DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

CIRCULAR NO.SU/B.Sc./CBC & GS/17/2024

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies/Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, **Academic Council at its meeting held on 08 April 2024 has accepted the following Syllabi under the Faculty of Science & Technology as per Choice Based Credit Grading System** as appended herewith.

Sr.No.	Courses	Semester
1.	B.Sc. Chemistry (Optional)	Vth & VIth semester
2.	B.Sc. Analytical Chemistry (Optional)	Vth & VIth semester
3.	B.Sc. Polymer Chemistry (Optional)	Vth & VIth semester
4.	B.Sc.Biochemistry (Optional)	Vth & VIth semester
5.	B.Sc.Dairy Science & Technology (Optional)	Vth & VIth semester
6.	B.Sc.Microbiology (Optional)	Vth & VIth semester
7.	B.Sc. Botany (Optional)	Vth & VIth semester
8.	B.Sc. Computer Science (Optional)	Vth & VIth semester
9.	B.Sc. Computer Science (Degree)	Vth & VIth semester
10.	B.Sc.Information Technology (Optional)	Vth & VIth semester
11.	B.Sc.Information Technology (Degree)	Vth & VIth semester
12.	Bachelor of Computer Application (Optional)	Vth & VIth semester
13.	Bachelor of Computer Application (Degree)	Vth & VIth semester

This is effective from the Academic Year 2024-25 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar.
-431 004.
REF.NO.SU/2024/ 1786-94
Date:- 21.06.2024.

★★★★★

Deputy Registrar,
Academic Section

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Copy forwarded with compliments to :-

1] **The Principal of all concerned Colleges,**
Dr. Babasaheb Ambedkar Marathwada University,

2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] **The Director, Board of Examinations & Evaluation,** Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

2] The Section Officer,[B.Sc.Unit] Examination Branch, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

3] The Programmer [Computer Unit-1] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

4] The Programmer [Computer Unit-2] Examinations, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

6] The Public Relation Officer, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

7] The Record Keeper, Dr.Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

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Deputy Registrar,
Academic Section

Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar - 431004(MS) India

Undergraduate Bachelor Degree Program
In Science(B.Sc.)
IT (Optional Subject)

Third Year

Course Structure and Curriculum

(Outcome based Curriculum)

Choice Based Credit System

(Effective from Academic Year 2024-25)

Dr. BabasahebAmbedkarMarathwada University

Chhatrapati Sambhajinagar – 431004 (MS) India

Structure and Curriculum for

Bachelor of Science (B. Sc.) Third Year
IT (Optional Subject)

(Choice Based Credit System)

Semester V

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSE-1 A) Discipline Specific Elective	IT-511	DSE-1A(1) (Theory Paper-IX) (Select any one paper from A1/B1)	2 hours	2	50	10	40	20
	IT-512	DSE-1A(2) (Theory Paper-X) (Select any one paper from A2/B2)	2 hours	2	50	10	40	20
	IT-521	Lab course 6 (based on IT-511)	3 hours	1.5	50	10	40	20
	IT-522	Lab course 7 (Seminar)	3 hours	1.5	50	10	40	20
Skill Enhancement course (SEC-3)	IT-513	SEC-3 **Any one skill to be chosen out of two SEC-3(E) , SEC-3 (F)** **SEC-3(E)**: Programming in SCILAB **SEC-3 (F)**: Aptitude and Reasoning	2 hours	2	50	10	40	20
Non-Credit Course	IT-514	Professional Ethics and Moral Values	2 hours					
			14	9	250	50	200	100

Total Credits for Semester V : 9 (Theory : 06 ; Laboratory : 03)

Semester VI

	Course Code	Course Title	Teaching time/week	Credits	Scheme of Examination			
					Max Marks	CIA	UA	Min Marks
Optional I (DSE-1 B) Discipline Specific Elective	IT-611	DSE-1B(1) (Theory Paper-XI) (Select any one paper from A1/B1)	2 hours	2	50	10	40	20
	IT-612	DSE-1B(2) (Theory Paper-XII) (Select any one paper from A2/B2)	2 hours	2	50	10	40	20
	IT-621	Lab course 8 (based on IT-611)	3 hours	1.5	50	10	40	20

