



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA  
VIZIANAGARAM**

**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**OPEN ELECTIVES OFFERED BY CSE (AI &ML) TO OTHER BRANCHES:**

<b>OPEN ELECTIVE -I</b>	<b>OPEN ELECTIVE -II</b>
<ol style="list-style-type: none"><li>1. Introduction to Artificial Intelligence</li><li>2. Exploratory Data Analysis with Python</li><li>3. Web Technologies</li></ol>	<ol style="list-style-type: none"><li>1. Fundamentals of Data Base Management System</li><li>2. JAVA Programming</li><li>3. Social Media Analytics</li></ol>
<b>OPEN ELECTIVE -III</b>	<b>OPEN ELECTIVE -IV</b>
<ol style="list-style-type: none"><li>1. Introduction to Machine Learning</li><li>2. Data Wrangling and Pre-processing</li><li>3. Block Chain Technologies</li></ol>	<ol style="list-style-type: none"><li>1. Internet of Things</li><li>2. Fundamentals of Cloud Computing</li><li>3. Cyber Security</li></ol>

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<b>OPEN ELECTIVE -III</b>	<b>OPEN ELECTIVE -IV</b>
<ol style="list-style-type: none"><li>1. Introduction to Machine Learning</li><li>2. AI Chabot</li><li>3. Data Wrangling and Pre-processing</li></ol>	<ol style="list-style-type: none"><li>1. Internet of Things</li><li>2. Cyber Security</li><li>3. Block Chain Technologies</li></ol>



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**OPEN ELECTIVES OFFERED BY CSE(DS) TO OTHER BRANCHES:**

<b>OPEN ELECTIVE -I</b>	<b>OPEN ELECTIVE -II</b>
<ol style="list-style-type: none"><li>1. Fundamentals of Data Science</li><li>2. Exploratory Data Analysis with Python</li><li>3. Internet of Things</li></ol>	<ol style="list-style-type: none"><li>1. Fundamentals of Data Base Management System</li><li>2. Data Wrangling and Pre-processing</li><li>3. Social Media Analytics</li></ol>
<b>OPEN ELECTIVE -III</b>	<b>OPEN ELECTIVE -IV</b>
<ol style="list-style-type: none"><li>1. Introduction to Artificial Intelligence</li><li>2. Data science applications</li><li>3. Java Programming</li></ol>	<ol style="list-style-type: none"><li>1. Introduction to Machine Learning</li><li>2. Block Chain Technologies</li><li>3. AI Chabot</li></ol>

**OPEN ELECTIVES OFFERED BY CSE(CYBER SECURITY) TO OTHER BRANCHES:**

<b>OPEN ELECTIVE -I</b>	<b>OPEN ELECTIVE -II</b>
<ol style="list-style-type: none"><li>1. Introduction to Artificial Intelligence</li><li>2. Ethical hacking</li><li>3. Exploratory Data Analysis with Python</li></ol>	<ol style="list-style-type: none"><li>1. Fundamentals of Data Base Management System</li><li>2. Data encryption and network security</li><li>3. AI Chabot</li></ol>
<b>OPEN ELECTIVE -III</b>	<b>OPEN ELECTIVE -IV</b>
<ol style="list-style-type: none"><li>1. Introduction to Cyber Security</li><li>2. Digital forensics</li><li>3. Social Media Analytics</li></ol>	<ol style="list-style-type: none"><li>1. Internet of Things</li><li>2. Data Wrangling and Pre-processing</li><li>3. Fundamentals of Cloud Computing</li></ol>



## OPEN ELECTIVES OFFERED BY AI & ET COURSES TO OTHER BRANCHES

### Introduction to Artificial Intelligence

#### Pre-requisite:

1. Knowledge in Computer Programming.
2. A course on “Mathematical Foundations of Computer Science”.
3. Background in linear algebra, data structures and algorithms, and probability.

#### Course Objectives:

1. The student should be made to study the concepts of Artificial Intelligence.
2. The student should be made to learn the methods of solving problems using Artificial Intelligence.
3. The student should be made to introduce the concepts of Expert Systems.
4. To understand the applications of AI, namely game playing, theorem proving, and machine learning.
5. To learn different knowledge representation techniques

**UNIT – I: Introduction:** AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

**UNIT – II: Searching-** Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A\* ,AO\* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions

**UNIT – III: Representation of Knowledge:** Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes’ probabilistic interferences and Dempstershafer theory.

