Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Forensic Science

B. Sc. Digital and Cyber Forensics- Batch (2023-27)
SEMESTER-VI

COURSE CODE	CATEGORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers				
BDCF601	Major Core	Reverse Engineering and Malware Analysis	60	20	20	60	40	4	0	4	6

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit; Th. - Theory
*Teacher Assessment shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, giventhat no component shall exceed more than 10 marks

Course Objectives: The student will have the ability

1. To understand the malware analysis concept
2. To understand advanced malware analysis

Course Outcomes: After studying this course, the students will

1. To know the analysis of malware using tools
2. To get overviews of malware analysis

UNIT I Basic Static Malware Analysis-I

Introduction to Malware, Types of malware – Virus, Worm, Trojan, Backdoor, Ransomware, The Goals of Malware Analysis, Malware Analysis Techniques,

UNIT II Basic Static Malware Analysis- II

Basic Static Techniques: Hashing, Finding Strings, Packed and Obfuscated Malware, Portable Executable File Format, Linked Libraries and Functions, PEFile Header and Sections, Virtual Machines for Malware Analysis

UNIT III Dynamic Malware Analysis

Basic Dynamic Analysis: Executing Malware Analysis in a safe environment, Monitoring with Process Monitor, Viewing Processes with Process Explorer, Comparing Registry Snapshots with Regshot, Faking a Network, Packet Sniffing with Wireshark

UNIT IV Advanced Static Malware Analysis

Introduction to x86 Disassembly: Architecture, Main Memory, Instructions, Opcodes and Endianness, Operands, Registers, Simple Instructions, Stack, Conditionals, Branching, Analyzing Malicious Windows Programs: Windows API, Windows Registry, Networking

APIs, Kernel vs User Mode, Native API.

UNIT V: Advanced Dynamic Malware Analysis

Debugging: Source Level vs Assembly Level Debuggers, Kernel vs User Mode Debugging, Using Debugger – OllyDbg/IDA Pro, Exceptions, Modifying execution with Debugger, Malware Behaviour: Reverse Shell, RAT, Botnet, Process Injection, Hook Injection, APC Injection

Practicals:

1. Use any Open or free Obfuscation tool.
2. Use any File analysis tools to extract metadata and other details.
3. Use the PEiD tool to examine & detect the presence of Packers
4. Explore the linked libraries and functions in the sample file using dependency walker tool.
5. Explore the PE File headers & sections in the sample file using the PEview tool.
6. Explore the Resource sections in the sample file using the Resource Hacker tool.
7. Installation of free automated Malware analysis sandboxes.
8. Install the following tools useful for developing a virtual environment: -
   a. Procmon
   b. Process Explorer
   c. Regshot
   d. INetsim or ApateDNS
   e. Wireshark
9. Perform Dynamic malware analysis
10 Behavioural Analysis of Windows Malware

Reference Books-:

1. Michael Sikorski, Andrew Honig: Practical Malware Analysis - The Hands-On GuidetoDissecting Malicious Software, 1st Edition
2. Eldad Eilam: Reversing – Secrets of Reverse Engineering, Wiley Publishing

- Allport, G. W., & Odbert, H. S. (1936). Trait names: A psycho-lexical study. Psychological Monographs, 47 (1 Whole No. 2II). Anastasi, A., & Urbina, S. (1996). Psychological testing (7th ed.). Upper Saddle River, NJ: Prentice Hall.

- Bellardo, T. (1985). An of online searcher traits and their relationship to search outcome. Journal of the American Society for Information Science, 36(4), 241- 250.

- Beyer, S., Rynes, K., Perrault, J., Hay, K., & Haller, S. (2003). Gender differences in computer science students. Proceedings of the SIGCSE'03, pp. 49- 53·

- Bishop-Clark, C. (1995). Cognitive style, personality, and computer programming. Computers in Human Behavior, II(2), 241-260.

