GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Postgraduate

Branch: Computer Engineering (Cybersecurity)

Course / Subject Code: ME01059031

Course / Subject Name: Defensive Programming Concepts

w. e. f. Academic Year:	2024-25
Semester:	1
Category of the Course:	Program Elective Course-01

Prerequisite:	• Basic concepts of C and C++.
Rationale:	• This course aims to write basic programs and high-level applications using the concepts of python programming and secure coding practice. • It is aimed to learn offensive security programming through penetration testing and forensic investigation programs with python.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the fundamentals of python programming with libraries and socket programming.	UN
02	Execute the secure code review practice for defensive programming.	AP
03	Implement web applications and web services using python programming.	AP
04	Analyze the digital investigation process through hands-on exercises.	AN
05	Detect the network intrusions through network traffic analysis and web recon with python.	EL

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
03	00	02	04	70	30	30	20	150

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	UNIT 1: Introduction: Basics of Python and its libraries, Basics of Vulnerability Assessment and Penetration Testing, A Penetration Test with Python, Setting Up Development Environment.	08	18
2.	UNIT 2: Secure Coding: Secure Code Review, Methodology, Secure Code Review Technical Reference, Code Review Checklist, Threat Modeling Examples, HTML5	08	18
3.	UNIT 3: Network Programming Basics: Networking: Basics of Networking, Networking and Multithreading Programming – sockets, Threads and processes, Chat Application	03	10
4.	UNIT 4: Penetration Testing: Build port scanner, Build SSH botnet, FTP Scanner, Regular Expression	05	15
5.	UNIT 5: Forensic Investigation with Python: Analysis of wireless access point in the Registry, Recover deleted items in recycle bin, Parse PDF metadata, Investigating application artifacts with python	07	15
6.	UNIT 6: Network Traffic Analysis with Python: Introduction of PyGeoIP, Analyse LOIC traffic, Pentagon's Dilemma, Intrusion Detection System using Scapy	04	10
7	UNIT 7: Wireless mayhem with python: Introduction of Wireless Security, Setting of Wireless attack environment, Listen wireless secret, Firesheep Detection	05	09
8	UNIT 8: Web recon with python: Introduction of Social Engineering, Mass Social Engineering	02	05

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
5	15	40	20	20	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. David Beazley and Brian K. Jones, Recipes for Mastering Python3 Cookbook, 3rd Edition, O'Reilly, 2013.
2. Mark Summerfield, Programming in Python 3, 2nd Edition, Pearson Education, 2010.
3. Violent Python – A Cookbook for Hackers, Forensic Analysts, Penetration Testers and Security Engineer by TJ O'Connor
4. Penetration Testing: A Hands-On Introduction to Hacking 1st Edition by Georgia Weidman
5. Larry Conklin and Gary Robinson, OWASP Code Review Guide 2.0 by OWASP Foundation, 2017.

(b) Open-source software and website:

1. https://python.org, Python3 latest version.
2. Course-related online MOOC on SWAYAM NPTEL/Coursera Platform.
3. Recently published papers/articles of reputed journals/conferences.

Suggested Course Practical List: If any

List of Laboratory/Learning Resources Required: The practical work will be carried out based on the content covered during the academic sessions. It is suggested to design the practical's based on Red Team Vs. Blue Team Concepts.

Suggested Project List: Basic Projects for Socket Programming.

Suggested Activities for Students: If any

Any Other:

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