**UNIT – IV: Logic concepts:** First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

**UNIT – V: Expert Systems:** Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

#### Textbooks:

1. S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill

#### Reference Books:

1. David Poole, Alan Mackworth, Randy Goebel, “Computational Intelligence: a logical approach”, Oxford University Press.
2. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problemsolving”, Fourth Edition, Pearson Education.
3. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

#### Online Learning Resources:

1. <https://ai.google/>
2. [https://swayam.gov.in/nd1\\_noc19\\_me71/preview](https://swayam.gov.in/nd1_noc19_me71/preview)



## Introduction to Machine Learning

### Course Objectives:

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Analyze a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Implement basic AI algorithms (e.g., standard search algorithms or dynamic programming).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

### Unit-I:

Introduction-Towards Intelligent Machines, Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

### Unit-II:

Supervised Learning- Rationale and Basics: Learning from Observations, Bias and Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metrics for assessing classification.

### Unit-III:

Statistical Learning- Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

### Unit-IV:

Support Vector Machines (SVM)- Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly separable data, Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines. Learning with Neural Networks: Towards Cognitive Machine, Neuron Models, Network Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error correction delta rule.

### Unit -V:

Multilayer Perceptron Networks and error back propagation algorithm, Radial Basis Functions Networks. Decision Tree Learning: Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3, C4.5, and CART decision trees, pruning the tree, strengths and weakness of decision tree approach.

### Course Outcomes:

After the completion of the course, student will be able to

- Explain the definition and usage of the term 'the internet of things' in different contexts.
- Demonstrate on various network protocols used in IoT.
- Analyze on various key wireless technologies used in IoT systems, such as WiFi, 6LoWPAN, Bluetooth and ZigBee.
- Illustrate on the role of big data, cloud computing and data analytics in IoT system.
- Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software.

### Textbooks:

1. Applied Machine Learning, M. Gopal, McGraw Hill Education



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2. Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press, 2012
3. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer 2009 (freely available online)

**Reference Books:**

1. Pattern Recognition and Machine Learning, Christopher Bishop, Springer, 2007
2. Programming Collective Intelligence: Building Smart Web 2.0 Applications - Toby Segaran
3. Building Machine Learning Systems with Python - Willi Richert, Luis Pedro Coelho



## Exploratory Data Analysis with Python

### Course Objectives:

- To introduce the fundamental operations of Numpy.
- To enable students to apply advanced Numpy functionalities.
- To equip learners with skills in data analysis using Pandas.
- To develop proficiency in data pre-processing and extraction techniques.
- To build competence in data visualization using Matplotlib, and to introduce natural language processing basics with libraries like NLTK

### Course Outcomes:

1. Understand and apply Numpy operations for array creation, reshaping, slicing, and transformation to manipulate large datasets efficiently.
2. Apply advanced indexing, slicing, stacking, and broadcasting techniques
3. Utilize Pandas for data analysis tasks such as creating and modifying Data Frames, handling missing data, and reading various data file formats
4. Perform data pre-processing, database import, and web scraping using Python
5. Create insightful data visualizations using Matplotlib and evaluate basic Natural Language Processing tasks using NLTK and related Python libraries.

### UNIT-I:

**Numpy Arrays** - Creating a Numpy Array- Basic ndarray- Array of zeros- Array of one's- Random numbers in ndarray- An array of your choice- Imatrix in Numpy- Evenly spaced ndarray. **The Shape and Reshaping of Numpy Array**- Dimensions of Numpy array- Shape of Numpy array- Size of Numpy array- Reshaping a Numpy array-Flattening a Numpy array- Transpose of a Numpy array. **Expanding and Squeezing a Numpy Array**- Expanding a Numpy array- Squeezing a Numpy array- Sorting in Numpy Arrays

### UNIT-II:

**Indexing and Slicing of NumPy Array:** Slicing1-D Num Pyarrays-Slicing2-D NumPyarrays-Slicing 3-D NumPyarrays-Negativeslicingof NumPyarrays.**Stacking and Concatenating Numpy Arrays**-Stackingndarrays-Concatenatingndarrays-BroadcastinginNumpyArrays.

### UNIT-III:

**Operations using Pandas**-Creating data frame-concat ()-Setting conditions- Adding a new column. **Perform following operations using pandas**-Filling Nan with string-Sorting based on column values- group by().**Read the following file formats using pandas**-Text files -CSVfiles-Excellfiles-JSONfiles

### UNIT-IV:

**Read the following file for mats**- Picklefiles-ImagefilesusingPILc.MultiplefilesusingGlob-Importingdata from database. Demonstrate web scraping using python.

**Case Study: Perform following preprocessing techniques on loan prediction dataset:** Feature Scaling- Feature Standardization- Label Encoding- One Hot Encoding

### UNIT-V:

**Visualizations using matplotlib**- Bar Graph- Pie Chart- Box Plot- Histogram-Line Chart and Sub plots- Scatter Plot. Getting started with NLTK, NLTK using PIP, SciKit-Learn&NLTK, Python NLTK/ Spicy/ Py NLPI



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**Text Book:**

1. Python for Data Analysis, Oreilly, Wes McKinney, BIM Publishers, first edition, 2012.

**Reference Books:**

1. "Hands-On Exploratory Data Analysis with Python: Performed A techniques to understand, summarize, and investigate your data" by Suresh Kumar Machida and Us man Ahmed.

