KRISHNA UNIVERSITY

RUDRAVARAM, MACHILIPATNAM-521003, (A.P), India

Minutes of the offline Board of Studies (BOS) meeting in **UG Data Analytics** held on Wednesday, 18 June, 2025 at 11 AM through off line mode.

Dr .R.Kiran Kumar
Associate Professor, Dept. of computers
Krishna University, Machilipatnam - 521001
Mobile: 9440872455,
Email: kirankreddi@gmail.com

Members:

1. Dr.R.Kiran Kumar
   Associate Professor,
   Krishna University, Rudravaram, Machilipatnam - 521004
   Mobile:9440872455
   Mail id: kirankreddi@gmail.com

2. Sri M.Naga Babu
   Lecture in Mathematics
   SSR Degree College, Machilipatnam-521001
   Mobile:8247718864
   Mail id: nagababumasteru@gmail.com

3. Sri P Ravi Kumar
   Lecture in Statistics
   Pavitra Degree college, Machilipatnam-521001
   Mobile: 7036229741
   Mail id: ravi_pamarti@yahoo.in

4. Sri D.V.Ravi Kiran
   Lecture in Computer Science
   SSR Degree College, Machilipatnam-521001
   Mobile: 9248771522
   mail id: venkata.rkurs@gmail.com

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5. Sri O.Rajesh
   Managing Director
   Raj Info Solutions,Machilipatnam-521001.
   Mobile:8520944933
   Mail id: rajinfosolutions.tech@gmail.com

O. Rajesh
18/06/25

6. Dr.M.Babu Reddy
   Assistant Professor
   Krishna University,Rudravaram,Machilipatnam-521004
   Mobile: 9963436460
   Mail id: m_babureddy@yahoo.in

7. Miss Ch.Harika
   (Regd no: Y233258052)
   I B.Sc Data Analytics
   Student Representative
   SSR Degree College,Machilipatnam-521001
   mobile:6304807686
   email: harikachabandi@gmail.com

Ch. Harika

8. Miss A.Mounika
   (Regd no: Y233258045)
   I B.Sc Data Analytics
   SSR Degree College, Machilipatnam-521001
   Mobile: 8179738700
   mail id: alladamounika@gmail.com

A. Mounika

No.of Members Present: 08

No.of Members Absent: Nil

Signature of the Chairperson with Offical stamp

Chairman
Board of Studies in Computer Science
Krishna University
Rudravaram, MACHILIPATNAM

KRISHNA UNIVERSITY

RUDRAVARAM, MACHILIPATNAM-521003, (A.P), India

Agenda:

1. To verify and approval of the revised Under Graduation (UG) syllabus of **B.Sc Data Analytics** under CBCS framework with effect from 2023-24 as per the guidelines of the Andhra Pradesh State Council of Higher Education (APSCHE-AC).

Resolutions:

The following resolutions were unanimously passed in the Board of Studies meeting held on Wednesday, 18 June, 2025 at 11.00 AM through off line mode.

1. It is resolved to approve revised under graduate (UG) syllabus of **B.Sc Data Analytics** under CBCS framework with effect from 2023-24 as per the guidelines and frame work of the Andhra Pradesh State Council of Higher Education (APSCHE) for the semesters II, III ,IV,V,VII and VIII syllabus accepted in toto.

2. It is resolved to approve the syllabus **Data Analytics** of proposed by Andhra Pradesh State Council of Higher Education (APSCHE) in toto with effect from 2023-24

Date :

Signature of the Chairperson with Offical stamp

M. Nagesh

Ch. Harika

A. Mounika

O. Rajesh

COURSE STRUCTURE
BACHELOR OF SCIENCE (B. Sc.) Data Analytics
2023-24 Batch onwards
w.e.f 2023-2024

