ANNA UNIVERSITY, CHENNAI

UNIVERSITY DEPARTMENTS

M.E. COMPUTER SCIENCE AND ENGINEERING

(DATA SCIENCE AND CYBER SECURITY)

I to IV SEMESTER CURRICULA & I SEMESTER SYLLABI

SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA3154	Advanced Mathematics for Scientific Computing	FC	4	0	0	4	4
2.	RM3151	Research Methodology and IPR	RMC	2	1	0	3	3
3.	CP3151	Data Structures and Algorithms	PCC	3	0	0	3	3
4.	CB3101	Data Science and Visualization	PCC	3	0	0	3	3
5.	CB3102	Cryptography and Network Security	PCC	3	0	0	3	3
6.	CP3152	Database Technologies	PCC	3	0	0	3	3
PRACTICALS								
7.	CP3161	Data Structures and Algorithms Laboratory	EEC	0	0	4	4	2
8.	CB3111	Data Science Laboratory	EEC	0	0	4	4	2
			TOTAL	**18**	**1**	**8**	**27**	**23**

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Artificial Intelligence for Cyber Security	PCC	3	0	0	3	3
2.		Advanced Operating Systems	PCC	3	0	4	7	5
3.		Machine Learning	PCC	3	0	3	6	4.5
4.		Professional Elective I	PEC	3	0	0	3	3
5.		Professional Elective II	PEC	3	0	0	3	3
PRACTICALS								
6.		Industry Oriented Course	EEC	0	0	4	4	2
			TOTAL	**15**	**0**	**9**	**24**	**20.5**

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.		Generative AI	PCC	3	0	0	3	3
2.		Professional Elective III	PEC	3	0	2	5	4
3.		Professional Elective IV	PEC	3	0	0	3	3
4.		Professional Elective V	PEC	3	0	0	3	3
PRACTICALS								
5.		Project Work I	EEC	0	0	12	12	6
			TOTAL	**12**	**0**	**14**	**26**	**19**

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.		Project Work II	EEC	0	0	24	24	12
			TOTAL	**0**	**0**	**24**	**24**	**12**

TOTALNO.OFCREDITS:74.5

PROFESSIONAL ELECTIVE COURSES(PEC)

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CONTACT PERIODS	CREDITS
1.		Big Data Acquisition	PEC	3	0	0	3	3
2.		Cloud Computing Technologies	PEC	3	0	2	5	4
3.		Ethical Hacking	PEC	3	0	0	3	3
4.		Internet of Things	PEC	3	0	2	5	4
5.		Deep Learning	PEC	3	0	2	5	4
6.		Web Content Design and Management	PEC	3	0	2	5	4
7.		Mobile Application Development	PEC	3	0	0	3	3
8.		Blockchain Technologies	PEC	3	0	2	5	4
9.		Information Retrieval Techniques	PEC	3	0	0	3	3
10.		Parallel Algorithms	PEC	3	0	0	3	3
11.		Soft Computing	PEC	3	0	0	3	3
12.		Game Theory	PEC	3	0	0	3	3
13.		Software Security	PEC	3	0	0	3	3
14.		Data Warehousing and Data Mining Techniques	PEC	3	0	0	3	3

S. NO.	COURSE CODE	COURSE TITLE	CATE GORY	L	T	P	CONTACT PERIODS	CREDITS
15.		Social Network Analysis	PEC	3	0	0	3	3
16.		Statistical Natural Language Processing	PEC	3	0	0	3	3
17.		Quantum Cryptography	PEC	3	0	0	3	3
18.		Full Stack Web Application Development	PEC	3	0	2	5	4
19.		Bioinformatics	PEC	3	0	0	3	3
20.		Mixed Reality	PEC	3	0	0	3	3
21.		Cyber Physical Systems	PEC	3	0	0	3	3
22.		Software Testing and Quality Assurance	PEC	3	0	0	3	3
23.		Data Privacy and Security	PEC	3	0	0	3	3
24.		Quantum Cryptography	PEC	3	0	0	3	3
25.		Adversarial Machine Learning	PEC	3	0	0	3	3
26.		Cyber Law	PEC	3	0	0	3	3
27.		Mobile Digital Forensics	PEC	3	0	0	3	3
28.		Text Mining	PEC	3	0	0	3	3
29.		IoT Security	PEC	3	0	0	3	3
30.		Computer Vision	PEC	3	0	0	3	3
31.		Autonomous Vehicle Systems	PEC	3	0	0	3	3
32.		Tools and Techniques for cyber security	PEC	3	0	2	5	4
33.		Responsible AI	PEC	3	0	0	3	3
34.		Retrieval-Augmented Generation	PEC	3	0	0	3	3
35.		Agentic AI	PEC	3	0	0	3	3
36.		Vibe coding	PEC	3	0	0	3	3
37.		UI/UX Design	PEC	3	0	0	3	3