**Links**

1. <https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-datascience-beginners/>
2. <https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutesguide-to-key-concepts/>
3. <https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formatspython/4>  
<https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessingpython-scikit-learn/>
5. <https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-datavisualization-exploration-python/6>.



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**Web Technologies**

**COURSE OBJECTIVES:**

1. To teach students the basics of server side scripting using PHP
2. To explain web application development procedures
3. To impart servlet technology for writing business logic
4. To facilitate students to connect to databases using JDBC
5. To familiarize various concepts of application development using JSP

**UNIT – I**

**Introduction to PHP:** Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc., Handling File Uploads, Connecting to database (My SQL as reference), executing simple queries, handling results, Handling sessions and cookies.

**File Handling in PHP:** File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

**UNIT – II**

**Client side Scripting:** Introduction to JavaScript: JavaScript language – declaring variables, scope of variables functions, event handlers (on click, on submit etc.), Document Object Model, Form validations. Simple AJAX applications.

**UNIT – III**

**XML:** Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML

**Parsing XML Data - DOM and SAX parsers in java**

**UNIT – IV**

**Introduction to Servlets:** Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, Reading initialization parameters, Handling Http Request & Responses, Using Cookies and sessions, connecting to a database using JDBC.



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**UNIT – V**

**Introduction to JSP:** The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session tracking, connecting to database in JSP.

**COURSE OUTCOMES:**

Upon completion of this course, students will be able to:

1. Create web pages using PHP
2. Identify the difference between the HTML PHP and XML documents.
3. Identify the engineering structural design of XML and parse tree
4. Analyze the difference between and PHP and XML.
5. Understand the concept of JAVA SCRIPTS.

**TEXT BOOKS:**

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill

**REFERENCE BOOKS:**

1. Web Programming, building internet applications, Chris Bates 2<sup>nd</sup> edition, Wiley Dremtech
2. Java Server Pages – Hans Bergsten, SPD O'Reilly
3. Java Script, D.Flanagan, O'Reilly, SPD.
4. Beginning Web Programming-Jon Duckett WROX.
5. Programming world wide web, R.W. Sebesta. Fourth Edition, Pearson.
6. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson.



## **Fundamentals of Data Base Management System**

### **Course Objectives:**

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

### **Course Outcomes:**

By the end of the course, the student will be able to

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

### **UNIT I**

Introduction: Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

### **UNIT II**

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).

### **UNIT III**

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams. SQL: Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**  
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**UNIT IV**

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF), Fifth Normal Form (5NF).

**UNIT V**

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

**Text Books:**

- 1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
- 2) Database System Concepts,5/e, Silberschatz, Korth, TMH

**Reference Books:**

- 1) Introduction to Database Systems, 8/e C J Date, PEA.
- 2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
- 3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**e-Resources:**

- 1) <https://nptel.ac.in/courses/106/105/106105175/>
- 2) <https://www.geeksforgeeks.org/introduction-to-nosql/>



## **JAVA Programming**

### **Course Objectives:**

The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

### **Course Outcomes:**

By the end of the course, the student will be

- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

### **UNIT I**

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**  
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Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

**UNIT II**

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

**UNIT III**

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three- dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

**UNIT IV**

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

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**UNIT V**

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

**Text Books:**

- 1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
- 2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

**References Books:**

- 1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
- 2) Murach's Java Programming, Joel Murach

**e-Resources:**

- 1) <https://nptel.ac.in/courses/106/105/106105191/>

[https://www.w3schools.com/java/java\\_data\\_types.asp](https://www.w3schools.com/java/java_data_types.asp)



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURJADA VIZIANAGARAM**  
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**Social Media Analytics**

**Course Objectives:**

- To provide an overview of social media platforms and their relevance to analytics.
- To equip students with the skills for collecting and pre-processing social media data.
- To introduce natural language processing techniques for analyzing textual data.
- To apply network analysis to understand relationships and influence in social networks.
- To develop the ability to visualize, interpret, and derive actionable insights from social media data.

*Unit I: Introduction to Social Media and Analytics*

This unit introduces the landscape of social media, focusing on platforms like Twitter, Facebook, Instagram, LinkedIn, and YouTube. It covers the types and characteristics of social media data including text, image, and video formats. The unit highlights the importance, challenges, and ethical aspects of social media analytics. Students will also be introduced to various APIs such as Twitter API and Facebook Graph API for data access.

*Unit II: Social Media Data Collection and Preprocessing*

Students learn about different methods and tools used for data extraction from social media platforms. The unit covers API authentication, rate limiting, and data retrieval in JSON format. Techniques for cleaning and pre-processing text data, handling missing values, and filtering irrelevant content are also discussed, along with storage solutions like NoSQL databases and cloud-based storage for big data handling.