S.No	Year	semester	Course	Title	Hrs/Week	Credits
1	I	I	1	Essentials and applications of Mathematical, Physical and Chemical Sciences	5	4
2			2	Advances in Mathematical, Physical and Chemical Sciences	5	4
3		II	3	Descriptive Statistics (T)	3	3
				Descriptive Statistics Lab (P)	2	1
4			4	Foundation of Data Analytics(T)	3	3
				Foundation of Data Analytics Lab (P)	2	1
5	II	III	5	Discrete Mathematics (T)	3	3
				Programming for Data Analytics I lab (P)	2	1
6			6	Probability Theory and Distributions (T)	3	3
				Probability Theory and Distributions lab(P)	2	1
7			7	Introduction to Python Programming(T)	3	3
				Introduction to Python Programming Lab(P)	2	1
8			8	Cloud Computing (T)	3	3
				Cloud Computing Lab (P)	2	1
9		IV	9	Linear Algebra (T)	3	3
				Programming for Data Analytics II lab (P)	2	1
10			10	Data Mining (T)	3	3
				Data Mining Lab (P)	2	1
11			11	Data Analytics with Python Programming(T)	3	3
				Data Analytics with Python Programming Lab(P)	2	1
12	III	V	12	Machine Learning(T)	3	3
				Machine Learning Lab(p)	2	1
13			13	R Programming(T)	3	3
				R programming lab(P)	2	1
14			14	Web Interface Designing Technologies (T)	3	3
				Web Interface Designing Technologies Lab (P)	2	1
15			15	Artificial Intelligence(T)	3	3
				Artificial Intelligence lab(P)	2	1
16	III	VI	16	Internship		
17	IV	VII	17	Advanced Databases(T)	3	3
				Advanced Databases Lab(p)	2	1
18			18	Introduction to Data Science(T)	3	3
				Introduction to Data Science Lab (P)	2	1
19			19	Web Security (T)	3	3
				Web Security Lab (P)	2	1
				SEC		
20			20	Bioinformatics (T)	3	3
				Bioinformatics Lab (P)	2	1
21			21	Digital Forensics (T)	3	3
				Digital Forensics lab(P)	2	1

COURSE STRUCTURE
BACHELOR OF SCIENCE (B. Sc.) Data Analytics
2023-24 Batch onwards
w.e.f 2023-2024

S.No	Year	semester	Course	Title	Hrs/Week	Credits
22	IV	VIII	22	Introduction to Digital Technology(T)	3	3
				Introduction to Digital Technology Lab(p)	2	1
23			23	Big Data and Hadoop (T)	3	3
				Big Data and Hadoop lab(P)	2	1
24	IV	VIII	24	Augmented Reality and Virtual Reality (T)	3	3
				Augmented Reality and Virtual Reality Lab (P)	2	1
			SEC			
25			25	Research Methodology and IPR(T)	3	3
				Research Methodology and IPR lab(P)	2	1
26			26	Software Engineering and Testing (T)	3	3
				SoftwareEngineering and Testing lab(P)	2	1

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VII : Syllabus
w.e.f 2023-2024
Course -16 : Advanced Databases

Theory **Credits-3** **3hrs/week**

UNIT I

Database Analysis and Design Techniques: Review of basic Database Concepts and database Design Methodologies. ER Modeling: Specialization, Generalization, Aggregation, Normalization Theory. Database Implementation using UML: Introduction to UML, Structure diagrams, behavioral diagrams, object-oriented analysis, class diagram, Advanced Transaction Processing, and Concurrency Control: Transaction Concepts, Concurrency Control: Locking Methods, Time stamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems.

(18 hours)

UNIT II

Query Compiler: Introduction, parsing, generating logical query plan from parse tree. Query Processing: Physical-Query-plan Operators. Operations: selection, sorting, join, project, set. Query Evaluation: Introduction, Approaches to QE, Transformation of relational expressions in Query optimization, heuristic optimization, cost estimation for various operations, transformation rule. **(18 hours)**

UNIT III

Distributed Database: Centralized DBMS and Distributed DBMS, functions and architecture of a DDBMS, Distributed Data Storage, Transparency issues in DDBMS, Query Processing DDBMS, Distributed transaction Management and Protocols, Distributed Concurrency Control and Deadlock Management. **(18 hours)**

UNIT IV

Object-oriented database: Limitations of RDBMS, Need of Complex Datatype, Data Definition, ODBMS Fundamentals, issues in OODBMS, Object-oriented database design. Comparison of ORDBMS and OODBMS. **(18 hours)**

UNIT V

Emerging Database Models, Technologies and Applications Multimedia database-Emergence, difference from other data types, structure, deductive databases, GIS and spatial databases, Knowledge database, Information Visualization, Wireless Networks and databases, Personal database, Digital libraries, web databases, case studies.

(18 hours)

TEXTBOOKS:

[1] Advanced database management system by RiniChkrabarti and Shibhadra Dasgupta, Dreamtech.
[2] Distributed Databases by Ozsu and Valduriez ,Pearson Education.

REFERENCE BOOKS:

[1] Fundamentals of Database Systems by Ramez Elmasri, Shamkant Navathe, Pearson Education.
[2] Database System Concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Tata McGraw-Hill.

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
w.e.f 2023-2024
Semester –VII : Syllabus
Course -16: Advanced Databases

Practical	**Credits-1**	**2hrs/week**

1. Advanced SQL Queries
- Write **nested queries** and **joins** (INNER, OUTER, LEFT, RIGHT) on a university database.

2. Triggers and Stored Procedures
- Create **triggers** for automatic logging of updates in a transaction table.
- Write a **stored procedure** to calculate employee bonuses.

