Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Artificial Intelligence**	Course Code: **C109511(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	**L: 3 T: 1 P: 0** Credits: **4**
Class Tests: **2** Assignments: **2 per unit**	Duration (End Semester Exam): **03 Hours**

Course Objective:

- To impart knowledge about Artificial Intelligence.
- To give understanding of the main abstractions and reasoning for intelligent systems.
- To enable the students to understand the basic principles of Artificial Intelligence in various applications.

UNIT-I: Introduction: Overview of AI problems, AI problems as NP, Artificial Intelligence and its applications, Artificial Intelligence Techniques, Level of models, criteria of success, Intelligent Agents, Nature of Agents, Learning Agents. AI Techniques, advantages, and limitations of AI, Impact and Examples of AI, Application domains of AI. The AI Ladder - The Journey for Adopting AI Successfully, Advice for a career in AI, Hotbeds of AI Innovation.

UNIT-II: Problem Solving Techniques: State space search, control strategies, heuristic search, problem characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A* search, Constraint satisfaction problem, Mean-end analysis, Min-Max Search, Alpha-Beta Pruning, Additional refinements, Iterative Deepening.

UNIT-III: Logic: Propositional logic, predicate logic, Resolution, Resolution in proportional logic and predicate logic, Clause form, unification algorithm.

UNIT-IV: Knowledge Representation Schemes and Reasoning: Mapping between facts and representations, Approaches to knowledge representation, procedural vs declarative knowledge, Forward vs. Backward reasoning, Matching, conflict resolution, Non-monotonic reasoning, Default reasoning, statistical reasoning, fuzzy logic Weak and Strong filler structures, semantic nets, frame, conceptual dependency, scripts.

UNIT-V: Planning: The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning.

Text Books:

1. A Classical Approach to Artificial Intelligence, M.C. Trivedi, Khanna Book Publishing, 2019.
2. Artificial Intelligence: A modern approach by Stuart Russel, Pearson Education, 2010.
3. Artificial Intelligence by Rich and Knight, The McGraw Hill, 2017.
4. Artificial Intelligence: A new synthesis by Nils and Nilson, Elsevier, 1997.
5. Artificial Intelligence by Luger, Pearson Education, 2002.
6. Artificial Intelligence by Padhy, Oxford Press, 2005.
7. https://www.edx.org/course/artificial-intelligence-ai
8. https://www.udemy.com/course/artificial-intelligence-az/

Reference Books:

1. Title Introduction to Artificial Intelligence and Expert Systems Author Dan W. Patterson Publisher Pearson Education Edition 1st Edition, 2015.
2. 2Title Artificial Intelligence: A Modern Approach Author S. Russell and P. Norvig. Publisher Prentice Hall Edition 3rd Edition 2009.

Course Outcome: [After undergoing the course, students will be able to:]

- Apply AI algorithms for solving practical problems.
- Describe human intelligence and AI.
- Explain how intelligent system works.
- Apply basics of Fuzzy logic and neural networks.
- Learn about Application and Analysis of planning approaches.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Theory of Computation**	Course Code: **C109513(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	**L: 3 T: 1 P: 0** Credits: **4**
Class Tests: **2** Assignments: **2 per unit**	Duration (End Semester Exam): **03 Hours**

Course Objective:

- Students will learn about a variety of issues in the mathematical development of computer science theory, particularly finite representations for languages and machines.
- Students will gain a more formal understanding of algorithms and procedures
- To illustrate finite state machines to solve problems in computing.
- To explain the hierarchy of problems arising in the computer sciences.
- To familiarize Regular grammars, context frees grammar.
- To solve various problems of applying normal form techniques, push down automata and Turing Machines.

UNIT-I: The Theory of Automata: Introduction to automata theory, Examples of automata machine, Finite automata as a language acceptor and translator. Deterministic finite automata. Non deterministic finite automata, finite automata with output (Mealy Machine. Moore machine). Finite automata with null moves, Conversion of NFA to DFA by Arden's method, Minimizing number of states of a DFA. My hill Nerode theorem, Properties and limitation of FSM. Two way finite automata. Application of finite automata.