MA3154 ADVANCED MATHEMATICS FOR SCIENTIFIC COMPUTING L T P C
4 0 0 4

UNIT I LINEAR PROGRAMMING 12

Formulation – Graphical solution – Simplex method – Two phase method -Transportation and Assignment Problems

UNIT II SIMULATION 12

Discrete Event Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to real time problems.

UNIT III ESTIMATION THEORY 12

Estimators: Unbiasedness, Consistency, Efficiency and Sufficiency – Maximum Likelihood Estimation – Method of moments.

UNIT IV TESTING OF HYPOTHESIS 12

Sampling distributions – Estimation of parameters - Statistical hypothesis – Tests based on Normal, t, Chi-square and F distributions for mean, variance and proportion, Tests for independence of attributes and goodness of fit.

UNIT V MULTIVARIATE ANALYSIS 12

Random vectors and Matrices – Mean vectors and Covariance matrices – Multivariate Normal density and its properties – Principal components: Population principal components – Principal components from standardized variables.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, students will be able to

CO1 Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.
CO2 Simulate appropriate application/distribution problems.
CO3 Obtain the value of the point estimators using the method of moments and method of maximum likelihood.
CO4 Apply the concept of various test statistics used in hypothesis testing for mean and variances of large and small samples.
CO5 Get exposure to the principal component analysis of random vectors and matrices.

REFERENCES:

1. Jay L. Devore, “Probability and Statistics for Engineering and the Sciences”, Cengage Learning, 9th Edition, Boston, 2016.
2. Johnson, R.A, Irwin Miller and John Freund., “Miller and Freund’s Probability and Statistics for Engineers”, Pearson Education, 9th Edition, New York, 2016.
3. Johnson, R.A., and Wichern, D.W., “Applied Multivariate Statistical Analysis”, Pearson Education, Sixth Edition, New Delhi, 2013.
4. Ross. S.M., “Probability Models for Computer Science”, Academic Press, SanDiego, 2002.
5. Taha H.A.,, “Operations Research: An Introduction”, Prentice Hall of India Pvt. Ltd. 10th Edition, New Delhi, 2017.
6. Winston, W.L., “Operations Research”, Thomson – Brooks/Cole, Fourth Edition, Belmont, 2003.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	2	2
CO2	3	3	3	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	3	3	2	2
CO5	3	3	3	3	2	2

RM3151 RESEARCH METHODOLOGY AND IPR L T P C
2 1 0 3

UNIT I RESEARCH PROBLEM FORMULATION 9

Objectives of research, types of research, research process, approaches to research; conducting literature review- information sources, information retrieval, tools for identifying literature, Indexing and abstracting services, Citation indexes, summarizing the review, critical review, identifying research gap, conceptualizing and hypothesizing the research gap

UNIT II RESEARCH DESIGN AND DATA COLLECTION 9

Statistical design of experiments- types and principles; data types & classification; data collection - methods and tools

UNIT III DATA ANALYSIS, INTERPRETATION AND REPORTING 9

Sampling, sampling error, measures of central tendency and variation,; test of hypothesis- concepts; data presentation- types of tables and illustrations; guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript; guidelines for writing thesis, research proposal; References – Styles and methods, Citation and listing system of documents; plagiarism, ethical considerations in research

UNIT IV INTELLECTUAL PROPERTY RIGHTS 9

Concept of IPR, types of IPR – Patent, Designs, Trademarks and Trade secrets, Geographical indications, Copy rights, applicability of these IPR; , IPR & biodiversity; IPR development process, role of WIPO and WTO in IPR establishments, common rules of IPR practices, types and features of IPR agreement, functions of UNESCO in IPR maintenance.