3. Indexing and Optimization
- Implement **B-Trees** and **Hash Indexing** for faster search.
- Use **EXPLAIN PLAN** to analyse query performance.

4. Transactions and Concurrency Control
- Simulate **ACID properties** using multiple concurrent transactions.
- Implement **locking mechanisms** (shared and exclusive locks).

5. Views and Materialized Views
- Create a **view** for department-wise employee salaries.
- Use **Materialized Views** for faster aggregation queries.

6. NoSQL with MongoDB
- Create and query a **MongoDB** collection for an online shopping database.
- Perform **CRUD operations** and use **aggregation pipelines**.

7. JSON and XML Data Handling
- Store and retrieve **JSON data** in **PostgreSQL**.
- Use **XML queries** in MySQL.

8. Data Warehousing and OLAP
- Implement **star schema** and run **OLAP operations** (Roll-up, Drill-down, Slice, Dice).

9. Graph Databases (Neo4j)
- Model and query a **social network database** using **Cypher queries**.

10. Advanced Data Mining Queries
- Use **SQL for data mining tasks** like clustering, association rules, and predictions.

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B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VII : Syllabus
w.e.f 2023-2024
Course -17: Introduction to Data Science

Theory **Credits-3** **3hrs/week**

UNIT I

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications**. (18 hours)**

UNIT II

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources**.** **(18 hours)**

UNIT III

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

(18 hours)

UNIT IV

Data visualization-Introduction, Types of data visualization, Data for Visualization- Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings. **(18 hours)**

UNIT V

Applications of Data Science, Technologies for visualization, Bokeh (Python), Recent trends in various data collection and analysis techniques, various visualization techniques, and application development methods of used in data science. **(18 hours)**

TEXTBOOKS:

[1] Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
[2] Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press.

REFERENCE BOOKS:

[1] Data science and analytics, 1st edition, V.K.Jain, Khanna Publlications,2018.

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
w.e.f 2023-2024
Semester –VII: Syllabus
Course -17: Introduction to Data Science Lab

Practical **Credits-1** **2hrs/week**

1. Data Preprocessing
- Load a dataset using **Pandas**.
- Handle **missing values** (mean/mode imputation, drop rows).
- Perform **feature scaling** (normalization, standardization).

2. Exploratory Data Analysis (EDA)
- Generate **summary statistics** (mean, median, mode, variance).
- Identify **outliers** using boxplots.
- Perform **correlation analysis** between features.

3. Data Visualization
- Plot histograms, scatter plots, and bar charts using **Matplotlib/Seaborn**.
- Create a **heatmap** for correlation visualization.

4. Probability and Statistics in Data Science
- Compute **mean, median, mode, standard deviation, variance**.
- Simulate **random variable distributions** (normal, binomial, Poisson).

5. Linear Regression
- Implement **Simple Linear Regression** using **Scikit-learn**.
- Predict values and visualize the regression line.

6. Classification using Logistic Regression
- Train a **logistic regression model** on a dataset (e.g., Titanic survival).
- Evaluate using **accuracy, precision, recall, F1-score**.

7. Clustering using K-Means
- Apply **K-Means clustering** to a dataset.
- Visualize clusters using a **scatter plot**.

8. Principal Component Analysis (PCA)
- Perform **dimensionality reduction** using PCA.
- Visualize the data in **2D/3D space**.

9. Decision Tree and Random Forest Classifiers
- Train a **decision tree** and **random forest** on a dataset.
- Compare performance using **confusion matrix and accuracy score**.

10. Big Data Processing using PySpark
- Load and analyze a large dataset using **Apache Spark (PySpark)**.
- Perform **basic transformations** (filter, groupBy, aggregate).

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VII : Syllabus
w.e.f 2023-2024
Course -18: Web Security

Theory **Credits-3** **3hrs/week**

UNIT I

Introduction: web security forensic lesson, Web languages, Introduction to different web attacks. Overview of N-tier web applications, Web Servers-Apache, IIS.(**18 hours)**

UNIT II

Securing the Communication Channel- Understanding the dangers of an insecure communication channel. Practical advice on deploying HTTPS, and dealing with the impact on your application. Insights into the latest evolutions for HTTPS deployments.