UNIT-II: Regular Expressions: Regular expression, Properties of Regular Expression. Finite automata and Regular expressions. Regular Expression to DFA conversion & vice versa. Pumping lemma for regular sets. Application of pumping lemma, Regular sets and Regular grammar. Closure properties of regular sets. Decision algorithm for regular sets and regular grammar.

UNIT-III: Grammars: Definition and types of grammar. Chomsky hierarchy of grammar. Relation between types of grammars. Role and application areas of grammars. Context free grammar. Left most linear &right most derivation trees. Ambiguity in grammar. Simplification of context free grammar. Chomsky normal from. Greibach normal form, properties of context free language. Pumping lemma fro context free language. Decision algorithm for context tree language.

UNIT-IV: Push Down Automata and Turing Machine: Basic definitions. Deterministic pushdown automata and non deterministic push down automata. Acceptance of push down automata. Push down automata and context free language. Turing machine model. Representation of Turing Machine Construction of Turing Machine for simple problem's. Universal Turing machine and other modifications. Church's Hypothesis. Post correspondence problem. Halting problem of Turing Machine.

UNIT-V: Computability: Introduction and Basic concepts. Recursive function. Partial recursive function. Partial recursive function. Initial functions, computability, A Turing model for computation. Turing computable functions, Construction of Turing machine for computation. Space and time complexity. Recursive enumerable language and sets.

Text Books :

1. Theory of Computer Science (Automata Language & Computation), K.L.P. Mishra and N. Chandrasekran, PHI.
2. Introduction to Automata theory. Language and Computation, John E. Hopcropt & Jeffery D. Ullman, Narosa Publishing House.

Reference Books :

1. Theory of Automata and Formal Language, R.B. Patel & P. Nath, Umesh Publication
2. An Introduction and finite automata theory, Adesh K. Pandey, TMH.
3. Theory of Computation, AM Natrajan. Tamilarasi, Bilasubramani, New Age International Publishers.
4. Finite Automata and Formal Languages: A Simple Approach, A.M. Padma Reddy, Pearson Education, India.

Course Outcome: [After undergoing the course, students will be able to:]

- Design finite automata to accept a set of strings of a language.
- Determine whether the given language is regular or not.
- Design context free grammars to generate strings of context free language.
- Design push down automata and the equivalent context free grammars and Design Turing machine.
- Distinguish between computability and non computability, Decidability and un-decidability

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Design and Analysis of Algorithms**	Course Code: **C131512(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	**L: 3 T: 1 P: 0** Credits: **4**
Class Tests: **2** Assignments: **2 per unit**	Duration (End Semester Exam): **03 Hours**

Course Objective:

- Apply Mathematical concepts and notations to define a problem.
- Apply the divide-conquer and Greedy methods to solve a problem.
- Ability to solve real life problems with these algorithmic techniques.
- Familiarize the concept to multidisciplinary functions.
- Interpret data using NP problems and applications of various algorithms to solve real life problems.

UNIT-I: INTRODUCTION TO ALGORITHM DESIGN

Fundamentals of algorithms, asymptotic notations: big oh, small oh, omega and theta notations, worst case, best case and average case analysis. solving recurrence equations: General recurrence equation, Master Method, Recursive Tree Method, substitution method, analysing control structures. Analysis of Sorting and Searching: Heap, insertion,selection and bubble sort; sequential, binary and Fibonacci search.

UNIT-II: DIVIDE AND CONQUER AND GREEDY METHOD

DIVIDE AND CONQUER: Introduction, Binary Search, Merge sort and its algorithm analysis, Quick sort and its algorithm analysis, Strassen's Matrix multiplication.

GREEDY METHOD: The basic greedy strategy &computing minimum spanningtrees, Algorithms of Kruskal and Prims, Dijkstra Algorithm, use of greedy strategy in algorithms for the Algorithm.