	IT-622	Lab course 9 (Project Work /Dissertation)	3 hours	1.5	50	10	40	20
Skill Enhancement course (SEC-4)	IT-613	SEC-4 **Any one skill to be chosen out of two SEC-4(G) , SEC-4 (H)** **SEC-4(G):** R Programming **SEC-4 (H):** Digital Marketing	2 hours	2	50	10	40	20
			15	9	250	50	200	100
Total Credits for Semester VI : 09 (Theory : 06 ; Laboratory : 03)								
Total Credits for three years : Sem I (11.5) + Sem II (11.5) + Sem III (15) + Sem IV (15) + Sem V (09) + Sem VI (09) = 71 Credits								

Discipline Specific Elective (Credit: 02 each)

V Semester			VI Semester		
Code	DSE Code	Title of Paper	Code	DSE Code	Title of Paper
IT-511 (Select any one paper from A1/B1)	DSE-1A(1)	Python-I	IT-611 (Select any one paper from A1/B1)	DSE-2A(1)	Python-II
	DSE-1B(1)	Data Mining		DSE-2B(1)	Data Visualisation
IT-512 Select any one paper from (A2/B2)	DSE-1A(2)	Computer Network	IT-612 (Select any one paper from A2/B2)	DSE-2A(2)	Networking Protocols
	DSE-1B(2)	Software Engineering		DSE-2B(2)	Software Quality Assurance & Testing

Skill Enhancement Courses (Credit: 02 each)

Semester	Code	Skill Code	Title of Paper
V(SEC-III)	IT 513	**SEC-3(E):**	Programming in SCILAB
		SEC-3 (F):	Aptitude and Logical Reasoning
VI (SEC-IV)	IT 613	**SEC-4(G):**	R Programming
		SEC-4 (H):	Digital Marketing

Curriculum for Semester V

Course Code: **IT-511 –DSE-1A(1)**
Course Title: **Python-I**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

1. Enable students to understand Python's syntax and set up their programming environment.
2. Teach core programming concepts like variables, data types, control structures, and data structures.
3. Educate students about Python-specific concepts like functions, classes, exception handling, and file operations.
4. Introduce students to Python libraries and advanced topics like list comprehensions, lambda functions, and regular expressions.

Unit-I: : (10 periods)

Introduction to Python: What is Python and Why Python? , Installing Python and setting up the development environment., Understanding Python syntax and basic data types, Variables and Operators in Python, Conditional Statements: If, Else, Elif, Looping Statements: While loop and For loop, Python Data Structures: Lists, Tuples, Python Data Structures: Sets, Dictionaries.

Unit-II: : (10 periods)

Python Functions, File 1/0, and Exceptions: Introduction to Functions in Python, Defining Functions and Calling them, 3. Function Parameters, Return Values, and Scope, Introduction to Python Modules and Packages, File Operations: Opening, reading, writing, and closing files, Introduction to Exceptions and Error Handling, Try, Except, Else, Finally blocks, Raising and catching exceptions, Introduction to the 'with' statement for simplified File I/O and exception handling.

Unit-III: (10 periods)

Object-Oriented Programming in Python: Understanding the concept of Object-Oriented Programming, Classes and Objects in Python, The **kit** method, class variables, and instance variables, Inheritance in Python, Overriding and Overloading methods, Polymorphism in Python, Encapsulation: Private methods and name mangling, Abstract Classes and Interfaces, Exception Handling in OOP

Unit-IV: (10 periods)

Introduction to Python Libraries, Introduction to NumPy and its applications, Introduction to Pandas for data manipulation, Introduction to Matplotlib for data visualization, Understanding List Comprehensions, Introduction to Lambda functions and Map, Reduce, Filter functions, Generators, Decorators, and Context Managers in Python, Overview of-RegdTar-Expressions in PFfiTri, Introduction to Python's Standard Library, Practice and Review Session.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. "Python Crash Course: A Hands-On, Project-Based Introduction to Programming" by Eric Matthes
2. "Learn Python the Hard Way" by Zed A. Shaw
3. "Automate the Boring Stuff with Python" by Al Sweigart

Additional References:

1. "Fluent Python: Clear, Concise, and Effective Programming" by Luciano Ramalho
2. "Effective Python: 90 Specific Ways to Write Better Python" by Brett Slatkin
3. "Python Cookbook: Recipes for Mastering Python 3" by David Beazley and Brian K. Jones

Course Code: **IT-521**
Course Title: **Lab course 1 (Based on IT-511 –DSE-1A(1))**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

1. Write a Python program to print "Hello, World!"
2. Write a Python program to perform basic arithmetic operations.
3. Write a Python program to check if a number is even or odd using conditional statements.
4. Write a Python program that sorts a list of numbers in ascending order.
5. Write a Python function that checks if a number is a palindrome.
6. Create a Python module with multiple functions and then import it in another Python program
7. Write a Python program that reads a file, prints the content of the file, and counts the number of lines in the file
8. Write a Python program that copies the content from one file to another.
9. Write a Python program that uses try, except, else, and finally blocks.
10. Write a Python program to demonstrate the concept of inheritance.
11. Write a Python program to demonstrate the concept of polymorphism.
12. Write a Python program to demonstrate the concept of encapsulation.
13. Write a Python program to demonstrate the concept of abstraction.
14. Write a Python program using Pandas to read a CSV file and perform basic data manipulation.
15. Write a Python program using Matplotlib to plot a bar chart.
16. Write a Python program that uses list comprehension to create a new list based on an existing one.

Course Code: **IT-511 –DSE-1B(1)**
Course Title: **Data Mining**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

1. Understand the fundamental concepts and motivations behind data mining.
2. Learn and apply basic data pre-processing techniques.
3. Gain the ability to describe, mine, and analyze data patterns and associations.
4. Develop skills to classify and predict data using various algorithms and evaluate their accuracy.

Unit-I: : (10 periods)

Introduction to data mining (DM): Motivation for Data Mining - Data MiningDefinition and Functionalities – Classification of DM Systems - DM task primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process.

Unit-II: : (10 periods)

Data Pre-processing: Data summarization, data cleaning, data integration andtransformation, data reduction, data discretization and concept hierarchy, generation, feature extraction , feature transformation, feature selection, introduction to Dimensionality Reduction, CUR decomposition.

Unit-III: (10 periods)

Concept Description, Mining Frequent Patterns, Associations and Correlations: What is concept description? - Data Generalization and summarization- based characterization - Attribute relevance - class comparisons, Basic concept, efficient and scalable frequent item-set mining methods, mining various kind of association rules, from association mining to correlation analysis, Advanced Association Rule Techniques, Measuring the Quality of Rules.

Unit-IV: (10 periods)

Classification and Prediction: Classification vs. prediction, Issues regarding classification and prediction, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree- Based Algorithms, Neural Network-Based Algorithms, Rule-Based Algorithms, Combining Techniques, accuracy and error measures, evaluation of the accuracy of a classifier or predictor. Neural Network Prediction methods: Linear and nonlinear regression, Logistic Regression Introduction of tools such as DB Miner / WEKA / DTREG DM Tools.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
2. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
3. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
4. Ning Tan, Vipin Kumar, Michael Steinbanch Pang, "Introduction to Data Mining", Pearson Education.

Course Code: **IT-521**
Course Title: **Lab course 1 (Based on IT-511 –DSE-1B(1))**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

Sample List of experiments to be carried out based on the course **CA-512T [A2]**

(The teacher can make use of either of Python and R language or WEKA tool for lab sessions and can add few more practical based on each unit)