(**18 hours)**

UNIT III

Web Hacking Basics- HTTP & HTTPS URL, Web under the Cover Overview of Java security Reading the HTML source, Applet Security Servlets Security Symmetric and Asymmetric Encryptions, Network security Basics, Firewalls & IDS. (**18 hours)**

UNIT IV

Securely Handling Untrusted Data-Investigation of injection attacks over time. Understanding the cause behind both server-side and client-side injection attacks. Execution of common injection attacks, and implementation of various defenses

(18 hours)

UNIT V

Preventing Unauthorized Access: Understanding the interplay between authentication, authorization, and session management. Practical ways to secure the authentication process, prevent authorization bypasses and harden session management mechanisms, Securing Large Applications, and Cyber Graffiti. **(18 hours)**

TEXT BOOKS:

[1] McClure, Stuart, Saumil Shah, and Shreeraj Shah. Web Hacking: attacks and defense. Addison Wesley. 2003.
[2] Garms, Jess and Daniel Somerfield. Professional Java Security. Wrox. 2001.

REFERENCE BOOKS:

1. Collection of Cryptography Web Sites, Publications, FAQs, and Reference Books::http://world.std.com/~franl/crypto.html
2. FAQ: What is TLS/SSL? http://www.mail.nih.gov/user/faq/tlsssl.htm
3. The Open SSL Project (SDKs for free download): http://www.openssl.org/
4. Windows & .NET security updates Web site: http://www.ntsecurity.net/
5. Preventing Unauthorized access Web site: https://www.edx.org/course/web-security-fundamentals

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC. Honours (Data Analytics) MAJOR - 2023-24
w.e.f 2023-2024
Semester –VII: Syllabus
Course -18: Web Security Lab

Practical **Credits-1** **2hrs/week**

1. SQL Injection Attack & Prevention
- Perform an **SQL injection attack** on a vulnerable web form.
- Implement **prepared statements** to prevent SQL injection.

2. Cross-Site Scripting (XSS)
- Inject a **malicious script** into a comment section.
- Implement **input validation** and **Content Security Policy (CSP)** to prevent XSS.

3. Cross-Site Request Forgery (CSRF)
- Perform a **CSRF attack** to change user details.
- Secure forms using **CSRF tokens**.

4. Broken Authentication & Session Management
- Implement a **vulnerable login system**.
- Fix it using **secure password hashing (bcrypt/scrypt)** and **session expiration**.

5. File Upload Vulnerability
- Upload a **malicious script** disguised as an image.
- Implement **file type validation** and **secure storage**.

6. Man-in-the-Middle (MITM) Attack Simulation
- Capture unencrypted credentials using **Wireshark**.
- Secure communication using **HTTPS/TLS**.

7. Secure API Development
- Create a **REST API** with authentication vulnerabilities.
- Implement **JWT tokens** and **OAuth 2.0** for security.

8. Cryptography in Web Security
- Implement **AES encryption** for securing user data.
- Hash passwords using **SHA-256** with salting.

9. Security Headers Implementation
- Analyze a website using **securityheaders.com**.
- Add **HTTP headers** like **X-Frame-Options, HSTS, X-XSS-Protection**.

10. Web Application Firewall (WAF)
- Set up **ModSecurity (WAF)** on an Apache/Nginx server.
- Test by blocking **malicious requests**.

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VII : Syllabus
w.e.f 2023-2024
Course -19: Bioinformatics

Theory **Credits-3** **3hrs/week**

UNIT I

History of bioinformatics-History of Bioinformatics-role of Bioinformatics in biological sciences- scope of bioinformatics -introduction to the Internet- network basics- LAN & WAN standards-network topologies and protocols- FTP- HTTP - a division of Bioinformatics- Bioinformatics and internet-challenges in Bioinformatics. (**18 hours)**

UNIT II

Databases in bioinformatics-Databases in Bioinformatics- Genbank- NCBI- EMBL- DDBJ - UniGene- SGD- EMI Genomes- protein databases-PIR- SWISSPROT-TrEMBL-Prosite-PRINTS - structural databases-PDB- SCOP- CATH- PDB_SELECT- PDBSUM- DSSP-FSSPDALI- PRODOM protein families & pattern databases-Pfam- KEGG - sequence storage sequence accuracy-EST-STS sequence retrieval systems- Entrez-SRS- sequence query refinement using Boolean operators- limits review- history and index **(18 hours)**

UNIT III

Sequence submission-Sequence submission tools-BANKIT-SEQUIN-WEBINSAKURA literature databases-PubMed and Medline. Data mining and its techniques- data warehousing Sequence annotation- principles of genome annotation- annotation tools & resources. **(18 hours)**

UNIT IV

Applications of bioinformatics-Applications of Bioinformatics-phylogenetic analysis steps in phylogenetic analysis-microarrays-DNA and protein microarrays-Bioinformatics in the pharmaceutical industry- informatics & drug- discovery – pharma informatics resources drug discovery and designing SNP. **(18 hours)**

UNIT V

File formats-File formats-raw/plain format-NCBI-Genbank flat file format-ASN.1-GCGFASTA- EMBL- NBRF- PIR-swiss prot sequence formats- PDB format- Introduction to structure prediction methods**.** **(18 hours)**

TEXT BOOKS:

[1] Attwood T.K, Parry-Smith, “Introduction to Bioinformatics”, Addison Wesley Longman, 1999.
[2] David W Mount, “Bioinformatics: Sequence and Genome Analysis”, 2nd edition, CBS Publishers, 2004.