UNIT-III: DYNAMICPROGRAMMING

The basic dynamic programming paradigm, Dynamic programming solution to the optimal matrix chain multiplication, longest common subsequence (LCS) problem, Flyod-Warshall Algorithm, Bellmanford Algorithm,0/1Knapsack Problem, Travelling Salesman Problem, Multistage graph, Optimal Binary Search Trees.

UNIT-IV: BACK TRACKING

Introduction- NXN Queen's Problem, Sum of Subsets, Graph Coloring, Hamiltonian's Circuit, Travelling Salesman Problem, Generating Permutation.

UNIT-V: BRANCHBOUND & RANDOMIZED ALGORITHM

Branch and Bound & NP Complete Problem: General method, applications: Travelling sales person problem, 0/1knapsack problem, LC (Least-cost search), FIFO Branch and Bound solution. NP-Hard and NP Complete problems: Basic concepts, non-deterministic algorithms, NP–Hard and NP-Complete classes, Cook's theorem.

Text Books:

1. Cormen, Lelserson, Rivert, "Introduction to Algorithms", Second Edition, PHI.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications Pvt. Ltd., 2008.

Reference Books:

1. Paneerselvam, "Design and Analysis of Algorithms", Prentice-Hall of India, 2006
2. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 2005.
3. Gilles Brassard and Paul Bratley, "Fundamentals of Algorithms", Prentice-Hall of India, 1997.

Course Outcome: [After undergoing the course, students will be able to:]

- Calculate the Time complexity of Insertion sort, Heap sort, Bubble sort, Linear and Binary searchalgorithms.
- Apply the algorithms and design techniques to solve problems related to divide and conquer and Greedy Algorithm.
- Analyse Dynamic Programming problems including Matrix chain multiplication, longestcommon subsequence and knapsack problem.
- Understand the implementation of Backtracking and Recursive Backtracking Methods.
- Understand the basic concepts of NP-Hard, NP-Complete and Branch and Bound methods.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Introduction to Python**	Course Code: **C131514(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	**L: 2 T: 1 P: 0** Credits: **3**
Class Tests: **2** Assignments: **2 per unit**	Duration (End Semester Exam): **03 Hours**

Objective:

- To introduce the use of various data structures available in Python.
- To introduce the use of Numpy Library Laboratoryy for performing various data processing activities.
- To introduce the use of Pandas library for data handling activities.
- To introduce the use of Matplotlib for data visualization activities.
- To introduce the concepts of Data Analysis.

UNIT-I: Introduction: Key Concepts: Python Identifiers, Keywords, Indentations, Comments in Python, Operators, Membership operator, String, Tuple, List, Set, Dictionary, File input/output.

UNIT-II: The NumPy Library: Ndarray, Basic Operations, Indexing, Slicing, and Iterating, Conditions and Boolean Arrays, Shape Manipulation, Array Manipulation, Vectorization, Broadcasting, Structured Arrays, Reading and Writing Array Data on Files.

UNIT-III: The pandas Library: The Series, The Data Frame, The Index Objects, Reindexing, Dropping, Arithmetic and Data Alignment, Operations between Data Frame and Series, Functions by Element, Functions by Row or Column, Statistics Functions, Sorting and Ranking, Correlation and Covariance, "Not a Number" Data. Reading and Writing Data: CSV and Textual Files, HTML Files, XML, Microsoft Excel Files.

UNIT-IV: Data Visualization with matplotlib: A Simple Interactive Chart, Set the Properties of the Plot, matplotlib and NumPy, Working with Multiple Figures and Axes, Adding Text, Adding a Grid, Adding a Legend, Saving the Charts. Line Chart, Histogram, Bar Chart, Pie Charts.

