

JAMIA MILLIA ISLAMIA

(A Central University by an Act of Parliament)

DEPARTMENT OF COMPUTER SCIENCE

Maulana Mohammad Ali Jauhar Marg, New Delhi-110025

Tel.: 26985177, 26980014, 26981717, EPABX : 3450, 3452



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UG-Multidisciplinary

Sem	#Seats	Course Code	Course Title	L-T-P	Credit	IA	UE	Sem Credits
I	40	24DCST101	Digital Empowerment	3-0-0	3	40	60	3
II	40	24DCST151	Buisness Informatics	3-0-0	3	40	60	3
III	40	24DCST201	Data Visualization and Analysis	3-0-0	3	40	60	3

UG-SEC

Sem	#Seats	Course Code	Course Title	L-T-P	Credit	IA	UE	Sem Credits
I	40	24DCSS101	Algorithmic Computation	2-0-0	2	40	60	3
	40	24DCSS102	Lab-S1 (AC)	0-0-2	1	50	50	
II	40	24DCSS151	Programming with Python	2-0-0	2	40	60	3
	40	24DCSS152	Lab-S2 (Python)	0-0-2	1	50	50	
V	40	24DCSS301	Web Programming	2-0-0	2	40	60	3
	40	24DCSS302	Lab-S3 (WP)	0-0-2	1	50	50	

(Prof. M. Nazir)
Head

UG-Multidisciplinary

24DCST101: Digital Empowerment(3-0-0) Credits:3

Course Objectives:

- To introduce students to digital literacy and major digital initiatives and services in India.
- To develop skills in digital communication, collaboration, and content creation.
- To provide an understanding of the role of digital technologies in society and governance.
- To familiarize students with digital ethics, legal frameworks, and responsible use of technology.

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Understand digital literacy concepts and effectively use digital platforms and e-governance services.
- Demonstrate digital communication, collaboration, and content creation skills.
- Analyze the impact of digital technologies on society, including issues of inclusion and the digital divide.
- Understand the ethical, legal, and social responsibilities associated with the use of digital technologies.

1.Digital literacy:Vision of Digital India: DigiYatra, e-Aadhaar, DigiLocker, e-Hospitals, e-Pathshala, e-Kranti (Electronic Delivery of Services), e-Health Campaigns;Public utility portals of Govt. of India such as RTI, Health, Finance, Income Tax filing, etc; Educational portals,SWAYAM, Virtual Labs, National Digital Library of India (NDLI),JMI e-Library, UPI BHIM, etc.

2.Digital Communication: Online Communication Skills, emails, instant messaging, and social media, Digital etiquetteand netiquette, Tools for online collaboration (Google Workspace, Microsoft Teams, Slack, Virtual teamwork andproject management; Digital Content Creation: tools (Canva, Adobe Spark), Writing and blogging for the web.

3.Digital Technologies and Society:Digital inclusion and the digital divide, cultural considerations; role of technology ineducation, healthcare, and governance, digital activism and social change, digital empowerment for personal andprofessional Growth, building a digital portfolio and online presence, Legal and Regulatory Frameworks: key laws andregulations affecting computing (e.g., GDPR, DMCA).

4.Digital Ethics and responsibility:Ethical issues in AI, and autonomous systems; Responsibility and accountability in autonomous decision-making; Case studies: Ethical dilemmas in autonomous vehicles and AI-driven healthcare; social media platforms ethics: Issues of misinformation, online harassment, and digital addiction, Case studies: The ethical responsibility of social media companies; Global Impact and Ethical Leadership in technology; Intellectual propertyrights and software licensing, etc.

Text Books:

- Digital Empowerment: Digital Transformation: Empowering People for Success by Ajay Dutta and Omika.

Reference Books:

- A Gift of Fire: Social Legal and Ethical Issues for Computing Technology by Sara Baase and Timothy M. Henry, 5th edition.
- Computer Science Illuminated by Nell Dale and John Lewis, 7th edition.
- Digital Ethics by P. Tamilselvan, R. Ramnath, and M. Mahendraprabu, 2020.

24DCST151:Business Informatics(3-0-0) Credits:3**Course Objectives:**

- To introduce the fundamental concepts of business analytics and its role in data-driven decision-making.
- To develop skills in data handling and analysis using spreadsheet tools such as Excel.
- To provide an understanding of data visualization and descriptive statistical techniques for business analysis.
- To familiarize students with forecasting methods for analyzing trends and supporting business decisions.

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Apply business analytics concepts and techniques to support organizational decision-making.
- Use Excel tools, functions, queries, and PivotTables for data analysis.
- Analyze and visualize data using appropriate statistical and graphical techniques.
- Apply forecasting models and evaluate their effectiveness in predicting business trends.

