MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI, TAMIL NADU, INDIA

Bachelor of Science in Cyber Security
Choice Based Credit System (CBCS)
Incorporating the Outcome Based Education (OBE) Norms with
Syllabus Pattern as recommended by Tamil Nadu State Council for Higher Education, (TNSCHE) Chennai

SYLLABUS

From the academic year 2026- 2027

OUTCOME BASED EDUCATION - CHOICE BASED CREDIT SYSTEM

A. VISION AND MISSION OF THE UNIVERSITY

Vision

"To provide quality education to reach the un-reached"

Mission

- To conduct research, teaching and outreach programmes to improve conditions of human living
- To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.
- To develop partnership with industries and government so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development
- To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled.

B. PREAMBLE

The Bachelor of Science (B.Sc.) in Cyber Security is designed to provide fundamental and advanced knowledge in cyber security, cyber forensics, information security, networking, cyber laws and cyber crime investigation through the Choice Based Credit System (CBCS) and Outcome Based Education (OBE) framework. The programme emphasizes theoretical understanding, practical exposure, analytical thinking, ethical values and professional skill development through laboratory training, internships, case studies and project work to prepare learners for careers in cyber security, digital forensics, information security and allied technology sectors.

C. PROGRAMME EDUCATIONAL OUTCOMES (PEO)

In alignment with the Vision and Mission of the University, the following have been defined as the PEO for the graduates.

PEO1: Developing strong positive attitude to learn independently the concepts in the field of study

PEO2: Ensuring confidence among the learners to apply the knowledge and skills gained to solve real life issues

PEO3: Habituating ethical values among the learners to succeed in personal and professional life.

D. PROGRAMME OUTCOMES (PO)

Programme Outcomes for the Under Graduate and Post Graduate Degree Programmes of the University are articulated as under.

After the successful completion of Postgraduate Programme from the University, the learner should be able to

PO1: Comprehend the knowledge acquired and the same to others
PO2: Analyze and compare the factual data / situation to comprehend and to critically evaluate to find solution to the problem ahead
PO3: Apply the theories and philosophies learned in the problem in scientific manner.
PO4: Think reflectively on the earlier activities and attempt for self directed lifelong learning process.
PO5: Understand the multicultural and identify the means to prolong moral/ethical values in personal and professional life
PO6: Explore through multiple sources and get exposed to the digital literacy and Information explosion with latest technology.
PO7: Act as a responsible member in the varied teams with facilitating capability and formulate teams as a leader for defined purposes.

Programme Specific Outcomes: At the end of this course of study, the student will be able to

PSO 1	Articulate diverse aspects of cyber and information security using cyber forensic via scientific methods, software's and instrumentations.
PSO 2	Illustrate the functioning of the cyber space and securing cyber information /data
PSO 3	Differentiate between and among methods/ protocols, and evaluative procedures required in the investigative process that is required for solving cybercrimes and also document the same as per the legal norms.
PSO 4	Assist in forensic investigation using established principles of forensic and step by step development of the investigative procedures.
PSO 5	Recommend and develop various aspects of cyber forensic investigation protocols based on the type of cybercrimes, evidences collected, evaluative procedures conducted and aid in solving cases keeping in mind the laws and justice systems pertaining to the same.
PSO 6	Develop epithetical concern towards various cyber security and ways to solve which will be very beneficial to society and industries.
PSO 7	Analyse critically the given cyber data, ascribe meaning to them and draw objective conclusions and formulate and create solutions to problems in cyber space and cyber security

MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI, TAMIL NADU, INDIA

Bachelor of Science in Cyber Security
Choice Based Credit System (CBCS) and
Outcome Based Education (OBE) Norms

Scheme, Regulations and Syllabus

Title of the course: Bachelor of Science (B. Sc.) Degree course in Cyber Security

Eligibility: Candidates for the BSc Degree in Cyber Security should have passed higher secondary examination in any group conducted by the Board of Secondary Education, Government of Tamil Nadu or any other equivalent examination prescribed and accepted by the Syndicate / SCAA of the Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu.

Objectives of the course:

- *To make the students conversant with the causes and consequences of cybercrimes and security breaches in cyber space.*
- *To get the students acquainted with the structure and functioning of the Cyberspace and its security.*
- *To develop in students, skill sets such as Communication, Analytical Thinking, Problem Solving, Decision Making, Imbibe Value Systems and to construct a regard for cyber security, Cyber forensic and information security– Through effective participatory teaching methodology, Practical Training and Internship.*
- *To prepare the students to take up a career in the field of Cyber Security, Cyber Forensic and Information Security,*

Medium Of Instruction

Medium of Instruction is in English

Duration of the course: Three years under semester pattern

Structure of the programme: This B.Sc. programme will consist of following courses compulsory for all students:

- *4- Language courses/ papers*
- *4- English courses/ papers*
- *15- Core courses/ papers (including Practical's)*
- *8- Electives courses/ papers (including Practical's)*
- *7- Skill Enhancement courses/ papers (including Practical courses)*
- *1- Skill Enhancement courses/ papers (Foundation Course)*
- *2- EVS courses/ papers*
- *1- Value Education courses/ paper*
- *1- Summer Internship/ Industrial Training courses/ papers*
- *1- Extension Activity courses/ papers*
- *1- Professional Competency Skill courses/ papers*

Semester wise breakup of courses/ papers

- ***I Semester: 2 Language Courses/ Papers, 2 Core Courses/ Papers, 1 Elective Course/ Paper, 1 Skill Enhancement Course/ Paper- Practical's, and 1 Skill Enhancement (Foundation) Course/ Paper***
- ***II Semester: 2 Language Courses/ Papers, 2 Core Courses/ Papers, 1 Elective Course/ Paper, and 2 Skill Enhancement Course/ Papers- including a Practical's***
- ***III Semester: 2 Language Courses/ Papers, 2 Core Courses/ Papers, 1 Elective Course/ Paper, 2 Skill Enhancement Course/ Paper including Practical's and 1 EVS Course/ Paper***
- ***IV Semester: 2 Language Courses/ Papers, 2 Core Courses/ Papers, 1 Elective Course/ Paper, 2 Skill Enhancement Course/ Paper (including one practical's, 1 Skill Enhancement Courses/ Papers and 1 EVS Course/ Paper***
- ***V Semester: 4 Core Courses/ Papers (including one project), 2 Elective Courses/ Papers, 1 Value Education Course/ Paper and 1 Summer Internship/ Industrial Training Course/ Paper***
- ***VI Semester: 3 Core Courses/ Papers, 2 Elective Courses/ Papers, 1 Extension Activity Course/ Paper and 1 Professional Competency Course/ Paper***

Note: All courses/ papers listed above are compulsory papers

Examinations

Theory Papers

Examination

There will be an internal assessment comprising of tests, seminars and assignments and one End-semester examination during each semester. The internal assessments will form 25 % of the marks (including 15 marks for tests, 5 marks for assignments and 5 marks for seminar presentation) and the end semester examination will form 75 % of the total marks.
In practical papers the continuous internal assessments will form 50 % of the marks and the end semester examination will form 50 % of the total marks

In select subjects the internal assessments will form 25 % of the marks (including 15 marks for tests, 5 marks for assignments and 5 marks for seminar presentation), Internal Evaluation of Hands-on Training 25 % of the marks and the end semester examination will form 50 % of the total marks.

A minimum of 50 % marks in each course is prescribed for a pass in the course. The candidate who has not secured a minimum of 50% marks in a course will be deemed to have failed in that course.

<table>
<tr><th>Phase of Examinations</th><th>Marks</th><th>Practical</th></tr>
<tr><td rowspan="2">Phase I –

Continuous Internal Assessment</td><td>Total – 50
Continuous Assessment (Internal)- 25 marks
Test – 25 marks.
Three tests should be conducted and average of two test marks will be taken.</td><td rowspan="2">“N” number of practical’s be conducted based on the practical’s prescribed in the syllabus and the marks should be distributed equally for each practical. There is no passing minimum in the Internal Continuous Assessment.

Passing minimum: 40% (20 marks) in the Internal.</td></tr>
<tr><td>Calculation of marks:
Sum of marks awarded to number of practical’s + the Average marks of two tests.</td></tr>
<tr><td>Phase II–

End semester assessment</td><td>Total – 50

Marks awarded by the Course teacher– 25 marks (20 for</td><td>Only one practical examination shall be conducted at the end of semester for the students on lot basis by appointing TWO</td></tr>
</table>

(March/April)– Practical Examinations	practical's + 5 for Records) Marks awarded by the External Examiner– 25 marks (20 for practical's + 5 for Records)	examiners from the same college / one from the other institution. 1. Course Teacher 2. External Examiner (From Other Institution/ Department/ from the same Department) Passing minimum: 40% (20 marks) in the External.

Theory Paper- QUESTION PAPER – Outline

Time: Three hours **Maximum: 75 Marks**

PART – A **(10X1=10 Marks)**

Answer ALL the Questions, choose the correct answer.

1. Define Cyber Security.
2. What is Malware?
3. What is Phishing?
4. Define Firewall.
5. What is Encryption?
6. What is a Trojan Horse?
7. Define Digital Evidence.
8. What is Intrusion Detection System?
9. What is Cyber Forensics?
10. Define Cloud Security.

PART – B **(5X5=25 Marks)**

Answer ALL the Questions, choosing either (a) or (b), in about 150 words.

11. (a) Explain the objectives of cyber security

(or)

(b) Discuss the importance of information security.

12. (a) Explain the working of cryptography.

(or)

(b) Describe different types of cyber attacks.

13. (a) Explain the role of firewalls in network security

(or)

(b) Discuss intrusion detection systems

14. (a) Explain the procedure of digital evidence collection

(or)

(b) Describe the stages of cyber forensic investigation

15. (a) Explain cyber laws relevant to cybercrime investigations.