UNIT-V: An Introduction to Data Analysis: Knowledge Domains of the Data Analyst, Understanding the Nature of the Data, The Data Analysis Process, Quantitative and Qualitative Data Analysis

Text Books:

1. Data Structures and Algorithms Using Python, Rance D. Necaise, WILEY.
2. Introduction to Python Programming, Gowrishankar S., Veena A., CRCpress.

Reference Books:

1. Python Data Analytics– Fabio Nelli, APress.
2. Python for Data Analysis, Wes McKinney, O'Reilly.

Laboratory Objective:

Outcomes [After undergoing the course, students will be able to:]

- Use various data structures available in Python.
- Apply the concepts of Data Analysis.
- Apply the use of Numpy Library for performing various data processing activities.
- Apply the use of Pandas library for data handling activities.
- Apply the use of Matplotlib for data visualization activities.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Artificial Intelligence (Lab)**	Course Code: **C131521(022)**
Total / Minimum-Pass Marks (End Semester Exam): **40 / 20**	**L: 0 T: 0 P: 2** Credits: **1**

Laboratory Objective:

To provide skills for designing and analyzing AI based algorithms.

- To enable students to work on various AI tools.
- To provide skills to work towards solution of real life problems

List of Experiments: (Each student should perform, at least, 10 experiments.)

1. Write a prolog program to find the rules for parent, child, male, female, son, daughter, brother, sister, uncle, aunt, ancestor given the facts about father and wife only.
2. Write a program to find the length of a given list
3. Write a program to find the last element of a given list
4. Write a program to delete the first occurrence and also all occurrences of a particular element in a given list.
5. Write a program to find union and intersection of two given sets represented as lists.
6. Write a program to read a list at a time and write a list at a time using the well defined read & write functions.
7. Write a program given the knowledge base,

1. If x is on the top of y, y supports x. If x is above y and they are touching each other, x is on top of y. A cup is above a book. The cup is touching that book. Convert the following into wff's, clausal form; Is it possible to deduce that `The book supports the cup'.
8. Write a program given the knowledge base, If Town x is connected to Town y by highway z and bikes are allowed on z, you can get to y from x by bike. If Town x is connected to y by z then y is also connected to x by z. If you can get to town q from p and also to town r from town q, you can get to town r from town p. Town A is connected to Town B by Road 1. Town B is connected to Town C by Road 2. Town A is connected to Town C by Road 3. Town D is connected to Town E by Road 4. Town D is connected to Town B by Road 5. Bikes are allowed on roads 3, 4, 5. Bikes are only either allowed on Road 1 or on Road 2 every day. Convert the following into wff's, clausal formand deduce that `One can get to town B from town D'.
9. Solve the classical problems for demonstrating AI search heuristics: (Water Jug problem, Monkey Banana problem, Missionary Cannibals problem, Travelling Salesman Problem and alike).
10. Solve the classical Crypt arithmetic problems in AI: (DONALD + GERALD = ROBERT, CROSS + ROADS = DANGER, SEND + MORE = MONEY and alike).
11. Solve the classical Blocks World Problem demonstrating Planning Problem-solving simulation in AI.
12. Write a program to search any goal given an input graph using AO* algorithm.

List of Equipments/Machine required: PC with Wndows XP Operating System, Visual prolog compiler

Recommended Books :

1. Ivan Bratko : Logic & prolog programming.
2. Carl Townsend : Introduction to Turbo Prolog, BPB, Publication.
3. W.F. Clocksin & Mellish : Programming in PRLOG, Narosa Publication House.

Laboratory Outcomes [After undergoing the course, students will be able to:]

- Acquire an overview of logic constructs for performing inferencing techniques. (First Order Predicate Calculus) in toy problems /classical problems using PROLOG / LISP syntax.
- Gain confidence in drafting production rules (iterative / recursive) for an AI simulating code, given a story domain.
- Understand, on how to use different data structures (lists, trees, stacks and queues) for solving routing problems and implementing heuristic searches.
- Gain exposure to deal with situations that crop up syntax / compile-time / run-time errors.
- Simulate game playing / puzzle problems using general solution in PROLOG / LISP syntax.