UNIT V PATENTS 9

Patents – objectives and benefits of patent, concept, features of patent, inventive steps, specifications, types of patent application; patenting process - patent filling, examination of patent, grant of patent, revocation; equitable assignments; Licenses, licensing of patents; patent agents, registration of patent agents.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Upon completion of the course, the student can

CO1: Describe different types of research; identify, review and define the research problem
CO2: Select suitable design of experiment s; describe types of data and the tools for collection of data
CO3: Explain the process of data analysis; interpret and present the result in suitable form
CO4: Explain about Intellectual property rights, types and procedures
CO5: Execute patent filing and licensing

REFERENCES:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 11e (2012).
2. Soumitro Banerjee, “Research methodology for natural sciences”, IISc Press, Kolkata, 2022,
3. Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2007.
4. David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2007.
5. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, “Professional Programme Intellectual Property Rights, Law and practice”, September 2013.

CP3151	DATA STRUCTURES AND ALGORITHMS	L T P C 3 0 0 3

UNIT I BASIC STRUCTURES AND ALGORITHM 9

Stack- Queue - Linked List Implementation - Min/Max heap – Algorithm Analysis- Asymptotic Analysis- Solving Recurrence Relation – Amortized Analysis

UNIT II BALANCED TREE STRUCTURES 9

Binary Search Trees – AVL Trees – Red-Black Trees – Multi-way Search Trees –B-Trees – Splay Trees – Tries

UNIT III MELDABLE HEAP STRUCTURES 9

Leftist Tree- Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy Binomial Heaps –Deap

UNIT IV NP COMPLETENESS 9

NP Classes- Polynomial Time Verification – Theory of Reducibility - NP Completeness Proof for Vertex Cover & Hamiltonian Cycle

UNIT V APPROXIMATION ALGORITHMS 9

Approximation Algorithms: Vertex Cover & Euclidean Travelling Salesperson Problem- Randomized Algorithms: Closest Pair Problem & Minimum Spanning Trees

TOTAL: 45 PERIODS

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.
2. Ellis Horowitz and Sartaj Sahni, “Fundamental of Computer Algorithms”, Galgotia, 1985.
3. R.C.T Lee, S.S Tseng, R.C Chang and Y.T Tsai, “Introduction to the Design and Analysis of Algorithms”, Tata McGraw-Hill Edition, 2012.
4. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, Third Edition, Prentice Hall, 2010.

COURSE OUTCOMES:

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

CO1: Understand, design and implement balanced search structures
CO2: Analyse algorithms for time complexity
CO3: Understand and implement different meldable priority queues
CO4: Appreciate Approximation and randomized algorithm design
CO5: Apply various data structures for solving problems

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1			3	2		
CO2				2		
CO3			3	2		
CO4	3		3	2		
CO5	2		3	3		

CB3101 DATA SCIENCE AND VISUALIZATION L T P C
3 0 0 3

UNIT I DATA SCIENCE 9

Data Science – Data Science Process – Handling Large Data on a Single Computer – General Techniques for Handling Large Volumes of Data – First Steps in Big Data – Distributing Data Storage and Processing with frameworks

UNIT II REPRESENTING DATA 9

NOSQL – Graph Databases – Introducing connected data and Graph Databases – Connected Data Example – Data Visualization to the End User

UNIT III PYTHON LIBRARIES FOR DATA WRANGLING 9

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean - logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and - selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT IV INTERACTIVE DATA VISUALIZATION 9

Drawing with data – Scales – Axes – Updates, Transition and Motion – Interactivity - Layouts –Geomapping – Exporting, Framework – D3.js, Tableau, Power BI.

UNIT V SECURITY DATA VISUALIZATION 9

Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization -Intrusion detection log visualization -Attacking and defending visualization systems – Creating security visualization system.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand different types of data description for data science process
CO2: Gain knowledge on representing data
CO3: Use the python libraries for data wrangling
CO4: Apply visualization libraries in python to interpret and explore data
CO5: Address the security issues present in data visualization

REFERENCES:

1. David Cielen, Arno D. B, Meysman and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2. Jake Vander Plas, “Python Data Science Handbook”, 2nd Edition, O’Reilly Media, January 2023.
3. Scott Murray, “Interactive data visualization for the web”, O"Reilly Media, Inc., 2013.
4. Greg Conti, “Security Data Visualization: Graphical Techniques for Network Analysis”, No Starch Press Inc, 2007.