REFERENCE BOOKS:

[1] Arun Jagota, “Data Analysis and Classification for Bioinformatics”, Pine Press, 2001.
[2] Des Higgins and Willie Taylor, “Bioinformatics Sequence, Structures and Databanks”, Oxford University Press, 2000.
[3] Jason T.L.Wang, Mohammed J. Zaki, Hannu T.T. Toivonene and Dennis Shasha, “Data Mining in Bioinformatics”, Springer International Edition, 2005.

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
w.e.f 2023-2024
Semester –VII: Syllabus
Course -19: Bioinformatics Lab

Practical **Credits-1** **2hrs/week**

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1. DNA Sequence Analysis
- Compute the **GC content** of a DNA sequence.
- Find **complementary and reverse complement** sequences.

2. Pairwise Sequence Alignment
- Implement **Needleman-Wunsch (Global Alignment)** algorithm.
- Implement **Smith-Waterman (Local Alignment)** algorithm.

3. Multiple Sequence Alignment (MSA)
- Perform **MSA using ClustalW** or **MUSCLE**.
- Visualize MSA results using **Jalview**.

4. BLAST Search Automation
- Write a script to run **NCBI BLAST** using Python.
- Parse and analyze BLAST results.

5. Protein Structure Visualization
- Use **PyMOL** or **RasMol** to visualize a **PDB file**.
- Analyze secondary structure elements.

6. Phylogenetic Tree Construction
- Construct a phylogenetic tree using **MEGA** or **PhyML**.
- Compare different tree-building methods (UPGMA, Neighbor-Joining).

7. Gene Prediction in Genomic Sequences
- Use **Glimmer** or **GENSCAN** for gene prediction.
- Analyze the predicted genes and their function.

8. Protein-Ligand Docking
- Perform molecular docking using **AutoDock** or **SwissDock**.
- Analyze binding affinities and interactions.

9. Microarray Data Analysis
- Process gene expression data using **R/Bioconductor**.
- Perform differential gene expression analysis.

10. Machine Learning in Bioinformatics
- Train a **decision tree classifier** for disease prediction.
- Use **Scikit-learn** for DNA sequence classification.

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VII: Syllabus
w.e.f 2023-2024
Course -20: Digital Forensics

Theory **Credits-3** **3hrs/week**

UNIT I

Digital Forensics Science: Forensics science, computer forensics, and digital forensics, **Computer Crime:** Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics. **(18 hours)**

UNIT II

Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, and retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation. **(18 hours)**

UNIT III

Evidence Management & Presentation: Create and manage shared folders using the operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.

(18 hours)

UNIT IV

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, **Critique a case, Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data. (**18 hours)**

UNIT V

Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, **Critique a case, Network Forensics:** open-source security tools for network forensic analysis, requirements for preservation of network data.

(18 hours)

TEXTBOOKS:

[1] John Sammons, 2e, The Basics of Digital Forensics, Elsevier, 2014.

REFERENCE BOOKS:

[1] Digital Forensics: The Fascinating world of digital evidences, 1st Edition, Nilakshi Jain, Dhananjay R. kalbande, wiley- 2016.

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
w.e.f 2023-2024
Semester –VII: Syllabus
Course -20: Digital Forensics Lab

Practical **Credits-1** **2hrs/week**

1. **File Metadata Extraction** (Retrieve file creation date, modification time, and size).
2. **Hashing for File Integrity Verification** (Generate MD5, SHA-1, and SHA-256 hashes).
3. **Disk Image Analysis** (Analyze forensic disk images like .dd and .img).
4. **Windows Registry Forensics** (Extract registry keys for user activity tracking).
5. **Steganography Detection** (Detect hidden data in images using LSB steganography).
6. **Email Header Analysis** (Analyze email headers for spoofing and phishing detection).
7. **Network Packet Capture & Analysis** (Monitor network traffic using packet sniffing).
8. **RAM Memory Forensics** (Extract running processes from a memory dump).
9. **Web Browser Forensics** (Analyze browser history, cookies, and cache).
10. **Malware Analysis - Detecting Suspicious Processes** (Monitor running processes for malicious activity).