1	How would you handle missing values in a dataset? Provide an example and explain your approach.
2	Implement a basic data summarization technique using Python or R.
3	Apply data cleaning techniques to a dataset to handle noise. Explain the steps you took.
4	Use a dataset to demonstrate data integration and transformation methods.
5	Implement data reduction techniques to reduce the volume of a dataset. Evaluate the effectiveness of your approach.
6	Perform feature extraction on a dataset using Principal Component Analysis (PCA). Interpret the results.
7	Select relevant features from a dataset using the Chi-Square Test. Discuss the significance of the selected features.
8	Use the Apriori algorithm to find frequent itemsets in a transaction dataset. Interpret the results.
9	Mine association rules from a dataset and discuss the implications of the discovered rules.
10	Apply correlation analysis to a dataset and interpret the correlation coefficients.
11	Implement a basic classification algorithm (e.g., Naive Bayes) on a dataset. Evaluate its performance using appropriate metrics.
12	Use k-Nearest Neighbors (k-NN) algorithm for classification. Compare the results with the previous classification algorithm.
13	Train a simple neural network model (e.g., perceptron) for classification tasks. Discuss the advantages and limitations of neural networks.
14	Evaluate the accuracy of different classification models using confusion matrix, precision, and recall metrics. Compare the performance of the models.

Course Code: **IT-512 – DSE-1A(2)**
Course Title: **Computer Networks**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

1. Understand the fundamental concepts of computer networks and their applications.
2. Gain knowledge of the layered network architecture and various network protocols and services.
3. Understand the functions and operation of various network layers, including the physical, data link, network, transport, and application layers.
4. Gain knowledge of network security threats and vulnerabilities, as well as various security protocols and encryption techniques.

Unit-I: : (10 periods)

Introduction:

Overview of computer networks and their applications, Network topologies and architectures, Layered network architecture and the OS I reference model, Network protocols and services.

Unit-II: : (10 periods)

Physical Layer and Data Link Layer:

Overview of the physical layer and its functions, Transmission media and their characteristics, Data encoding and modulation techniques, Error detection and correction, Data link layer and its functions, Framing, flow control, and error control in data link layer protocols.

Unit-III: (10 periods)

Network Layer and Transport Layer:

Overview of the network layer and its functions, Routing algorithms and protocols, IPv4 and IPv6 addressing and routing, Transport layer and its functions, Reliable data transfer and flow control, TCP and UDP protocols.

Unit-IV: (10 periods)

Application Layer and Security:

Overview of the application layer and its functions, Client-server and peer-to-peer architectures, Common application layer protocols (HTTP, FTP, SMTP, DNS), Network security threats and vulnerabilities, Cryptography and encryption techniques, Security protocols (SSL/TLS, IPSec, VPN),

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. "Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall
2. "Data Communications and Networking" by Behrouz A. Forouzan

Additional Reference:

1. "TCP/IP Protocol Suite" by Behrouz A. Forouzan-
2. "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross
3. "Networking Essentials" by Jeffrey S. Beasley and Piyasat Nilkaew

Course Code: **IT-512 – DSE-1B(2)**
Course Title: **Software Engineering**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

1 To study Software Development Life Cycle,
2 To study different Software Development models
3 To study Agile Software development.
4 To study software project planning
5 To study software cost estimation.

Unit-I: : (10 periods)

Introduction to Software and Software Engineering

The nature of Software, Defining software, Software application domain, legacy software, Unique Nature of WebApps, Software Engineering the Process, Practice, the essence of practice, general principles, Software Myths

Unit-II: : (10 periods)

Software Process Models: Generic Process model, Defining a framework activity, Identifying a task set, process patterns., Process assessment and Improvement, Prescriptive Process Models the waterfall model, Incremental, Evolutionary process Models, concurrent models.

Unit-III: (10 periods)

Specialized Process Models, Component based development, the formal method model, Aspect oriented, Software development, the unified Process and its phases, Personal and team Process Models.Agile Development: what is an Agile and Agile process, Agility principles, politics of agile development, human factors.

Unit-IV: (10 periods)

Software Project Planning: Observations on Estimating, Project Planning Objectives, Software Scope, Obtaining Information Necessary for Scope, Feasibility, Resources, Human Resources, Reusable Software Resources, Environmental Resources, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, The COCOMO Model.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. "Software Engineering a Practitioner Approach" by Roger S. Pressman.
2. "An integrated Approach to software Engineering" by Pankaj Jalote
3. "Software Engineering Concepts" By Richard Fairley

Course Code: **IT-522**
Course Title: **Seminar**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

Guidelines for seminar:

1. Student should select any topic associated with current trends in computer field individually.
2. The topic should be other than the curriculum.
3. A report is to be submitted.
4. A presentation on the topic choose is to be delivered by the student in the examination.