- Booth, P., Fowler, C. J. H., & Macaulay, L. A. (1987). An investigation into business information presentation at human-computer interfaces. In: Bullinger, H. J., and Schackerl, B. (Eds.), Proceedings of Human-Computer Interaction-INTERACT'87, Elsevier, North-Holland. pp. 599-604.

- Cathcart, W. (1990). Effects of LOGO instruction on cognitive style. Journal of Educational Computing Research, 6,231-242.

- Chak, K., & Leung, L. (2004). Shyness and locus of control as predictors of Internet addiction and Internet use. CyberPsychology & Behavior, 7(5), 559- 570 . Chen, c., & Rada, R. (1996). Interacting with hypertext: A meta-analysis of experimental studies. Human-Computer Interaction, II, 125-156.

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BDCF602	DSE-I	Machine Learning in Digital Forensics	60	20	20	30	20	3	0	2	4

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Learning Objectives:

1. Feature Selection and dimensionality Reduction
2. Provide the Framework for accessing and optimizing model performance.
3. Develop skills in selecting appropriate hyperparameters for machine learning algorithms
4. To

Learning Outcomes: Upon completion of the subject, students will be able toknow

1. Able to understand Machine Learning
2. Provide the Framework for accessing and optimizing model performance.
3. To discover patterns in User Data and make predictions
4. To enable Learning, Reasoning, and decision-making outside of human interaction.

UNIT-I: Introduction to Machine Learning

Introduction to Machine Learning, Well-Posed Learning Problems, Motivation to Machine Learning, Applications of Machine Learning, Designing a Learning System, Perspective and Issues in Machine Learning, Concept Learning; Types of Machine Learning - Supervised Learning, Unsupervised Learning, Reinforcement Learning

UNIT-II Regression Classification Methods in Machine Learning

Subset Selection, Shrinkage Methods, Principle Components Regression; Linear Classification, Logistic Regression, Classification-Separating Hyperplanes Classification

UNIT-III Other Classification Methods in Machine Learning

Naïve Bayes Classification: Fitting Multivariate Bernoulli Distribution, Gaussian Distribution, and Multinomial Distribution, K-Nearest Neighbors, and Decision Trees. Support Vector Machines: Hard Margin and Soft Margin.

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UNIT-IV: Artificial Neural Networks

Artificial Neural Networks (Early models, Back Propagation, Initialization, Training & Validation), Decision Trees, Evaluation Measures, Hypothesis Testing, Ensemble Methods, Graphical Model

UNIT-V: Clustering Methods

Clustering, Gaussian Mixture Models, Spectral Clustering; Ensemble Methods; Learning Theory, Reinforcement Learning

Practical List:

1. Find the Error Metrics Like Mean Absolute Error, Mean Squared Error, and Root Meansquared error for the given dataset weather.csv and using temperature parameters.
2. Implement the decision tree using breast cancer Wisconsin (Diagnostic) Data Set
3. Implementing the decision tree using the dataset
4. Implementing Naïve Bayes Algorithm
5. Working with Numpy Library
6. Working with Pandas Library
7. Perform with Linear Regression

References:

1. Tom Mitchell, Machine Learning, TMH
2. C. Bishop, Pattern Recognition and Machine Learning, Springer
3. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification and Scene Analysis, Wiley
4. Kishan Mehrotra, Chilukuri Mohan and Sanjay Ranka, Elements of Artificial NeuralNetworks, Penram International
5. Rajjan Shinghal, Pattern Recognition, Techniques and Applications, OXFORD
6. Athem Ealpaydin, Introduction to Machine Learning, PHI
7. Andries P. Engelbrecht, Computational Intelligence - An Introduction, Wiley Publication
8. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, Theodoridis and Koutroumbas

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BDCF603	DSE II	Cyber Forensics Psychology	60	20	20	30	20	3	0	2	4

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Learning Objectives:

1. The Basic Psychological Qualities of Cyberspace
2. The Psychology of the Individual in Cyberspace
3. The Psychology of Cyberspace Relationships

Learning Outcomes: Upon completion of the subject student will be able to know the