*Unit III: Natural Language Processing for Social Media*

This unit covers essential NLP techniques including tokenization, stop word removal, stemming, and lemmatization. It discusses part-of-speech tagging, named entity recognition, and syntactic parsing. Emphasis is placed on sentiment analysis, emotion detection, and opinion mining. Word embedding models such as Word2Vec and GloVe are introduced to help in semantic analysis.

*Unit IV: Social Network Analysis*

The focus of this unit is on understanding the structure and dynamics of social networks using graph theory. Students learn about nodes, edges, and graph representations. Key metrics such as degree centrality, closeness, betweenness, and eigenvector centrality are explored. Concepts like community detection, influencer identification, and information diffusion in networks are also covered using real-world datasets.

*Unit V: Visualization and Case Studies*

Students will learn to visualize social media data using tools such as Matplotlib, Seaborn, and Plotly. They will build dashboards and visual reports with platforms like Tableau and Power BI. This unit includes practical case studies in brand monitoring, hashtag trend analysis, political sentiment tracking, and crisis communication. Ethical issues such as misinformation and data privacy are also discussed.

**Course Outcomes:**

- Understand the landscape and significance of social media analytics.
- Collect, clean, and manage large volumes of social media data.
- Apply natural language processing techniques to analyze textual social media content.
- Perform network-based analysis to identify key users and patterns.
- Visualize social media insights and apply them to real-world problems.

**Text Books:**

1. Matthew A. Russell, *Mining the Social Web*, O'Reilly Media, 3rd Edition.
2. Charu C. Aggarwal, *Social Network Data Analytics*, Springer.

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**VIZIANAGARAM – 535 003, Andhra Pradesh, India**



3. Reza Zafarani, Mohammad Ali Abbasi, Huan Liu, *Social Media Mining: An Introduction*, Cambridge University Press.

**Reference Books:**

1. Peter Mika, *Social Networks and the Semantic Web*, Springer.
2. Subbarao Kambhampati, *AI Methods for Social Media*, Morgan & Claypool.
3. Pak, A., & Paroubek, P., "Twitter as a Corpus for Sentiment Analysis and Opinion Mining," LREC Proceedings.



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**Fundamentals of Cloud Computing**

**COURSE OBJECTIVES:**

- 1) To learn various system models for Distributed and Cloud Computing.
- 2) To understand about Virtual machines, Its Structure and mechanisms.
- 3) To learn Cloud Computing Paradigm.
- 4) To introduce the various levels of services that can be achieved by cloud.
- 5) To describe the security aspects in cloud.

**UNIT- I**

Systems Modeling: System Models for Distributed and Cloud Computing- Cloud Computing in a Nutshell, Layers and Types of Clouds, Desired Features of a Cloud, Infrastructure as a Service Providers, Platform as a Service Providers, Challenges and Risks.

**UNIT- II**

Virtualization: Virtual machines, Implementation Levels of Virtualization -Virtualization Structures/Tools and Mechanisms-Virtualization of CPU, Memory, and I/O Devices

**UNIT- III**

Foundations: Introduction to Cloud Computing- Migrating into a Cloud-The Enterprise Cloud Computing Paradigm.

**UNIT- IV**

Infrastructure as a Service (IAAS) & Platform (PAAS): Virtual machines provisioning and Migration services-On the Management of Virtual machines for Cloud InfrastructuresAneka— Integration of Private and Public Clouds.

**UNIT- V**

Software as a Service (SAAS) &Data Security in the Cloud: Google App Engine, An Introduction to the idea of Data Security- The Current State of Data Security in the CloudCloud Computing and Data Security Risk- Cloud Computing and Identity.

**COURSE OUTCOMES:**

- 1) Understanding various system models for Distributed and Cloud Computing.
- 2) Understanding about Virtual machines, ItsStructure and mechanisms.
- 3) Learning Cloud Computing Paradigm.
- 4) Understanding the various levels of services that can be achieved by cloud.
- 5) Learning about security aspects in cloud.

**TEXT BOOKS:**

- 1) Distributed and Cloud Computing, Kaittwang Geoffrey C.Fox and Jack J Dongrra, Elsevier India 2012.

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2) Mastering Cloud Computing- Raj Kumar Buyya, Christian Vecchiola and S.Tanurai Selvi, TMH, 2012.

3) Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.



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**Data Wrangling and Pre-processing**

**Course Objectives**

1. To understand the importance and foundational concepts of data wrangling and pre-processing.
2. To learn practical methods for cleaning and correcting raw datasets.
3. To transform and encode data effectively for machine learning applications.
4. To integrate and reduce data while preserving key information.
5. To prepare clean and structured data suitable for use in various machine learning models.