CB3102 CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

OBJECTIVES:

1. To understand the foundational principles of cryptography and number theory.
2. To gain knowledge of public key infrastructure and its role in secure communications.
3. To learn key management strategies and authentication methods.
4. To explore security mechanisms at the network and transport layers.
5. To identify and analyze different types of security attacks.

UNIT I SYMMETRIC CIPHERS AND NUMBER THEORY **9**

Classical Cryptosystem - Block Cipher - Data Encryption Standard (DES) - Triple DES - Modes of Operation - Stream Cipher - LFSR-based Stream Cipher – Introduction to Number Theory - The Euclidean Algorithm - Fermat's and Euler's Theorems - Testing for Primality - The Chinese Remainder Theorem - Discrete Logarithms – Finite Fields - Advanced Encryption Standard (AES)

UNIT II PUBLIC KEY CRYPTOGRAPHY **9**

Introduction to Public Key Cryptosystem - Diffie-Hellman Key Exchange - Knapsack Cryptosystem - RSA Cryptosystem - ElGamal Cryptosystem - Elliptic Curve over the Reals - Elliptic Curve Modulo a Prime - Rabin Cryptosystem.

UNIT III DATA INTEGRITY ALGORITHMS AND CRYPTANALYSIS **9**

Message Authentication - Digital Signature, Key Management - Key Exchange - Hash Function - Cryptographic Hash Function - Secure Hash Algorithm (SHA) - Digital Signature Standard (DSS) - Cryptanalysis - Time-Memory Trade-off Attack - Differential and Linear Cryptanalysis - Cryptanalysis on Stream Cipher - Modern Stream Ciphers - Shamir's secret sharing - Identity-based Encryption (IBE) - Attribute-based Encryption (ABE).

UNIT IV NETWORK SECURITY **9**

Web security considerations - Secure Socket Layer and Transport Layer Security - HTTPS, Secure Shell (SSH) - E-Mail Security - S/MIME – PGP - IP Security overview - IP Security architecture - Authentication Header - Encapsulating security payload - Wireless Security - Mobile Device Security - IEEE 802.11 Wireless LAN - IEEE 802.11i Wireless LAN Security

UNIT V SECURITY ATTACKS **9**

Buffer overflow attacks - Denial-of-Service Attacks - Hijacking attacks : exploits and defenses - Internet worms – Viruses – Spyware – Phishing – Botnets - TCP session hijacking - ARP attacks - Route table modification - UDP hijacking - Man-in-the-middle attacks

TOTAL : 45 PERIODS

OUTCOMES:

At the end of this course, the students will be able to:

CO1: Interpret the basic principles of cryptography and general cryptanalysis.
CO2: Illustrate the public key management technique and authentication.
CO3: Analyze various cryptography techniques and their applications.
CO4: Evaluate the security techniques applied to the network and transport layers
CO5: Discuss various types of attacks and their characteristics.

REFERENCES:

1. Cryptography and Network Security: Principles and Practice, William Stallings, 8th Edition, by Pearson, 2023
2. Introduction to Cryptography with Coding Theory, Wade Trapp and Lawrence Washington, by Pearson, 2020
3. Computer Security: Principles and Practice, William Stallings and Lawrie Brown, 4th Edition, by Pearson, 2017

CP3152 DATABASE TECHNOLOGIES L T P C
3 0 0 3

UNIT I RELATIONAL MODEL 9

Entity Relationship Model – Relational Data Model – Mapping Entity Relationship Model to Relational Model – Relational Algebra – Structured Query Language – Database Normalization – First Normal Form – Second Normal Form – Third Normal Form – Boyce Codd Normal Form – Fourth Normal Form – Fifth Normal Form.

UNIT II PARALLEL AND DISTRIBUTED DATABASES 9

Parallel Databases – I/O Parallelism - Inter-Query and Intra-Query Parallelism– Inter-Operation and Intra-operation Parallelism – Performance evaluation for Parallel DB Systems –Distributed Database Architecture – Distributed Data Storage – Distributed Transactions – Distributed Query Processing – Distributed Transaction Management – Load balancing tools for DDB – DDB Security.