Course Code: **IT-513 – SEC-3 (E)**
Course Title: **Programming in SCILAB**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

1. To explore the various basic feature of SCILAB for a user who has never used numerical computation software.
2. Computations, graphs and illustrations are made with SCILAB

Unit-I: : (10 periods)

Introduction to Programming: Components of a computer, working with numbers, Machine code, Software hierarchy. Programming Environment: SCILAB Environment, Workspace, Working Directory, Expressions, Constants, Variables and assignment statement, Arrays.

Unit-II: : (10 periods)

Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save. Matrices and Some Simple Matrix Operations, Sub- Matrices. Procedures and Functions: Arguments and return values.

Unit-III: (10 periods)

Control Statements: Conditional statements: If, Else, Else-if, Repetition statements: While, for loop.

Unit-IV: (10 periods)

Manipulating Text: Writing to a text file, Reading from a text file, Randomising and sorting a list, searching a list.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. M.Affouf, SCILAB by Example , CreateSpace Independent Publishing Platform, 2012
2. H. Ramchandran, A.S. Nair, SCILAB , S.Chand, 2011

Course Code: **IT-513 – SEC-3 (F)** Course Title: **Aptitude and Logical Reasoning** Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)
Objective This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.
Unit-I: (10 periods) Quantitative Ability: LCM and HCF, Decimal Fractions, Simplification, Square Roots and Cube Roots, Average, Problems on Ages, Surds & Indices, Percentages, Problems on Numbers.
Unit-II: : (10 periods) Quantitative Ability : Logarithm, Permutation and Combinations, Probability, Profit and Loss, Simple and Compound Interest, Time, Speed and Distance,Time & Work, Ratio and Proportion, Area.
Unit-III: (10 periods) Data Interpretation: Data Interpretation, Tables, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Venn Diagrams
Unit-IV: (10 periods) Logical Reasoning: Analogy, Blood Relation, Directional Sense, Number and Letter Series, Coding – Decoding, Calendars, Clocks, Seating Arrangement
UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
2. Analytical and Logical reasoning By Sijwali B S
3. Quantitative aptitude for Competitive examination By R S Agarwal
4. Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4 th edition
5. Quantitative Aptitude & Data Interpretation – Disha Expert
6. Quantitative Aptitude for Competitive Examinations – Dinesh Khattar
7. Fast Track Objective Arithmetic – Rajesh Verma
8. Logical Reasoning and Data Interpretation for CAT by Pearson

Curriculum for Semester VI

Course Code: **IT-611 –DSE-2A(1)**
Course Title: **Python -II**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

1. Understand databases and SQL fundamentals, including sqlite3 usage in Python.
2. Master database connectivity and management using Python's sqlite3 module.
3. Execute CRUD operations, manage transactions, and ensure data integrity in sqlite3 databases with Python.
4. Design efficient database schemas and integrate sqlite3 functionalities into Python applications.

Unit-I: : (10 periods)

Introduction to Databases in Python:

- Understanding the Purpose and Types of Databases, including data storage, management, retrieval, integrity, and security, and exploring relational, NoSQL, in-memory, NewSQL, time-series, object-oriented, hierarchical, and network databases.
- Overview of sqlite3 and Its Usage in Python, encompassing the features of sqlite3 such as serverless, self-contained, and zero-configuration nature, common use cases, and the process of installing and setting up sqlite3.

Basic SQL Commands with sqlite3:

Creating and Managing Databases and Tables, involving tasks like creating a new sqlite3 database, defining schema, and altering table structure.

Unit-II: : (10 periods)

Connecting to sqlite3 Database:

- **Establishing Connections to sqlite3 Databases Using Python:**
  - Importing sqlite3 module.
  - Connecting to a sqlite3 database file.
  - Handling connection errors.
- **Creating Database Connections and Cursors:**
  - Creating a cursor object.
  - Using the cursor to execute SQL commands.
  - Closing connections and cursors properly.