**Unit 1: Introduction to Data Wrangling**

This unit introduces the concepts of data wrangling and pre-processing, highlighting their significance in analytics and machine learning. It covers the different types of data — structured, unstructured, and semi-structured — and their respective implications on data processing workflows. Students explore various data collection methods and formats, including CSV, JSON, XML, and data retrieved through APIs. Additionally, the unit presents a brief overview of essential tools such as Python, Pandas, and NumPy, which are widely used in data wrangling tasks. The goal is to build foundational knowledge and awareness of the data pre-processing ecosystem.

**Unit 2: Data Cleaning**

In this unit, students learn to address common issues found in raw datasets. Techniques for identifying and handling missing data are covered, as well as strategies to eliminate duplicates and inconsistencies. Data type conversions and formatting are discussed to ensure consistency and compatibility across tools. Students will also learn to detect and treat outliers, an essential step in preserving model accuracy. The unit includes practical exercises in parsing data, manipulating strings, and applying regular expressions to clean and organize unstructured or messy data effectively.

**Unit 3: Data Transformation**

This unit focuses on the transformation of data to make it more useful and compatible with machine learning models. Students explore methods such as normalization and standardization to scale numerical features. Feature extraction and engineering are introduced to enhance model input quality, and techniques like binning and discretization help simplify continuous variables. The unit also covers encoding categorical variables using label encoding and one-hot encoding. Special attention is given to processing temporal data, equipping students with the ability to handle dates and time-series information effectively.

**Unit 4: Data Integration and Reduction**

Here, students explore how to combine and streamline multiple datasets. Techniques such as merging, joining, and concatenation are introduced for integrating data from different sources. The unit discusses methods for resolving conflicts and removing redundancies that can occur during integration. Students are introduced to dimensionality reduction techniques like Principal Component Analysis (PCA), t-Distributed Stochastic Neighbor Embedding (t-SNE), and Linear Discriminant Analysis (LDA). Feature selection strategies, including filter, wrapper, and embedded methods, are explored to optimize datasets. The unit concludes with approaches for data aggregation and summarization to improve dataset manageability and computational efficiency.

**Unit 5: Data Pre-processing for Machine Learning**

The final unit addresses the final steps in preparing data for machine learning. It covers how to split datasets effectively using train-test splits and cross-validation. Handling imbalanced datasets is

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**VIZIANAGARAM – 535 003, Andhra Pradesh, India**



discussed through techniques such as oversampling, under sampling, and Synthetic Minority Over-sampling Technique (SMOTE). Various scaling techniques, including Min-Max, Standard, and Robust Scaling, are explained to bring numerical features into comparable ranges. The concept of automating the pre-processing workflow using pipelines is introduced, allowing for repeatable and efficient pre-processing steps. The unit concludes with the preparation of datasets tailored for both supervised and unsupervised learning scenarios.

**Course Outcomes**

1. Students will gain proficiency in identifying, collecting, and organizing raw datasets from diverse sources.
2. Students will clean and pre-process data by handling missing values, outliers, and inconsistencies.
3. Students will apply transformation techniques such as encoding, scaling, and feature engineering.
4. Students will integrate, reduce, and aggregate datasets for performance and efficiency.
5. Students will prepare high-quality input datasets ready for training machine learning models.

**Textbooks**

1. *Data Wrangling with Pandas* by Jacqueline Kazil and Katharine Jarmul, O'Reilly Media
2. *Python for Data Analysis* by Wes McKinney, O'Reilly Media
3. *Data Pre-processing Techniques* by Salvador García, Julián Luengo, Francisco Herrera, Springer

**Reference Books**

1. *Hands-On Data Pre-processing in Python* by Roy Jafari
2. *Feature Engineering and Selection* by Max Kuhn and Kjell Johnson
3. *Machine Learning Yearning* by Andrew Ng



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**AI Chatbots**

**COURSE OBJECTIVES:**

1. To introduce students to the foundations and evolution of AI-powered conversational agents.
2. To familiarize students with Natural Language Processing (NLP) techniques essential for chatbot development.
3. To provide hands-on understanding of chatbot frameworks, platforms, and development workflows.
4. To explore machine learning and deep learning models used in building intelligent conversational systems.
5. To equip students with the skills to design, implement, test, and deploy AI chatbots for real-world use cases.

**UNIT I:**

Introduction to Chatbots and Conversational AI: History and evolution of chatbots. Types of chatbots – rule-based vs AI-based. Key components of a chatbot – NLU, dialogue management, and NLG. Overview of chatbot architecture. Applications in customer service, healthcare, education, and e-commerce. Challenges in chatbot development – language ambiguity, user intent, and dialogue coherence.

**UNIT II:**

Natural Language Processing for Chatbots: Basics of NLP – tokenization, stemming, lemmatization, POS tagging, NER. Intent recognition and entity extraction. Text vectorization – Bag of Words, TF-IDF, and Word Embeddings (Word2Vec, GloVe, BERT). Sentiment analysis and language detection. Introduction to spaCy, NLTK, and Hugging Face Transformers for NLP tasks.