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Program / Semester: B.Tech (V Sem)	Branch: Cyber Security
Subject: Python (Lab)	Course Code: C131522(022)
Total / Minimum-Pass Marks (End Semester Exam): 40 / 20	L: 0 T: 0 P: 2 Credits: 1

Laboratory Objective:

- To be able to use Python for handling various data structures for data representation and manipulation.
- To be able to use Numpy for data handling.
- To be able to use Pandas for data processing.
- To be able to use Matplotlib for visual representation of data.

List of Experiments:

1. Write programs to understand the use ofPython Identifiers, Keywords, Indentations, Comments in Python, Operators, Membership operator.
2. Write programs to understand the use of Python String, Tuple, List, Set, Dictionary, File input/output.
3. Write programs to understand the use of Numpy's Ndarray, Basic Operations, Indexing, Slicing, and Iterating, Conditions and Boolean Arrays.
4. Write programs to understand the use of Numpy's Shape Manipulation, Array Manipulation, Vectorization.
5. Write programs to understand the use of Numpy's Structured Arrays, Reading and Writing Array Data on Files.
6. Write programs to understand the use of Pandas Series, Data Frame, Index Objects, Reindexing, Dropping, Arithmetic and Data Alignment.
7. Write programs to understand the use of Pandas Functions by Element, Functions by Row or Column, Statistics Functions, Sorting and Ranking, Correlation and Covariance, "Not a Number" Data.
8. Write programs to understand the use of Pandas for Reading and Writing Data using CSV and Textual Files, HTML Files, XML, Microsoft Excel Files.
9. Write programs to understand the use of Matplotlib for Simple Interactive Chart, Set the Properties of the Plot, matplotlib and NumPy.
10. Write programs to understand the use of Matplotlib for Working with Multiple Figures and Axes, Adding Text, Adding a Grid, Adding a Legend, Saving the Charts.
11. Write programs to understand the use of Matplotlib for Working with Line Chart, Histogram, Bar Chart, Pie Charts.

Recommended Books:

1. Python Data Analytics– Fabio Nelli, APress.
2. Python for Data Analysis, Wes McKinney, O'Reilly.

Laboratory Outcomes: [After undergoing the course, students will be able to:]

- Apply Python for handling various data structures for data representation and manipulation.
- Apply Numpy for data handling.
- Apply Pandas for data processing.
- Apply Matplotlib for visual representation of data.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: B.Tech (V Sem)	Branch: Cyber Security
Subject: R Programming (Lab)	Course Code: C131523(022)
Total / Minimum-Pass Marks (End Semester Exam): 40 / 20	L: 0 T: 0 P: 2 Credits: 1

Laboratory Objective:

In this course student will learn about the fundamentals of R programming, standard R libraries, solid understanding of R functions, write programs using the R and gain skills in R programming Language, get acquaintances with Arrays, Files, Strings, Packages, and distributions using R.

LIST OF PROGRAMS:

1. Download and install R-Programming environment and install basic packages using install. Packages() command in R.
2. Learn all the basics of R-Programming (Data types, Variables, Operators etc.)
3. Implement R-Loops with different examples.
4. Learn the basics of functions in R and implement with examples.
5. Implement data frames in R. Write a program to join columns and rows in a data frame using c bind () and r bind () in R.
6. Implement different String Manipulation functions in R.
7. Implement different data structures in R(Vectors, Lists, Data Frames)
8. Write a program to read acsv file and analyze the data in the file in R.
9. Create pie charts and bar charts using R.
10. Create a data set and do statistical analysis on the data using R.
11. Write R program to find Correlation and Covariance.
12. Write R program for Regression Modeling.
13. Write R program to build classification model using KNN algorithm 14. Write R program to build clustering model using K-mean algorithm.

References:

1. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, 2nd Edition, Pearson Education, 2018.
2. S.R. Mani Sekhar and T.V. Suresh Kumar, Programming with R, 1st Edition, CENGAGE, 2017.