Unit-III: (10 periods)

CRUD Operations with Python and sqlite3:

- **Implementing CRUD (Create, Read, Update, Delete) Operations on sqlite3 Databases Using Python:**
  - Writing Python functions for each CRUD operation.
  - Executing CRUD operations through Python scripts.
  - Handling exceptions and ensuring data integrity.
- **Executing Basic SQL Commands (CREATE, INSERT, SELECT, UPDATE, DELETE) Using sqlite3:**
  - Writing and executing SQL commands in Python.
  - Inserting data into tables.

- Selecting and querying data.
- Updating and deleting data from tables.

Unit-IV: (10 periods)

Transactions and Error Handling:

- **Managing Transactions and Implementing Error Handling in sqlite3 Database Operations:**
  - Understanding transactions and their importance.
  - Using BEGIN, COMMIT, and ROLLBACK.
  - Implementing try-except blocks for error handling.
  - Ensuring atomicity, consistency, isolation, and durability (ACID properties).

Query Execution and Data Retrieval:

- **Executing SQL Queries with Parameters:**
  - Preventing SQL injection using parameterized queries.
  - Using placeholders and binding parameters.
- **Fetching and Processing Query Results:**
  - Retrieving data using fetchall(), fetchone(), and fetchmany().
  - Iterating over result sets.
  - Converting result sets to dictionaries or other data structures.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. "Python SQLite3 Documentation"
2. "SQL Fundamentals" by Joe Celko

Online Resources:

1. SQLite Tutorial at SQLite.org
2. Real Python SQLite Tutorial

Course Code: **IT-621**
Course Title: **Lab course 1 (Based on IT-611 –DSE-2A(1))**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

1	Set up the sqlite3 environment in Python and verify the installation.
2	Create a new sqlite3 database file and establish a connection to it using Python.
3	Write and execute basic SQL commands (CREATE TABLE, INSERT INTO, SELECT, UPDATE, DELETE) using sqlite3 in Python.
4	Design and create a schema for a sample database using sqlite3 in Python.
5	Establish a database connection to an existing sqlite3 database file and verify the connection in Python.
6	Create and execute a Python script to retrieve data from a sqlite3 database using SELECT queries.
7	Implement error handling in Python scripts for database connection errors and SQL query execution errors.
8	Develop Python functions to perform CRUD operations (Create, Read, Update, Delete) on sqlite3 databases.
9	Implement transactions in Python scripts using sqlite3 to ensure data consistency and integrity.
10	Write a Python program to execute batch processing operations on sqlite3 databases.
11	Handle SQL exceptions in Python scripts using try-except blocks with sqlite3 operations.
12	Configure and utilize connection pooling in Python programs to optimize database connection management.
13	Develop a Python application using sqlite3 to manage a real-world dataset, including database creation, data insertion, and retrieval.

Course Code: **IT-612 – DSE-2A(2)**
Course Title: **Data Visualization**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

- Create effective and visually appealing data visualizations using Python and R.
- Efficiently clean, transform, and prepare datasets for visualization.
- Develop interactive and dynamic visualizations using Plotly.
- Apply principles of color theory and visual aesthetics to enhance data visualizations.

Unit-I: : (10 periods)

Introduction - Basic ideas behind blockchain, How it is changing the landscape of digitalization, Cryptographic basics for cryptocurrency, A short overview of hashing, Signature schemes, Encryption schemes and elliptic curve cryptography

Unit-II: : (10 periods)

Models for Blockchain - The Consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on permission-less, nameless, peer- to-peer network, Abstract Models for Blockchain, GARAY model, RLA Model, Proof of Work (PoW) as random oracle, formal treatment of consistency, liveness and fairness, Proof of Stake (PoS) based Chains, Hybrid models (PoW + PoS)

Unit-III: (10 periods)

Mechanics of Bitcoin Bitcoin, Wallet, Blocks, Merkley Tree, Bitcoin transactions, Transaction verifiability, Anonymity, Forks, Double spending, Mathematical analysis of properties of Bitcoin, Bitcoin scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements, How to store and use Bitcoins, Simple local storage, Hot and cold storage, Splitting and sharing keys, Online wallets and exchanges, Payment services, Transaction fees, Currency exchange markets

Unit-IV: (10 periods)

Alternative coin and Recent Trends Ethereum, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Smart Contracts, some attacks on smart contracts, Zero Knowledge proofs and protocols in Blockchain, Succinct non interactive argument forKnowledge (SNARK), pairing on Elliptic curves, Zcash