**UNIT III:**

Chatbot Frameworks and Tools: Overview of popular chatbot development platforms – Dialogflow, IBM Watson Assistant, Microsoft Bot Framework, Rasa. Building intents, entities, and actions. Conversation flow design using stories and rules. Integration with messaging platforms like Telegram, Slack, WhatsApp, and web interfaces. Testing and debugging chatbots.

**UNIT IV:**

Machine Learning and Deep Learning for Chatbots: Supervised learning for intent classification. Sequence-to-sequence models and transformers for response generation. Use of LSTMs and GRUs in dialogue systems. Reinforcement learning for dialogue policy optimization. Pretrained language models and fine-tuning for conversational agents (e.g., GPT, BERT-based models).

**UNIT V:**

Deployment, Ethics, and Applications: Hosting chatbots using cloud services and REST APIs. Logging, analytics, and user feedback loops. Personalization and contextual conversation handling. Ethical considerations – data privacy, hallucinations, bias, and misuse. Case studies: AI chatbots in banking, mental health, education, and e-commerce. Capstone project discussion and roadmap.

**COURSE OUTCOMES:**

1. Understand the foundational concepts and architecture of AI-powered chatbots.
2. Apply NLP techniques to extract meaningful information and understand user inputs.
3. Develop and test conversational agents using popular chatbot development frameworks.
4. Integrate machine learning and deep learning models to enhance chatbot intelligence.
5. Design, deploy, and evaluate AI chatbots with awareness of ethical and practical implications.

**TEXT BOOKS:**

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1. Jason D. Brown (2020). Designing Bots: Creating Conversational Experiences, O'Reilly Media.
2. Sumit Raj (2019). Building Chatbots with Python: Using Natural Language Processing and Machine Learning, Apress.
3. Srini Janarthanam (2017). Hands-On Chatbots and Conversational UI Development, Packt Publishing.

**REFERENCE BOOKS:**

1. Michael McTear (2020). Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots, Springer.
2. Brad Abrams et al. (2020). Designing Bots with Microsoft Bot Framework and Azure Bot Services, Microsoft Press.
3. Md. Rezaul Karim (2021). Building Smart Chatbots Using Dialogflow, Packt Publishing.



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**Data science applications**

**Course Objective:** To give deep knowledge of data science and how it can be applied in various fields to make life easy.

**Course Outcomes:** After completion of course, students would:

1. To correlate data science and solutions to modern problems.
2. To decide when to use which type of technique in data science.

**UNIT - I**

Data Science Applications in various domains, Challenges and opportunities, tools for data scientists, Recommender systems – Introduction, methods, application, challenges.

**UNIT - II**

Time series data – stock market index movement forecasting. Supply Chain Management – Real world case study in logistics.

**UNIT – III**

Data Science in Education, Social media.

**UNIT - IV**

Data Science in Healthcare, Bioinformatics.

**UNIT - V**

Case studies in data optimization using Python.

**TEXT BOOKS:**

1. Aakanksha Sharaff, G.K.Sinha , “Data Science and its applications “, CRC Press, 2021.
2. Q. A. Menon, S. A. Khoja, “Data Science: Theory, Analysis and Applications”, CRC Press, 2020.



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**Data encryption and network security**

**Course Objectives:**

- Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers) are Introduced.
- Introduction to Public –key cryptography (RSA, discrete logarithms)is provided.
- Algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes are learnt.
- An overview of e-mail and web security is provided.
- An overview of viruses, firewalls and system security is provided.

**Course Outcomes:**

1. Understand the basics of Cryptography, the goals, services and mechanisms.
2. Analyze the Symmetric Encryption Algorithms.
3. Analyze the Asymmetric Cryptographic Algorithms.
4. Understand the Digital signature Schemes.
5. Understand the email security and system security.

**UNIT-I:**

Basic Principles Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography

**UNIT-II:**

Symmetric Encryption Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

**UNIT-III:**

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography

**UNIT-IV:**

Data Integrity, Digital Signature Schemes & Key Management Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

**UNIT-V:**

Network Security: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, IPsec, System Security.

**Text Books:**

- Cryptography and Network Security, Behrouz A Forouzan, Debdeep Mukhopadhyay, 3rd Edition, Mc Graw Hill,11 Feb 2007.

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- Cryptography and Network Security, William Stallings, 6th Edition, Published by Pearson, 2014 April.

**Reference Books:**

- Everyday Cryptography, Keith M. Martin, Oxford, 2nd Edition, Aug 2017.
- Network Security and Cryptography, Bernard Meneges, Cengage Learning, 2010



### *Blockchain Technologies*

#### Course Objectives

1. To provide conceptual understanding of the function of Block chainsaw method of securing distributed ledgers.
2. To understand the structure of a Block chain and why/when it is better than a simple distributed database
3. To make students understand the technology call under pinning of Blockchain operations as distributed data structures and decision-making systems.
4. To understand “smart” contract and its legal implications.