1. The Basic Psychological Qualities of Cyberspace
2. The Psychology of the Individual in Cyberspace
3. The Psychology of Cyberspace Relationships
4. Group Dynamics in Cyberspace

UNIT-I

The Basic Psychological Qualities of Cyberspace

Cyberspace as a psychological space - basic psychological features of cyberspace-Networks as "mind" and "self"-Presence. The online disinhibition effect -Psychology of avatars and graphical space- Cyberspace as dream world-Two Paths of Virtual Reality-The black hole of cyberspace Online lingo-Internet demographics -Cyberspace humor -Coping with spam - Social Psychology of Cyberspace: Self and community in the age of Internet.

UNIT-II

The Psychology of the Individual in Cyberspace

Identity management in cyberspace -Personality types in cyberspace-Unique roles in cyberspace- Transference to computers and cyberspace- Addiction to computers and cyberspace Regressive behavior in cyberspace-Online gender-switching-Adolescents in cyberspace-Wizards: The heart of an online community-On being a "god"-Y2K and apocalyptic thinking- Integrating online and offline living. An online psycho-educationalprogram – Media transitions – Computer and Cyberspace addiction.

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UNIT-III

The Psychology of Cyberspace Relationships

In-person versus cyberspace relationships-Transient and long term online relationships-The psychology of text relationships -Hypotheses about online text relationships-E-mail communication and relationships – Transference among people online – How to resolve conflict online – Cyberspace romances – Subtlety in multimedia chat. Assistive and augmentive technologies - Media: games, entertainment, and education - The future: the ultimate human-computer interface

UNIT-IV

Group Dynamics in Cyberspace

Social psychology of online groups-Developmental stages of mailing lists-Making virtual communities work-Early history of an online community-Wizards: The heart of an online community-Therapy and support groups in cyberspace-Unique groups in cyberspace-TextTalk: Communicating with typed text chat-A decision-making method for e-mail groups-Extending a work group into cyberspace - Using discussion boards in teaching-Group games using avatars-Geezer Brigade: Studying an online group-Managing deviant behavior in online groups – Online photo-sharing communities (flickr).

UNIT-V

Research Methods and Computer therapies in Cyber psychology

Publishing online - Case studies of digital life forms - One of Us: Participant observation research - Steps in studying an online group - Ethics in cyberspace research - Studying full cyberspace immersion - Computer mediated Therapy, Towards cyber psychology – theory and methods - Theoretical approaches: models and metaphors; Research: modes and methods; Sensory-motor interfaces: input and output; Learning and memory, transfer and interference; Cognitive psychology: thinking and problem solving; Interpersonal relations. Abnormal behaviour and cyber therapies

Practicals

1. Reflective exercises to understand personal strengths and weaknesses in relation to family life in the cyber world.
2. To analyse a ‘family’ depicted in the media (such as television and movies) through the lens of major theoretical perspectives.
3. Conducting face recognition experiments
4. Criminal profiling through social media.
5. Analysing social problems from psychological perspectives.
6. Development of basic apps for everyday usage on the basis of psychological theories.
7. SWOT analysis of today's cyber world.
8. MMPI and 16 PF

Chairperson	Chairperson	Controller of Examination	Registrar
Board of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Faculty of Studies Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore	Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

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BDCF604	INTERNSHIP	-	-	-	75	25	-	-	12	6

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Internship

Every student will carry out an Internship in cyber forensic/digital forensic/cyber security organisation for fifteen days under the supervision of Supervisor/(s) (Internal/External). Every student will be required to present aseminar talk towards the end of the semester and should submit a report of the same, presenting the work carried out by him/her in the semester. Every student will carry out an internship under the supervision of Supervisor/(s) (Internal/External). The topic shall be approved by a committee constituted by the head of the concerned institute.

Every student will be required to present two seminar talks, first at the beginning of the project (Phase-I) to present the scope of the work and to finalize the topic, and second towards the end of the semester, presenting the work carried out by him/her in the semester.