concepts of data types, variables, operators, and control statements to develop simple programs and functions.	3	2
CO3	Implement advanced JavaScript concepts including scope, closures, asynchronous programming (callbacks, promises), and debug programs using browser tools.	3	



Tulsiramji Gaikwad-Patil College of Engineering and Technology
Wardha Road, Nagpur-441108
NAAC Accredited with A+ Grade
(An Autonomous Institute Affiliated to RTM Nagpur University, Nagpur)



Program : Bachelor in Computer Application Semester-III

Semester	Course Code	Name of Course	L	T	P	Credit
III	BCA12311	Feature Engineering Lab	0	0	4	2

Course Objectives:

1.	To understand the importance of data preprocessing and feature engineering in the machine learning pipeline.
2.	To learn techniques for handling missing data using statistical methods such as mean, median, and mode.
3.	To develop skills in cleaning datasets by identifying and removing invalid or inconsistent data entries.
4.	To apply feature scaling techniques such as Min-Max normalization to improve model performance.

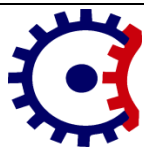
Course Contents

1.	Handle missing values in column(s) of a dataset. For example, fill missing values with the mean/median/mode of the columns such as 'Age', 'Height', 'Weight', 'Grade' for a dataset.
2.	Clean a dataset by identifying and removing invalid data entries. For example, a dataset having columns 'Name', 'Gender' and 'Age' where 'Name' contains 'invalid data'
3.	Scale numerical features using Min-Max normalization for a dataset with columns like 'Height', 'Weight'.
4.	Perform exploratory data analysis and visualize data distributions using histograms and boxplots.
5.	Compute and visualize the correlation matrix of a dataset with 2 or more columns.
6.	Bin numerical data into discrete intervals for a dataset with a column containing numerical values
7.	Preprocess text data (tokenization) for a dataset with a column 'Text'.
8.	Preprocess text data (stemming) for a dataset with a column 'Text'.
9.	Perform image augmentation resizing for a set of images.
10.	Perform image augmentation normalization for a set of images.

Text Books

T.1	M.C. Trivedi, Data Science and Data Analytics Using Python Programming, Khanna Publishing House, 2024
-----	---

T.2	Zheng, Alice, & Casari, Amanda. (2018). Feature engineering for machine learning: Principles and techniques for data scientists. O'Reilly Media, Inc.
Reference Books	
R.1	Duda, R. O., Hart, P. E., Stork, D (2007). Pattern classification (2Ed), John Wiley & Sons, ISBN-13: 978-8126511167.
R.2	N. Bhaskar, Vasundhara, Machine Learning, Khanna Publishing House, 2024.



Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

**(An Autonomous Institute Affiliated to RTM Nagpur University,
Nagpur)**



Program: Master in Computer Application

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCA12312	Basics of Data Analytics using Spreadsheet Lab	-	-	4	2

Pre-Requisites: Knowledge on basics of mathematical & Statistical concepts such as arithmetic, percentages, averages, and basic algebra.

Course Objectives:

1. Understand the basics of data analytics and its applications.
2. Develop proficiency in using spreadsheet software for data manipulation and analysis.
3. Build and use spreadsheet models for decision making & Communicate data insights effectively

Sr. No.

List of Experiment

PART – A: Understanding and Describing the Data

1. To study Excel interface and perform data entry and formatting.
2. To apply basic functions (SUM, AVERAGE, MIN, MAX) and cell referencing.
3. To import data and perform data cleaning (remove duplicates, handle missing data).
4. To perform data transformation using text functions and Find & Replace.
5. To perform descriptive statistical analysis and create charts in Excel.
6. To apply advanced functions (IF, VLOOKUP, INDEX, SUMIFS) for data analysis.
7. To create and customize charts (bar, line, pie, scatter) for data visualization.
8. To create PivotTables and Pivot Charts for data summarization.
9. To design an interactive dashboard using slicers, charts, and conditional formatting.

10.	To apply data visualization best practices for effective data presentation and communication.
Text Books	
T.1	“Beginner's Guide for Data Analysis using R Programming” by Jeeva Jose, Khanna Publishing House, 2024.
T.2	“Data Analytics” by V.K. Jain, Khanna Book Publishing Company, 2024
Reference Books	
R.1	"Excel 2019 Bible" by Michael Alexander, Richard Kusleika, and John Walkenbach, John Wiley & Sons, 25 Sept 2018
R.2	"Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics" by Cliff T Ragsdale, Cengage learning asia pet. 2015

	Course Outcomes	CL	Class Session
CO1	Understand the Basics of Data Analytics using Spreadsheet	2	8
CO2	Apply data types and basic concepts of data analytics. Understand its importance and applications.	3	8
CO3	Prepare datasets for analysis using appropriate preprocessing methods.	3	8