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder Princeton University Press
2. SoK: Research Perspectives and Challenges for Bitcoin and Cryptocurrency by Joseph Bonneau et al IEEE Symposium on Security and Privacy, 2015
3. The bitcoin backbone protocol - analysis and applications by J.A.Garay et al EUROCRYPT 2015 LNCS VOl 9057, (VOLII), pp 281-310

Course Code: **IT-621** Course Title: **Lab course 1 (Based on IT-611 –DSE-2B(1))** Total Credits: 1.5 Contact Hours: 03 Hours (Week) Marks: 50
1. Create different types of Blockchain bitcoin wallet. 2. Do the Bitcoin Transaction from bitcoin wallet. 3. Implement Merkley tree hash algorithm. 4. Set up an environment for Ethereum on Windows and Linux. 5. Install & setup Ethereum wallet and send/receive ether. 6. Create smart contracts using solidity. 7. Create smart contract for connect with the front end (web page). 8. Implement smart contract to send ether to another contract/address. 9. Implement smart contract for deposit and withdrawals money from digital bank. 10. Implement zero knowledge proof protocol using blockchain.

Course Code: **IT-611 –DSE-2B(1)**
Course Title: **Networking Protocols**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objective

- The major components of computer based information systems is computer networks. Through computer networks we can share hardware, Software, Processing, Data and Applications besides getting global connectivity for internet based communication and services.
- to make students learn the technology of establishing, commissioning (making operational) and maintaining computer networks.

Unit-I: : (10 periods)
Optical Networking : Introduction to Optical Networking, SONET / SDH Standard, DWDM

Unit-II: : (10 periods)
ATM: The WAN Protocol : Introducing ATM Technology, Introducing Faces of ATM, Explaining the basic concepts of ATM Networking, Exploring the B-ISDN reference model, Explaining the Physical Layer, Explaining the ATM Layer, Explaining the ATM Adaptation Layer, Exploring ATM Physical interface, Choosing an Appropriate ATM Public Service.

Unit-III: (10 periods)
Packet Switching Protocols : Introduction to Packet Switching, Introduction to Virtual Circuit Packet Switching, Introduction to X.25, Introducing switched multimegabit data service

Unit-IV: (10 periods)
Protocols and Interfaces in Upper Layers of TCP/IP : Introducing TCP/IP suite, Explaining Network Layer Protocols, Explaining Transport Layer Protocol, Explaining Application Layer Protocol.

UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. Advance Computer Network, By Dayan and Ambawade, Dr. Deven shah,Prof. Mahendra Mehra,Wiley India

2. High-Speed Networks and Internets, Performance and Quality of Service,Second Edition, William Stallings, Pearson

3. TCP/IP Protocol Suite by Behrouz A. Forouzan

4. Computer Networks, Andrew Tanenbaum, 5th Edition, Pearson Education.

Course Code: **IT-612 – DSE-2B(2)**
Course Title: **Software Quality Assurance and Testing**
Total Credits: 02
Contact Hours: 30 (Clock Hours)
Marks: 50
Periods: 45 (45 minutes each)

Objectives

1. To understand the basic view of software quality and quality factors.
2. To understand the Software Quality Assurance (SQA) architecture and the details of its components.
3. To understand how the SQA components can be integrated into the project life cycle.
4. To be familiar with the software quality infrastructure

Unit-I: : (10 periods)
Introduction to software Quality and Assurance, The software quality challenge, Software quality, Software quality factors, Management and its role in software quality assurance, Components of SQA, The components of the software quality assurance system – overview, Pre-project Software Quality Components, Contract review, Development and quality plans.