#### **UNIT I:(10 Hours)**

**Introduction:** History and basics, Types of Blockchain, Consensus, CAP Theorem. **Cryptographic Hash Functions:** Properties of hash functions, Secure Hash Algorithm, Merkle trees, Patricia trees.

#### **UNIT II:(10 Hours)**

**Decentralization:** Decentralization using Blockchain, Methods of decentralization, decentralization framework, Blockchain and full ecosystem decentralization, Smart contracts, Decentralized Organizations, Platforms for decentralization.

#### **UNIT III: (10 Hours)**

**Bitcoin:** Introduction to Bitcoin, Digital keys and addresses, Transactions, Blockchain, The Bitcoin network, Bitcoin payments, Bitcoin Clients and APIs, Alternatives to Proof of Work, Bitcoin limitations.

#### **UNIT IV:(10 Hours)**

**Ethereum:** Smart Contracts, Introduction to Ethereum, The Ethereum network, Components of the Ethereum ecosystem, Blocks and Blockchain, Fee schedule, Ethereum Development Environment, Solidity.

#### **UNIT V:(08 Hours)**



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**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**Hyper ledger:** Introduction, Hyper ledger Projects, Protocol, Architecture, Hyper ledger Fabric, Saw tooth Lake, Corda.

**Challenges and Opportunities:** Scalability, Privacy, Blockchain for IoT, Emerging trends

### **Course Outcomes**

The student will be able to:

1. Illustrate the fundamentals of Blockchain.
2. Summarize decentralization and the role of Blockchain in it.
3. Analyse Bit coin Crypto currency and underlying Blockchain network.
4. Understand Ethereum currency and platform, and develop applications using Solidity.
5. Analyse the challenges and future opportunities in Blockchain technology

### **Text Books**

1. Mastering Blockchain, Imran Bashir, Second Edition, Packet Publishing, 2<sup>nd</sup> edition, March 2018.

### **Reference Books:**

1. Mastering Bitcoin: Unlocking Digital Crypto currencies, Andreas Antonopoulos, O'Reilly.
2. Blockchain Blueprint for a New Economy, Melanie Swan, O'Reilly.
3. Mastering Bitcoin: Programming the Open Blockchain, Antonopoulos, And reasM. O'Reilly.
4. BlockchainTechnology: Crypto currency and Applications, S.Shukla, M.Dhawan, S. Sharma, S. Venkatesan, Oxford UniversityPress.

### **Links:**

- <https://www.coursera.org/learn/introduction-blockchain-technologies>  
[https://onlinecourses.nptel.ac.in/noc22\\_cs44/preview](https://onlinecourses.nptel.ac.in/noc22_cs44/preview)



## **Internet of Things**

### **Course Objectives:**

The main objectives of this course are

- Vision and Introduction to Internet of Things (IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

### **Course Outcomes (COs):**

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

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- Develop prototype models for various applications using IoT technology.

### **UNIT I:**

**The Internet of Things:** An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

### **UNIT II:**

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High- level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

### **UNIT III:**

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

### **UNIT IV:**

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

### **UNIT V:**

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.



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**VIZIANAGARAM – 535 003, Andhra Pradesh, India**

**Text Books:**

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

**Reference Books:**

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly



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**Ethical hacking**

**Course Objectives:**

- The aim of the course is to introduce the methodologies and framework of ethical hacking for enhancing the security.
- The course includes-Impacts of Hacking; Types of Hackers; Information Security Models, Information Security Program, Business Perspective, Planning a Controlled Attack
- Framework of Steps (Reconnaissance, Enumeration, Vulnerability Analysis, Exploitation, Deliverable and Integration)

**Course Outcomes:** At the end of the course, student will be able to

- Explain the concepts related to hacking, ports and protocols, pen testing and virtualization
- Determine the applicable footprinting techniques and scanning methods
- Explain the process of system hacking and Explain the concepts Trojans, backdoors, worms and virus and it's countermeasures
- Demonstrate systematic understanding of the concepts of Sniffing and Social Engineering and it's attacks
- Determine the applicable methods of cryptography, steganography and Vulnerability Assessment

**UNIT I:**

**Introduction to Hacking:** Hacking, Types and phases of hacking, **Introduction to Ports & Protocols:** Ports, Protocols, Primary Network Types, **Virtualization & Introduction to Kali Linux:** Virtualization, Virtualization software, supported platforms, **Introduction to Penetration Testing:** Penetration test, Categories and Types of Penetration tests, Structure of Penetration Test Report.

**UNIT II:**

**Footprinting:** Footprinting, Types, Using ping and ns Lookup commands in Windows command line, **Scanning:** Scanning, Basics of Scanning, Basic Techniques of Scanning, Enumerating DNS using dns enum, Performing flag scan using hping3.