UNIT III ADVANCED DATABASES 9

XML Data Model – DTD – XML Schema – XML Querying – Web Databases – Open Database Connectivity – Java Database Connectivity – Accessing Relational Database using PHP – Analytical Operations involved in Processing Spatial Data –Spatial Data Types and Models–Spatial Operators and Spatial Queries–Spatial Data Indexing– Multimedia Database Concepts - Introduction to Deductive Databases–Prolog/Datalog Notation– Clausal Form and Horn Clauses–Interpretations of Rules.

UNIT IV ACTIVE TEMPORAL AND DEDUCTIVE DATABASES 9

Event Condition Action Model – Design and Implementation Issues for Active Databases – Termination, Confluence, Determination and Modularization – Temporal Databases –Interpreting Time in Relational Databases – Deductive Databases – Data log Queries

UNIT V NOSQL DATABASES 9

NoSQL Database vs.SQL Databases – CAP Theorem –Migrating from RDBMS to NoSQL – MongoDB – CRUD Operations– MongoDB Sharding – MongoDB Replication – Web Application Development using MongoDB with PHP and Java.

TOTAL: 45 PERIODS

REFERENCES

1. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2016.
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Seventh Edition, McGraw Hill Education 2020.
3. Brad Dayley, “Teach Yourself NoSQL with MongoDB in 24 Hours”, Sams Publishing, 2014.

4. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
5. V. S. Subramanian, “Principles of Multimedia Database Systems”, Harcourt India Pvt. Ltd.,2001.
6. C. J. Date, A. Kannanand S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
7. Shashank Tiwari, “Professional NoSQL”, Wiley, 2011.
8. David Lane, Hugh. E. Williums, Web Database Applications with PHP and MySQL, O’Reilly Media; 2nd edition, 2004.

COURSE OUTCOMES:

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

CO1: Design a Relational Database for an Enterprise.

CO2: Design a Distributed Database, Active Database and Temporal Database for an Enterprise.

CO3: Gain the knowledge in advanced databases.

CO4: Comprehend the use of XML Database, Web Database, Spatial Database, Multimedia Database and Deductive Database.

CO5: Use MongoDB NoSQL Database to Maintain Data of an Enterprise.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	3	1	-	2
CO2	1	1	3	1	-	2
CO3	3	1	3	3	-	2
CO4	2	1	3	3	-	3
CO5	2	1	3	3	-	2

CP3161 DATA STRUCTURES AND ALGORITHMS LABORATORY L T P C
0 0 4 2

LIST OF EXPERIMENTS:

1. Linked list implementation of Stack and Queue ADTs
2. Binary Search tree
3. Min/Max Heap
4. AVL tree
5. Red- Black tree
6. Splay Tree
7. Leftist Heap
8. Binomial Heap

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Apply suitable data structures in problem solving.

CO2: Select suitable search structures for an application

CO3: Understand priority queue implementations

CO4: Differentiate between approximation and Randomized algorithms

CO5: Understand NP complete problem solutions

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-		3	-	-	-
CO2			3	-	-	-
CO3	-		2	2	-	-
CO4	-		2	2	-	-
CO5	2		2	3	-	-

CB3111 **DATA SCIENCE LABORATORY** **L T P C**
0 0 4 2

List of Exercises:

1. Install the Data Science and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) on with datasets like email dataset and Nessus dataset. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
3. Working with lists, files (.csv, .txt) and larger datasets (Common Vulnerabilities and Exposures (CVE) database).
4. Working with Numpy arrays, Pandas data frames, Basic plots using Matplotlib.
5. Explore various variable and row filters in R for cleaning data, perform outlier detection. Apply various plot features in R on sample data sets and visualize.
6. Perform Time Series Analysis and apply the various visualization techniques.
7. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction.
8. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
9. Perform EDA on Automobile dataset and Wine Quality dataset.
10. Case study: Apply the various EDA and visualization techniques and present an analysis report.
11. Explore NVisionIP by the Security Incident Fusion Tools (SIFT) and Time-based Network Traffic Visualizer (TNV) by John Goodall
12. Visualize the malicious activities in security datasets (http://www.honeynet.org/scans).

TOTAL:60 PERIODS

COURSE OUTCOMES:

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

CO1: Use various Visualization tools and do exploratory data analysis
CO2: Work with lists, files and large datasets to draw inferences
CO3: Use the python libraries for data wrangling
CO4: Apply visualization libraries in python to interpret and explore data
CO5: Explore security tools and visualize malicious activities in security datasets