1. Business Analytics: Informatics and Business Analytics, Using Business Analytics, Impacts and Challenges, Evolution of Business Analytics, Analytic Foundations, Modern Business Analytics, Software Support and Spreadsheet Technology, Descriptive, Predictive, and Prescriptive Analytics, Data for Business Analytics; Big Data, Data Reliability and Validity; Models in Business Analytics: Descriptive, Predictive and Prescriptive; Model Assumptions, Uncertainty and Risk, Problem-Solving with Analytics: Interpreting Results and Making a Decision, Implementing the Solution.

2. Data Analytics: Introduction to Excel, Data Sets and Databases, Using Range Names in Databases; Data Queries: Tables, Sorting, and Filtering; Database Functions: Logical Functions, Lookup Functions for Database Queries, Template Design, Data Validation Tools, Form Controls, PivotTables, PivotTable Customization and Slicers.

3. Data Visualization and Descriptive Analytics: Data Visualization, Value of Data Visualization, Tools and Software for Data Visualization, Creating Charts, Charts from PivotTables, Geographic Data, Data Visualization Tools; Descriptive Statistics: Metrics and Data Classification, Frequency Distributions; Percentiles and Quartiles, Cross-Tabulations, Descriptive Statistical Measures, Business Decisions; Measures of Dispersion; Empirical Rules; Measures of Association; Using Descriptive Statistics to Analyze Survey Data; Statistical Thinking in Business Decisions and Variability in Samples.

4. Business Forecasting: Qualitative and Judgmental Forecasting, Historical Analogy, The Delphi Method, Indicators and Indexes, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Moving Average Models, Error Metrics and Forecast Accuracy, Exponential Smoothing Models, Forecasting Models for Time Series with a Linear Trend, Double Exponential Smoothing, Regression-Based Forecasting for Time Series with a Linear Trend, Forecasting Time Series with Seasonality and Regression-

Based Seasonal Forecasting Models.

Text Books:

- Business Analytics by James R. Evans, 2nd edition, Pearson.
- Business Analytics with Microsoft Excel by James R. Evans, 5th edition, Pearson.

Reference Books:

- Business Intelligence Analytics and Data Science: A Managerial Perspective by Ramesh Sharda, DursunDelen, and Efraim Turban, 4th edition, Pearson.
- Data Science for Business by Foster Provost and Tom Fawcett, O'Reilly Media.

24DCST201: Data Visualization and Analysis(3-0-0) Credits:3

Course Objectives:

- To introduce the fundamental concepts of data analysis and descriptive statistics.
- To provide knowledge of data handling and numerical computing using Python libraries such as NumPy and Pandas.
- To develop skills in data cleaning, transformation, and analysis.
- To familiarize students with data visualization techniques using Python.

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Explain the fundamental concepts of data analysis and descriptive statistics.
- Perform numerical computations and array operations using NumPy.
- Apply data cleaning, transformation, and analysis techniques using Pandas.
- Create and interpret data visualizations using Matplotlib and Pandas.

1. Introduction to Data Analysis and Statistics: Fundamentals of data analysis, types of data, introduction to descriptive statistics, measures of central tendency, measures of dispersion, correlation and covariance, introduction to linear regression, basic concept of statistical hypothesis testing, and overview of Python libraries including NumPy, Pandas, and Matplotlib.

2. Array Manipulation using NumPy: Introduction to NumPy arrays, creating arrays, data types of arrays, indexing and slicing, reshaping arrays, transposing arrays, swapping axes, arithmetic operations on arrays, and data processing using NumPy arrays.

3. Data Manipulation using Pandas: Introduction to Pandas, Series and DataFrame, loading data into DataFrame, indexing and filtering, arithmetic operations, statistical functions, handling missing values, sorting, grouping, data cleaning, data transformation, merging, and reshaping of data.

4. Data Visualization and Aggregation: Introduction to plotting using Matplotlib, creating figures and subplots, labels and legends, line charts, bar charts, scatter plots, histograms, heatmaps, plotting functions in Pandas, group by operations, data aggregation, pivot tables, and cross tabulation.

Text Books:

- Python for Data Analysis by Wes McKinney, O'Reilly Media.
- Hands-On Data Analysis with Pandas by Stefanie Molin, Packt Publishing.
- Fundamentals of Mathematical Statistics by S. C. Gupta and V. K. Kapoor.

Reference Books:

- Pandas for Everyone by Daniel Y. Chen.
- Statistics for Data Science by James D. Miller.

UG-SEC

24DCSS101: Algorithmic Computation (2-0-0) Credits:2

Course Objectives:

- To introduce fundamental problem-solving and algorithm design techniques.
- To develop an understanding of algorithms for numerical and mathematical problems.
- To provide knowledge of array-based problem-solving methods.
- To familiarize students with sorting, searching, and merging algorithms.