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VIII: Syllabus
w.e.f 2023-2024
Course -21: Introduction to Digital Technology

Theory **Credits-3** **3hrs/week**

UNIT I

Digital Primer - Why is Digital Different?- Digital Metaphors On Cloud 9-A Small Intro to Big Data-Social Media & Digital Marketing-Artificial Intelligence- Unchain the Block Internet of Everything-Immersive Technology. **(18 hours)**

UNIT II

Digital for Industries- Manufacturing and Hi-tech-Banking and Financial services and Healthcare-Retail-Travel & Hospitality-Communications, Media & Information Services and Government. **(18 hours)**

UNIT III

Automatix – Art of RPA-Introduction - Setting the Context-RPA Prelude-RPA Demystified-RPA vs BPM RPA Implementations-RPA in Industries-RPA Tools-Automatix.

(18 hours)

UNIT IV

Automation Anywhere-Getting Started with AA Enterprise-Exploring AA Enterprise-AA Enterprise – Architecture. **(18 hours)**

UNIT V

Knowing the Bots-More About TaskBots- AA Enterprise - Assess your Learning, All About Recorders, Designers, MetaBots, Cognitive RPA **(18 hours)**

TEXTBOOKS:

[1] Getting started with RPA using Automation Anywhere: Automate your day-to-day Business Processes using Automation Anywhere (English Edition) by Vaibhav Srivastava.

REFERENCE BOOKS:

[1] Robotic Process Automation Projects: Build Real-world RPA Solutions Using UiPath and Automation Anywhere by Arun Kumar Asokan and Nandan Mullakara .

KRISHNA UNIVERISITY: MACHILIPATNAM
B.SC . Honours (Data Analytics) MAJOR - 2023-24
w.e.f 2023-2024
Semester –VIII: Syllabus
Course -21: Introduction to Digital Technology Lab

Practical **Credits-1** **2hrs/week**

1. **Simulating Basic Logic Gates**
   - Implement AND, OR, NOT, XOR, NAND, and NOR gates using Python functions.
2. **Boolean Algebra Simplification**
   - Use the sympy.logic module to simplify Boolean expressions.
3. **Binary to Gray Code and Gray to Binary Converter**
   - Implement a Python program to convert binary numbers to Gray code and vice versa.
4. **Half Adder and Full Adder Implementation**
   - Simulate a half adder and full adder circuit using logical operations in Python.
5. **Multiplexer (MUX) and Demultiplexer (DEMUX) Simulation**
   - Write a Python program to simulate an **n:1 multiplexer** and **1:n demultiplexer**.
6. **Flip-Flop Simulation**
   - Implement SR, JK, D, and T Flip-Flops using Python functions and visualize state transitions.
7. **Shift Register Simulation**
   - Simulate a **4-bit Shift Register** (SISO, SIPO, PISO, PIPO) using Python lists and bitwise operations.
8. **Counter (Up/Down) Simulation**
   - Implement **4-bit Up and Down Counters** using loops and bitwise operations in Python.
9. **Binary Arithmetic Operations Using Python**
   - Perform **binary addition, subtraction, multiplication, and division** using bitwise operators.
10. **Microprocessor Instruction Simulation (8085/8086)**
    - Write a Python program to simulate basic **8085/8086 instructions** like MOV, ADD, and SUB using lists and dictionaries.

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B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VIII : Syllabus
w.e.f 2023-2024
Course -22: Big Data and Hadoop

Theory **Credits-3** **3hrs/week**

UNIT I

Introduction to Big Data: What is Big Data? Structuring Big Data -Types of Big Data, Elements of Big Data- Volume, Velocity, Variety, Veracity, Big Data Applications.

(18 hours)

UNIT II

Introduction to Hadoop: What is Hadoop? Comparing SQL databases and Hadoop, Understanding Map Reduce-Scaling Word Count Program Manually, Scaling Word Count Program in Map Reduce. **(18 hours)**

UNIT III

Hadoop Eco-System: HDFS-HDFS Architecture, Concept of Blocks in HDFS-Name Node, Data Node, Secondary Name Node, Job Tracker, Task Tracker. **(18 hours)**

UNIT IV

Working with files in HDFS: Basic File Commands, Reading & Writing to HDFS Programmatically, Anatomy of Map Reduce Program-Hadoop Data Types, Mapper, Reducer, Partitioner, Combiner, Word Counting With Pre-Defined Mapper and Reducer, Reading & Writing-Input Format, Output Format. **(18 hours)**

UNIT V

Introducing Hive, Hive Services, Hive Variables, Hive Queries, Data types, Hive Built-in functions, Hive - DDL, DML, and Data Retrieval Queries. **(18 hours)**

TEXTBOOKS:

[1] BIG DATA (covers hadoop2, map-reduce, Hive, Yarn, Pig, R, and Data Visualization) Black Book, DreamTech Press.
[2] Hadoop in Action by Chuck Lam, DreamTech Press.