Web Reference: 1. https://www.r-project.org/ https://www.tutorialspoint.com/r/index.htm

Laboratory Outcomes: [After undergoing the course, students will be able to:]

- Show the installation of R Programming Environment.
- Utilize and R Data types for developing programs.
- Make use of different R Data Structures.
- Develop programming logic using R Packages.
- Analyze the data sets using R programming capabilities.

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Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Foundation of Ethical Hacking** ***(Professional Elective – I)***	Course Code: **C131531(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	**L: 2 T: 0 P: 0** Credits: 2
Class Tests: **2** Assignments: **2 per unit**	Duration (End Semester Exam): **03 Hours**

Course Objectives:

In this course to teach the students how to legally and responsibly identify, assess, and address security vulnerabilities in computer systems, networks, and software.

UNIT-I: Introduction to Ethical Hacking

Overview of ethical hacking concepts

What is hacking? Terms we use in hacking, Need of Ethical hacking, Cases of Hacking in India & across the globe, Principles of Ethical hacking, Commandments of Ethical Hacking, Hacking Methodologies Types of Hacking and legal considerations. Types of hackers, Hacking Phases, Role of Ethical Hacker, Roles and Responsibilities, Scope & limitations of hacking, Advantages & scope for hacking, Drawbacks & Limitation of hacking, Common Hacking Tools, Hacking Techniques & Approaches, Concept of Penetration testing, Types of Penetration testing , Phases of Penetration testing, Vulnerability Assessment by Penetration testing.

UNIT-II: Footprinting and Reconnaissance

Information gathering: Footprinting through Search Engines, Web Services, • Information Gathering Using Google Advanced Search and Image Search. • VoIP and VPN Footprinting through Google Hacking Database, Footprinting through Web Services • Finding Company's Top-level Domains (TLDs) and Sub-domains • Finding Location, People search, Professional search.

Passive and active reconnaissance techniques, and tools like Whois, Dig, and Nmap.

UNIT-III: Scanning Networks and Enumeration

Network scanning techniques, Network Scanning Concepts. • Scanning Tools and Techniques • Scanning Pen Testing • Port Scanning & Countermeasures, Detecting live systems, identifying open ports, and enumerating network resources. Techniques for Enumeration, Services and Ports to Enumerate • NetBIOS, SNMP, LDAP Enumeration • Information Gathering Using Groups, Forums, and Blogs

UNIT-IV: Vulnerability Analysis and System Hacking

Identifying and analyzing vulnerabilities in systems, and exploring system hacking techniques like password cracking and privilege escalation. Vulnerability Assessment Concept & Solutions • Vulnerability Assessment Tools & Reports • Comparing Security Audit, Vulnerability Assessment, and Penetration Testing

UNIT-V: Malware Threats and Sniffing

Understanding malware types, detecting malware infections, • Introduction to Malware Analysis • Malware Analysis Procedure • Malware Detection Method.Network sniffing techniques to capture and analyze data traffic. Sniffing Network • Sniffing Concepts & Techniques • WireShark installing & concept • Sniffing Detection Techniques

Text Book :

1. CEH v11 Certified Ethical Hacker Study Guide" by Ric Messier

References Books :

1. **"**Hacking Exposed 7: Network Security Secrets and Solutions" by Stuart McClure
2. "The Basics of Hacking and Penetration Testing" by Patrick Engebretson
3. "Ethical Hacking for Beginners" by Rafay Baloch
4. CEH v11 Certified Ethical Hacker Study Guide" by Ric Messier

Course Outcomes:

- Understand fundamental concepts of ethical hacking, including its legal and ethical framework.
- Apply networking fundamentals to identify vulnerabilities in systems and networks.
- Analyze information gathering and vulnerability assessment techniques.
- Evaluate the effectiveness of different cyberattacks and their impact.
- Design basic security measures to defend against common network and system threats.