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Apply algorithm design techniques to solve computational problems.
- Develop algorithms for mathematical problems such as GCD computation, Fibonacci series generation, and prime number testing.
- Use array-based techniques for data manipulation and problem solving.
- Implement and analyze basic sorting, searching, and merging algorithms.

1. Algorithms Design: Introduction, Problem-Solving Aspect, Top-down Design, Implementation of Algorithms, Program Verification, Efficiency of Algorithms. Introduction to Flowchart, Exchanging the Values of Two Variables, Counting, Summation of a Series of Numbers, Factorial computation, Computation of Sin(X) and Cos(x) values, Reversing the Digits of an Integer.

2. Factoring Methods: Finding Square Root of a Number, Smallest Divisor of an Integer, Greatest Common Divisor of Two Integers, Generating Prime Numbers, raising a Number to a Large Power, Computing the nth Fibonacci Number.

3. Array Techniques: Introduction to array, Array Order Reversal, Array Counting, Finding Max/ Min Number in an Array, Removal of Duplicates from an Ordered Array, Partitioning of Array, Finding Kth Smallest Element.

4. Merging, Sorting and Searching: Two ways merge, Selection Sort, Quick Sort, Insertion Sort, Linear Search, Binary Search.

Text Books:

- How to Solve It by Computer by R. G. Dromey, 1st edition, Pearson Education.

Reference Books:

- Design and Analysis of Algorithms by Parag Himanshu Dave and HimanshuBhalchandra Dave, 2nd edition, Pearson.
- Fundamentals of Computer Algorithms by Ellis Horowitz, SartajSahni, and SanguthevarRajasekaran, 2nd edition, Universities Press.

24DCSS102: Lab-S1 (AC) (0-0-2) Credits:1

1. Implementation of programs for swapping numbers, digit counting, digit reversal, and palindrome detection.
2. Implementation of programs for factorial computation, Fibonacci series generation, and power computation.
3. Implementation of programs for prime number testing, prime number generation, and GCD computation.
4. Implementation of programs for square root computation and finding divisors of integers.
5. Implementation of array operations, including reversal, counting, duplicate removal, and identification of maximum and minimum elements.
6. Implementation of sorting algorithms, including Selection Sort, Insertion Sort, and Quick Sort.
7. Implementation and analysis of searching algorithms, including Linear Search and Binary Search.

Text Books:

- How to Solve It by Computer by R. G. Dromey, 1st edition, Pearson Education.

Reference Books:

- Design and Analysis of Algorithms by Parag Himanshu Dave and HimanshuBhalchandra Dave, 2nd edition, Pearson.
- Fundamentals of Computer Algorithms by Ellis Horowitz, SartajSahni, and SanguthevarRajasekaran, 2nd edition, Universities Press.

24DCSS151: Programming With Python (2-0-0) Credits:2**Course Objectives:**

- To introduce the fundamentals of Python programming and its development environment.
- To develop an understanding of Python data structures and control flow constructs.
- To provide knowledge of functions, modules, and object-oriented programming in Python.
- To familiarize students with file handling and exception handling techniques.

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Explain Python syntax, data types, and program structure.
- Apply control structures and built-in data structures to solve programming problems.
- Develop Python programs using functions, modules, and object-oriented concepts.
- Implement file handling and exception handling mechanisms in Python applications.

- 1. Introduction:** Getting Started: Setting up Programming Environment, Python on Different Operating Systems, Running Python Programs from a Terminal. Variables & Simple Data Types: Variables, Strings, Numbers, Comments, The Zen of Python. Working with Lists: What is a List, Changing, Adding, Removing Elements, Organizing a List, Avoiding Index Errors, Looping through an Entire List, Avoiding Indentation Errors, Making Numerical Lists, Slicing a List, Working with Tuples and Dictionaries.
- 2. Basic Constructs:** User Inputs: input() and int() Functions, Accepting Input in Python. Conditional Tests: if Statements, Using if Statement with Lists. While Loop: Introducing while Loops, using a flat, break, continue, Using a while Loop with Lists and Dictionaries.
- 3. Functions, Classes & Modules:** Functions: Defining a Function, Passing Arguments, Return Values, Passing a List, Passing an Arbitrary Number, Storing Your Functions in Modules. Classes: Creating and Using a Class, Working with Classes and Instances, Inheritance, _init_() Method for a Child Class, Overriding Methods, Instances as Attributes, Importing Classes, Modules, Storing Multiple Classes in a Module, Importing Classes from a Module, Importing a Module into a Module.
- 4. Files & Exceptions:** Reading from a File, Reading an Entire File, File Paths, Reading Line-by-line, Making a List of Lines from a File, Working with a File's Contents, Large Files, Writing to a File, Writing to an Empty File, Writing Multiple Lines, Appending to a File. Exceptions: Handling the ZeroDivisionError Exception, Using try-except Blocks, The else Block, Handling the FileNotFoundError Exception, Analyzing Text, Working with Multiple Files

Text Books:

- Python Crash Course by Eric Matthes, 2nd edition, No Starch Press.
- Learning Python by Mark Lutz, 5th edition, O'Reilly Media.