REFERENCE BOOKS:

1. Boris Dubinsky, Kevin T. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.

2. Chris Eaton, Dirk deroos, et al., “Understanding Big data ”, McGraw Hill, 2012.

3. Tom White, “HADOOP: The Definitive Guide”, O Reilly 2012.

4. Vignesh Prajapati, “Big Data Analytics with R and Hadoop”, Packet Publishing 2013.

5. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014.

6. Jy Liebowitz, “Big Data and Business Analytics”, CRC Press, 2013

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w.e.f 2023-2024
Semester –VIII: Syllabus
Course -22: Big Data and Hadoop Lab

Practical	**Credits-1**	**2hrs/week**

HDFS (Hadoop Distributed File System) Operations

1. Install and configure Hadoop in pseudo-distributed mode.
2. Perform basic HDFS operations:
    - Upload, download, delete files.
    - List files and directories in HDFS.
    - Change file permissions and ownership in HDFS.

MapReduce Programs

3. Write a basic Word Count program in MapReduce.
4. Implement a MapReduce program for sorting a dataset.
5. Write a MapReduce program to calculate the average salary from an employee dataset.
6. Implement a MapReduce program to find the maximum temperature from a weather dataset.
7. Develop a MapReduce program for a simple recommendation system (e.g., movie rating analysis).

Apache Hive (SQL on Hadoop)

8. Create a database and tables in Hive and perform CRUD operations.
9. Load structured data into Hive and run queries.
10. Implement partitioning and bucketing in Hive for better query performance.
11. Use built-in functions in Hive (string functions, date functions, aggregate functions).
12. Implement joins in Hive (inner join, outer join, left join).

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B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VIII : Syllabus
w.e.f 2023-2024
Course -23: Augmented Reality and Virtual Reality

Theory **Credits-3** **3hrs/week**

UNIT I

Introduction to Virtual Reality (VR): Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark. (**18 hours)**

UNIT II

Computer Graphics and Geometric Modelling- The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, Color theory, Conversion From 2D to 3D, 3D space curves, 3D boundary representation, Simple 3D modelling, 3D clipping, Illumination models, Reflection models, Shading algorithms. (**18 hours)**

UNIT III

Virtual Environment: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Video based Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices).

(**18 hours)**

UNIT IV

Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system. **(18 hours)**

UNIT V

Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft. **(18 hours)**

TEXTBOOKS:

[1] Coiffet, P., Burdea, G. C., (2003), “Virtual Reality Technology,” Wiley-IEEE Press, ISBN: 9780471360896.
[2] Schmalstieg, D., Höllerer, T., (2016), “Augmented Reality: Principles & Practice,” Pearson, ISBN: 9789332578494.

REFERENCE BOOKS:

1. Norman, K., Kirakowski, J., (2018), “ Wiley Handbook of Human-Computer Interaction,” Wiley-Blackwell, ISBN: 9781118976135.
2. LaViola Jr., J. J., Kruijff, E., McMahan, R. P., Bowman, D. A., Poupyrev, I., (2017), “3D User Interfaces: Theory and Practice,” Pearson, ISBN: 9780134034324.

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B.SC. Honours (Data Analytics) MAJOR - 2023-24
w.e.f 2023-2024
Semester –VIII: Syllabus
Course -23: Augmented Reality and Virtual Reality

Practical **Credits-1** **2hrs/week**

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1. Introduction to AR Development Environment

- Install **Unity3D**, **Vuforia**, and **AR Foundation** for AR development.
- Create a basic Unity project and configure it for AR.

2. Display a 3D Object in AR

- Load a 3D model (e.g., a car or cube) into an AR scene.
- Use AR Plane detection to place the object on a real-world surface.

3. Image Target Recognition using Vuforia

- Use **Vuforia** to detect and track an image target (e.g., QR code, logo).
- Display a 3D model when the image target is detected.

4. AR Face Tracking

- Implement AR face tracking using ARKit (iOS) or ARCore (Android).
- Apply filters, masks, or animated objects to the detected face.

5. AR Object Manipulation (Move, Rotate, Scale)

- Implement touch gestures to **move, rotate, and scale** a virtual object in AR.
- Use pinch-to-zoom and drag gestures.