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Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Web Application Security *(Professional Elective – I)***	Course Code: **C131532(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	**L: 2 T: 0 P: 0** Credits: 2
Class Tests: **2** Assignments: **2 per unit**	Duration (End Semester Exam): **03 Hours**

Course Objectives:

To understand the fundamentals of web application security To focus on wide aspects of secure development and deployment of web applications To learn how to build secure APIs To learn the basics of vulnerability assessment and penetration testing To get an insight about Hacking techniques and Tools.

UNIT-I: FUNDAMENTALS OF WEB APPLICATION SECURITY 6

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation.

UNIT-II: SECURE DEVELOPMENT AND DEPLOYMENT 5

Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM).

UNIT-III: SECURE API DEVELOPMENT 6

API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNIT-IV: VULNERABILITY ASSESSMENT AND PENETRATI ON TESTING 6

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database- based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNIT-V: HACKING TECHNIQUES AND TOOLS 7

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.

Text Books:

1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, First Edition, 2020, O'Reilly Media, Inc.
2. Bryan Sullivan, Vincent Liu, Web Application Security: A Beginners Guide, 2012, The McGraw-Hill Companies.
3. Neil Madden, API Security in Action, 2020, Manning Publications Co., NY, USA.

References:

1. Michael Cross, Developer's Guide to Web Application Security, 2007, Syngress Publishing, Inc.
2. Ravi Das and Greg Johnson, Testing and Securing Web Applications, 2021, Taylor & Francis Group, LLC.
3. Prabath Siriwardena, Advanced API Security, 2020, Apress Media LLC, USA.
4. Malcom McDonald, Web Security for Developers, 2020, No Starch Press, Inc.
5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

Course outcomes:

- Understanding the basic concepts of web application security and the need for it.
- Be acquainted with the process for secure development and deployment of web applications.
- Acquire the skill to design and develop Secure Web Applications that use Secure APIs.
- Be able to get the importance of carrying out vulnerability assessment and penetration testing .
- Acquire the skill to think like a hacker and to use hackers tool sets.

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Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Multimedia and Virtual Reality *(Professional Elective – I)***	Course Code: **Multimedia and Virtual Reality**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	**L: 2 T: 0 P: 0** Credits: **2**
Class Tests: **2** Assignments: **2 per unit**	Duration (End Semester Exam): **03 Hours**

UNIT-I: Theory of Internet:-Introduction, Evolution of Internet, Internet applications, Internet Protocol: TCP/IP, Protocol, Versions, Class full addressing, IP data gram, ICMP &IGMP. Functions of ARP and RARP, User Data gram Protocol (UDP), Transmission Control Protocol (TCP): Flow-Control, Error-Control. Internet Security & Firewalls.

UNIT-II: Bounded Media for Internet: Cable media, Telephone network, ISDN: Overview, Interfaces& Functions, Physical Layer, Data Link Layer, Network Layer Services, Signaling System Number7.ATM& BISDN: Introduction Services & Applications, Principles& building blocks of B-ISDN, DIAS network.

UNIT-III: Un-Bounded Media for Internet: Wireless media: Components and working of Wireless network, IEEE 802.11standardsandWLANtypes, Ad-hoc networks, MACAW Protocol. Features and Goals of Bluetooth, Bluetooth products and security, TCP OverWireless&Ipv6: Mobile IP, support of Mobility on the Internet, Mobile TCP, Traffic Routing in Wireless Networks, Circuit switched Data Services, Packet switched Data services. WLL Architecture, WLL Technologies and frequency spectrum, Local Multipoint Distribution Service (LMDS), Ultra Wideband Technology.

UNIT-IV: Introduction to Multimedia:-Concept of Non-Temporal and Temporal Media. Hypertext and Hypermedia. Presentations: Synchronization, Events, Scripts and Interactivity, Compression Techniques: Basic concepts of Compression. Still Image Compression: JPEG Compression, FeaturesofJPEG2000.Video Compression: MPEG-1&2 Compression Schemes, MPEG-4 Natural Video Compression. Audio Compression: Introduction to speech and Audio Compression, MP3 Compression Scheme. Compression of synthetic graphical objects.