Unit-II: : (10 periods)
SQA Components in the Project Life Cycle and Strategies, Integrating quality activities in the project life cycle, Reviews, Software testing – strategies

Unit-III: (10 periods)
Software Testing – Implementation: Software Quality Implementation, Assuring the quality of software maintenance components, Assuring the quality of external participants' contributions, CASE tools and their effect on software quality

Unit-IV: (10 periods)
Software Quality Infrastructure Components Procedures and work instructions, Staff training and certification, Corrective and preventive actions, Documentation control, Software Quality Metrics, Software Quality metrics, Cost of Quality

UNIT-5: Tutorial and Assignment (05 periods)

Reference Books:-

1) Quality and Management Standards (ISO, CMMi, ISO/IEC, IEEE, EIA).
2) KshirsagarNaik and PriyadarshiTripathy, Software Testing & Quality Assurance-Theory and Practice, Wiley Student edition
3) William E. Perry, Effective Methods for Software Testing, WILLEY, . 3rd Edition
4) Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press, 1997.
5) M G Limaye, Software Testing, Tata McGraw-Hill Education, 2009

Course Code: **IT-622**
Course Title: **Project Work / Dissertation**
Total Credits: 1.5
Contact Hours: 03 Hours (Week)
Marks: 50

Guidelines :-

1. The synopsis approval will be given by the project Guides
2. The Project work should be either an individual (one) or a group of not more than three members.
3. The project work/Dissertation will focused on survey, planning, designing, coding and testing of the project.
4. The project report will content at least following documentation
    a. Abstract of the project.
    b. Current system
    c. Proposed system.
    d. User Interview.
    e. Feasibility Study report.
    f. Data Flow Diagram
    g. E-R Diagram
    h. Data Dictionary/ Table Structure
    i. Sample Screen Layouts
    j. Limitations.
    k. Conclusion.

Course Code: Course Title: **R-Programming** Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)
Objective 1. Student will learn how to program in R 2. Student will learn how to use R for effective data analysis. 3. Student will learn reading data into R, accessing R packages, 4. Student will learn writing R functions, debugging, profiling R code
Unit-I: (10 periods) Basics to get started up with R. The Background Materials lesson contains Information about course mechanics and installation of R. History of R, basic data types in R, functions for reading and writing data. Operator Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Miscellaneous Operators.
Unit-II: : (10 periods) control structures and functions. Decision Making statements if statement, if...else statement, switch statement, if...else Ladder, ifelse0 function, Loop Introduction, for loop, while Loop, repeat Loop, Break Statement, Next Statement.
Unit-III: (10 periods) loop functions and the debugging tools in R. Matrix Introduction, Matrix Construction, Addition & Subtraction, Multiplication & Division. Simulation Studio, Simulate data in R, profiler in R, data frame introduction and details.
Unit-IV: (10 periods) Filtering and sub setting data aggregate functions, profiling to optimize the R program. str function. Input types CSV, Excel files reading and writing data. Graphics procedures, plot function.
UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. R in Action By Robert L. Kabacoff paperback publisher- Dreamtech Press
2. R for Data Science By Hadley Wickham and Garrett Gorlemund, O'Reilly Publication.

Course Code: **IT-613 – SEC-3 (H)** Course Title: **Digital Marketing** Total Credits: 02 Contact Hours: 30 (Clock Hours) Marks: 50 Periods: 45 (45 minutes each)
Objective To understand the basic Concepts of Digital marketing and the road map for successful Digital marketing strategies.
Unit-I: : (10 periods) Fundamentals of Digital marketing & Its Significance, Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape, Key Drivers, Digital Consumer & Communities
Unit-II: : (10 periods) The Digital users in India, Digital marketing Strategy- Consumer Decision journey, POEM Framework, Segmenting & Customizing messages, Digital advertising Market in India, Skills in Digital Marketing, Digital marketing Plan.
Unit-III: (10 periods) Terminology used in Digital Marketing, PPC and online marketing through social media, Social Media Marketing, Keyword advertising, Google web-master and analytics overview, Affiliate Marketing, Email Marketing, Mobile Marketing
Unit-IV: (10 periods) Introduction to SEO, How Search engine works, SEO Phases, History Of SEO, How SEO Works, What is Googlebot (Google Crawler), Types Of SEO technique, Keywords, Keyword Planner tools.
UNIT-5: Tutorial and Assignment (05 periods)

Core Reference:

1. Digital Marketing, S.Gupta, McGraw-Hill
2. Digital Marketing –Kamat and Kamat-Himalaya
3. Marketing Strategies for Engaging the Digital Generation, D. Ryan