Reference Books:

- Learn Python the Hard Way by Zed A. Shaw, 3rd edition, Addison-Wesley.

24DCSS152: Lab-S2 (Python) (0-0-2) Credits:1

1. Implementation of programs using Python data types and input/output operations. 2. Implementation of programs using decision-making and iterative control structures. 3. Development of applications utilizing functions and string processing techniques. 4. Application of Python data structures, including lists and tuples. 5. Use of built-in modules for problem solving and program development. 6. Design of object-oriented applications using classes and objects. 7. Development of file processing applications involving reading, writing, and data manipulation.
Text Books: • Python Crash Course by Eric Matthes, 2nd edition, No Starch Press. • Learning Python by Mark Lutz, 5th edition, O'Reilly Media. Reference Books: • Learn Python the Hard Way by Zed A. Shaw, 3rd edition, Addison-Wesley.

24DCSS301: Web Programming (2-0-0) Credits:2
Course Objectives: • To introduce the fundamental concepts of Internet technologies, web architecture, and web communication protocols. • To develop skills in designing and developing web pages using HTML5, CSS, and JavaScript. • To provide knowledge of server-side scripting using PHP for form handling and data processing. • To familiarize students with web server configuration and database connectivity for dynamic web applications. Course Outcomes: Upon successful completion of the course, students will be able to: • Explain Internet concepts, web architecture, and communication protocols. • Design and develop interactive web pages using HTML5, CSS, and JavaScript. • Implement server-side applications using PHP for form handling and data processing. • Develop database-driven web applications and perform CRUD operations using MySQL
1. Introduction to Internet and Web Programming: Brief History of the Internet, WWW, Web System Architecture, Protocol used in Internet: TCP/IP, SMTP, Web Servers, Overview of Web Authoring Tools, Design Frameworks. 2. HTML5 & CSS: HTML5, Basic Structures of HTML Documents, HTML5 Semantic Elements: Header, Footer, Article, Section. Ordered & Unordered Lists, Hyperlinks, Working with Table, Working with Forms: Form and Input Tags, Text Box, Radio Button, Checkbox, Select Tag and Pull-Down Lists, Hidden, Submit and Reset, Cascading Style Sheets (CSS) and JavaScript: Benefit of CSS, CSS Properties, CSS Styling, Writing JavaScript into HTML 3. Introduction to PHP: Evaluation of PHP, Basic Syntax, defining variable and constant, Data Types, Operator and Expression, Handling HTML Form With PHP: Capturing Form Data, Dealing with Multi-valued Fields, Conditional Statement, Iterations, Arrays Working with Functions, Working with String. 4. Web Server & Database Connectivity: Introduction to WAMP/XAMPP Server – Configuration and Web Application Deployment, PHP Server Variables, State Management using Session. Database Connectivity with MySql: Connection with MySql Database, Basic Database Operations – Insert, Delete, Update and Select, Setting Query Parameter, Executing Query.
Text Books: • Programming the World Wide Web by Robert W. Sebesta, 8th edition, Pearson. • PHP: The Complete Reference by Steven Holzner, McGraw Hill.

Reference Books:

- Learning PHP MySQL and JavaScript by Robin Nixon, 5th edition, O'Reilly Media.
- Web Technologies by Uttam K. Roy, Oxford University Press.

24DCSS302: Lab-S3(WP) (0-0-2) Credits:1

1. Implementation of Internet-based applications involving DNS lookup and domain information retrieval.
2. Development of web pages using HTML5 elements, lists, hyperlinks, images, and tables.
3. Design of HTML forms using various input controls and form elements.
4. Application of Cascading Style Sheets (CSS) for web page styling and layout design.
5. Development of client-side scripts using JavaScript for computations and dynamic content manipulation.
6. Creation of server-side applications using PHP, including form handling, arrays, and user-defined functions.
7. Development of database-driven web applications using PHP and MySQL connectivity.

Text Books:

- Programming the World Wide Web by Robert W. Sebesta, 8th edition, Pearson.
- PHP: The Complete Reference by Steven Holzner, McGraw Hill.

Reference Books:

- Learning PHP MySQL and JavaScript by Robin Nixon, 5th edition, O'Reilly Media.
- Web Technologies by Uttam K. Roy, Oxford University Press.