6. Markerless AR (AR Plane Detection)

- Use **AR Plane detection** to place a 3D object on a flat surface (like a table).
- Implement AR raycasting to interact with virtual objects.

7. AR Navigation and Wayfinding

- Develop an **AR-based indoor navigation** system.
- Guide the user using virtual arrows in an AR environment.

8. AR-Based Virtual Try-On

- Use **AR** to place virtual objects on the user (e.g., glasses, clothes, or watches).
- Implement face or body tracking for real-time object fitting.

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B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VIII: Syllabus
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Course -24: Research Methodology and IPR

Theory **Credits-3** **3hrs/week**

UNIT I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations . (**18 hours)**

UNIT II

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee **(18 hours)**

UNIT III

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT. **(18 hours)**

UNIT IV

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. **(18 hours)**

UNIT V

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs. **(18 hours)**

TEXTBOOKS:

[1] Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students’”.
[2] Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”.

REFERENCE BOOKS:

[1] Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”.

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B.SC. Honours (Data Analytics) MAJOR - 2023-24
w.e.f 2023-2024
Semester –VIII: Syllabus
Course -24: Research Methodology and IPR Lab

Practical	**Credits-1**	**2hrs/week**

1. **Literature Review and Citation Management**
   - Use tools like **Zotero, Mendeley, or EndNote** to organize and format research papers.
2. **Formulating a Research Problem and Hypothesis**
   - Define a research problem statement and develop a hypothesis for a given topic.
3. **Data Collection and Survey Design**
   - Create a survey using **Google Forms** or **Qualtrics** to collect responses.
4. **Data Cleaning and Preprocessing using Python (Pandas & NumPy)**
   - Handle missing values, duplicate records, and format inconsistencies in a dataset.
5. **Statistical Analysis using Python (SciPy & Stats models)**
   - Perform **T-tests, ANOVA, and Regression Analysis** for research data.
6. **Research Paper Writing and Formatting**
   - Write a structured **IEEE or APA format** research paper using **LaTeX or MS Word**.

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B.SC . Honours (Data Analytics) MAJOR - 2023-24
Semester – VIII: Syllabus
w.e.f 2023-2024
Course -25: Software Engineering and Testing

Theory **Credits-3** **3hrs/week**

UNIT I

Selenium Basics : Software Testing, Automation Testing, Introduction to Selenium and its Components, Selenium IDE Features, Selenium Download and Installation, Locator Types **(18 hours)**

UNIT II

Selenium WebDriver: Selenium WebDriver Installation with Eclipse, Handling Dropdowns, Explicit and Implicit Wait, Handling Alerts/Pop-ups, Handling Web Tables, Frames, Dynamic Elements, Robot API, AutoIT **(18 hours)**

UNIT III

Test Automation Framework: Introduction, Benefits of Automation Framework, Types of Automation Framework **(18 hours)**

UNIT IV

TestNG: Introduction to TestNG, TestNG Framework, TestNG installation, TestNG Annotations and Listeners, TestNG Example, TestNG Process Execution: Batch, Controlled Batch & Parallel (**18 hours)**

UNIT V

Advanced Selenium- Selenium Grid: Introduction, Usage of Selenium Grid, Grid1.0 vs Grid2.0, Selenium Grid architecture, How to setup Selenium Grid using a command line, designing test scripts that can run on the Grid, Using Desired Capabilities Object, Using Remote WebDriver Object, Running a sample Test Case on the Grid **(18 hours)**

TEXTBOOKS:

[1] Test Automation using Selenium WebDriver with Java: Step by Step Guide by Navneesh Garg.

REFERENCE BOOKS:

[1] Absolute Beginner Java 4 Selenium Webdriver: Come Learn How to Program for Automation Testing by Rex Allen Jones II .

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B.SC . Honours (Data Analytics) MAJOR - 2023-24

w.e.f 2023-2024

Semester –VIII: Syllabus

Course -25: Software Engineering and Testing Lab

Practical **Credits-1** **2hrs/week**

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1. Write a script to open google.com and verify that the title is Google and that it is redirected to google.co.in
2. Write a script to open Google.co.in using Chrome browser (ChromeDriver)
3. Write a script to open Google.co.in using Internet Explorer (InternetExplorerDriver)
4. Write a script to create a browser instance based on the browser name
5. Write a script to search for specified options in the list box
6. Write a script to print the content of the list in sorted order.
7. Write a script to print all the options. For duplicates add entry only once. Use HashSet.
8. Write a script to close all the browsers without using the quit() method.
9. Write a generic method in selenium to handle all locators and return web elements for any locator.
10. Write a generic method in selenium to handle all locators containing dynamic wait and return web elements for any locator