**UNIT III:**

**Hacking into System:** System Hacking, Password Cracking, Default password databases, Manual and Automated Password Cracking, Process of System Hacking, Using Keyloggers, **Trojans & Backdoors:** Trojans, Working of Trojan, Infection Techniques, Attack, Lifecycle and Classification of Virus, Worms, Virus Construction Kit.

**UNIT IV:**

**Sniffing, Packet Analysis & Session Hijacking:** Sniffing, Packet Analysis, Types of Sniffing, Active and Passive Sniffing Techniques, Session Hijacking, **Social Engineering:** Social Engineering, Process, Identity Theft, Human and Computer Based Social Engineering Techniques, Phishing Process, Types of Phishing Attacks, Social Engineering Toolkit (SET)

**UNIT V:**

**Cryptography:** Cryptography, Digital Signature, Hash Functions, **Steganography:** Steganography Process, watermarking, Steganography Methods and Attacks, Steganography tools, **Vulnerability Assessment:** Vulnerability, The Open Web Application Security Project (OWASP), Prevention, Damn Vulnerable Web Application (DVWA), installation and testing of DVWA



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**Text Books:**

1. Hacking: Be a Hacker with Ethics, Harsh Bothra, Khanna Publications, 2019
2. Ethical Hacking and Penetration Testing Guide, Rafay Baloch, 2014

**Reference Books:**

1. Kali Linux Wireless Penetration Testing Beginner's Guide, Vivek Ramachandran, Cameron Buchanan, Packt Publishing, 2015
2. SQL Injection Attacks and Defense, 1<sup>st</sup> Edition, Justin Clarke-Salt, Syngress Publication
3. Mastering Modern Web Penetration Testing, Prakhar Prasad, Packt Publishing, October 2016



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**Introduction to Cyber Security**

**Course Objectives:**

- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

**Course Outcomes:** At the end of the course, student will be able to

- Apply cyber security architecture principles.
- Demonstrate the risk management processes and practices.
- Appraise cyber security incidents to apply appropriate response
- Distinguish system and application security threats and vulnerabilities.
- Identify security tools and hardening techniques

**UNIT-I:**

**Introduction to Cyber Security**-Cyber security objectives, roles, differences between information security and cyber security, Cyber security principles-confidentiality, integrity, availability, authentication and non repudiation

**UNIT-II:**

**Information Security within Lifecycle Management**-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, **Risks & Vulnerabilities**-Basics of risk management, Operational threat environments, Classes of attacks

**UNIT-III:**

**Incident Response**-Incident categories, Incident response, Incident recovery, **Operational security protection**-Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management

**UNIT-IV:**

**Threat Detection and Evaluation Monitoring**-Vulnerability management, Security logs and alerts, Monitoring tools and appliances, **Analysis**-Network traffic analysis, packet capture and analysis

**UNIT-V:**

**Introduction to backdoor System and security**-Introduction to metasploit, backdoor, demilitarized zone (DMZ), Digital signature, Brief study on Harding of operating system.

**Text Books:**

1. NASSCOM: Security Analyst Student Hand Book, Dec 2015
2. Information Security Management Principles, Updated Edition, [David Alexander](#), [Amanda Finch](#), [David Sutton](#), BCS publishers, June 2013

**Reference Books:**

1. Cyber Security Fundamentals-Cyber Security, Network Security and Data Governance Security, 2<sup>nd</sup>

Edition, ISACA Publishers, 2019



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**Digital forensics**

**OBJECTIVES:**

1. Provides an in-depth study of the rapidly changing and fascinating field of computer forensics.
2. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
3. Understand how to manage Evidence & Presentation
4. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics.
5. To gain knowledge on Mobile Forensics.

**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.

**UNIT - II**

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

**UNIT - III**

Evidence Management & Presentation: Create and manage shared folders using 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.

**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

**UNIT - V**

Mobile Forensics: mobile forensics techniques, mobile forensics tools. Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008. Recent trends in mobile forensic technique and methods to search and seizure electronic evidence

**TEXT BOOKS:**

1. B. Nelson, A. Phillips, and C. Steuart, Guide to Computer Forensics and Investigations, 4th Edition, Course Technology, 2010

**REFERENCE BOOKS:**

1. John Sammons, The Basics of Digital Forensics, 2nd Edition, Elsevier, 2014
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition, Laxmi Publications, 2005.



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**COURSE OUTCOMES:**

1. Understand relevant legislation and codes of ethics.
2. Investigate computer forensics and digital detective and various processes, policies and procedures data acquisition and validation, e-discovery tools.
3. Analyze E-discovery, guidelines and standards, E-evidence, tools and environment.
4. Apply the underlying principles of Email, web and network forensics to handle real life problems
5. Use IT Acts and apply mobile forensics techniques.