UNIT-V: Multimedia Systems Technology: Architecture for Multimedia Support: Multimedia PC/Workstation Architecture, Characteristics of MMX instruction set, I/O systems: IEEE 1394 interface, Operating System Support for Multimedia Data: Resource Scheduling with real time considerations, File System, I/O Device Management. Multimedia Information Management: Multimedia Database Design, Content Based Information Retrieval: Image Retrieval, Video Retrieval, OverviewofMPEG-7, Design of Video-on-demand systems.

Text Books:

1. Multimedia System Design, Andleigh and Thakarar, PHI, 2003.
2. Multimedia Technology & Application, David Hillman, Galgotia Publications.

Reference Books:

1. Multimedia Computing Communication and Application, Steinmetz, Pearson Edn.
2. Virtual Reality Systems, John Vince, Pearson Education.
3. Fundamentals of Computer Graphics and Multimedia, D.P. Mukherjee, PHI.

Course Outcomes [After undergoing the course, students will be able to:]

- Know the fundamental video, audio, image, text processing techniques.
- Acquire the basic skill of designing video compression, audio compression, image compression, text compression.
- Know the basic techniques in designing video transmission systems: error control and rate control.
- Know the technologies related to virtual reality and application of virtual reality system.
- Get familiar with VRML programming.

Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.)

Program / Semester: **B.Tech (V Sem)**	Branch: **Cyber Security**
Subject: **Soft Computing** ***(Professional Elective – I)***	Course Code: **C131534(022)**
Total / Minimum-Pass Marks (End Semester Exam): **100 / 35**	**L: 2 T: 0 P: 0** Credits: **2**
Class Tests: **2** Assignments: **2 per unit**	Duration (End Semester Exam): **03 Hours**

UNIT-I: Introduction: Concept of computing systems. "Soft" computing versus "Hard" computing, Characteristics of Soft computing, Some applications of Soft computing techniques.

UNIT-II: Fuzzy logic: Introduction to Fuzzy logic. Fuzzy sets and membership functions. Operations on Fuzzy sets. Fuzzy relations, rules, propositions, implications and inferences. Defuzzification techniques. Fuzzy logic controller design. Some applications of Fuzzy logic. Fuzzy rule base system : Fuzzy propositions, formation, decomposition & aggregation of fuzzy Rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.

UNIT-III: Artificial Neural Networks: Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference b/w ANN and human brain, characteristic and applications of ANN, single layer network. Perceptron: Perceptron training algorithm, Linear separability Introduction of MLP, different activation functions, Error back propagation algorithm, Applications of ANNs to solve some real life problems.

UNIT-IV: Genetic Algorithms: Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modelling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

UNIT-V: Multi-objective Optimization Problem Solving: Concept of multi-objective optimization problems (MOOPs) and issues of solving them. Multi-Objective Evolutionary Algorithm (MOEA). Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs, Some applications with MOEAs.

Text Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, S. Rajasekaran, G. A. Vijayalakshami, PHI.
2. Neural Networks and Learning Machines, (3rd Edn.), Simon Haykin, PHI Learning, 2011.
3. Soft Computing, D. K. Pratihar, Narosa, 2008.

Reference Books:

1. Fuzzy Logic: A Pratical approach, F. Martin, Mc neill, and Ellen Thro, AP Professional, 2000.
2. Genetic Algorithms In Search, Optimization And Machine Learning, David E. Goldberg, Pearson Education, 2002.

Course Outcomes [After undergoing the course, students will be able to:]

- Fuzzy logic and its applications.
- Artificial neural networks and its applications.
- Solving single-objective optimization problems using GAs.
- Solving multi-objective optimization problems using Evolutionary algorithms (MOEAs).
- Applications of soft computing to solve problems in varieties of application domains.