(or)

(b) Discuss the importance of risk management in cyber security

PART – C **(5X8=40 Marks)**

Answer ALL the Questions, choosing either (a) or (b), in about 250 words.

16. (a) Analyze the impact of cybercrime on organizations and society

(or)

(b) Evaluate the effectiveness of modern cyber security practices

17. (a) Analyze different authentication mechanisms used in cyber security

(or)

(b) Evaluate the role of cryptography in protecting digital information.

18. (a) Examine the challenges involved in cyber forensic investigations

(or)

(b) Analyze the importance of digital evidence in cybercrime prosecution.

19. (a) Evaluate intrusion detection and prevention systems in securing networks

(or)

(b) Analyze the role of cloud security in modern enterprises

20. (a) Design a cyber security awareness programme for college students

(or)

(b) Develop a comprehensive cyber incident response plan for an organization

Model Questions

S. No	**Questions**	**Cognitive levels**
	1 Marks	
1.	Define Cyber Security.	**K1**
	5 Marks	
2.	Explain the working of cryptography in cyber security.	**K2**
3.	Demonstrate the steps involved in installing Kali Linux.	**K3**
	8 Marks	
4.	Analyze the impact of malware attacks on organizational security.	**K4**
5.	Critically evaluate different authentication mechanisms.	**K5**
6	Develop a cyber security awareness plan for college students.	**K6**

COURSE OUTCOMES AND MAPPING

Four Course Outcomes (COs) for each course that can be achieved by the learners on completion of that particular course are as follows:

Considering outcomes related to

i. K1 and K2 level of evaluation in all the Units as CO1

ii. K3 level of evaluation in all the Units as CO2

iii. K4 level of evaluation in all the Units as CO3

iv. K5 and K6 level of evaluation in all the Units as CO4.

All the COs proposed in each of the courses should be mapped with POs based on the relevance.

Level of Correlation between COs and POs

0 – No Correlation 1 – Low 2 – Medium 3 – High

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids:

Mapping of Course Outcomes to Programme Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO 1							
CO 2							
CO 3							
CO 4							
Total Score							

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**
CO1							
CO2							
CO3							
CO4							
Total Score							

SEMESTER I

	Title of the Paper	**Teaching hrs/ week**	**Credits**
1.1	Tamil/Other Languages	6	3
1.2	English	6	3
1.3 (CC I)	Basics of Computers and Problem Solving	5	5
1.4 (CC II)	Basics of Computer Networks	5	5
1.5 (Elective 1)	Fundamentals of Operating Systems	4	3
1.6 SEC- 1 Practical's	Network Lab and Kali Linux Lab- Practical's	2	2
1.8 Skill Enhancement (Foundation Course)	Basics of Programming (C++)	2	2
	Total	**30**	**23**

SEMESTER II

	Title of the Paper	**Teaching hrs/ week**	**Credits**
2.1	Tamil/Other Languages	6	3
2.2	English	6	3
2.3 (CC III)	Introduction to Cyber Security	5	5
2.4 (CC IV)	Advanced Networking and Communication Protocols	5	5
2.5 (Elective II)	Forms of Cyber Crime	4	3
2.6 SEC- 2	Advance Programming- Python	2	2
2.7 SEC- 3 Practical's	SQL and Internet Security Lab- Practical's	2	2
	Total	**30**	**23**

SEMESTER III

	Title of the Paper	**Teaching hrs/week**	**Credits**
3.1	Tamil/Other Languages	6	3
3.2	English	6	3
3.3 (CC V)	Mobile and Web Application Security	5	5
3.4 (CC VI)	Fundamentals of Crime, Law and Cyber Criminology	5	5
3.5 (Elective III)	Data Privacy- Technology and Law	4	3
3.6 SEC- 4	Fundamentals of Cloud Computing	1	1
3.7 SEC 5- Practical's	Advanced Internet Security Tools Lab- Practical's	2	2
3.8 EVS	Environmental Studies	1	-
	Total	**30**	**22**

SEMESTER IV

	Title of the Paper	**Teaching hrs/week**	**Credits**
4.1	Tamil/Other Languages	6	3
4.2	English	6	3
4.3 (CC VII)	Intrusion Detection and Prevention System	5	5
4.4 (CC VIII)	Data Storage	5	5
4.5 (Elective IV)	Cyber Risk Management	3	3
4.6 SEC- 6	Intrusion Detection and Prevention Lab-Practical's	2	2
4.7 SEC- 7	Database Management and Data structure	2	2
4.8 EVS	Environmental Studies	1	2
	Total	**30**	**25**

SEMESTER V

	Title of the Paper	**Teaching hrs/week**	**Credits**
5.1 (CC IX)	Cryptography	5	4
5.2 (CC X)	Cyber Laws and Intellectual Property Rights	5	4
5.3 (CC XI)	Information Security and Audit	5	4
5.4 (CC XII)	Project / Case Study Presentation (Non- Programming)	5	4
5.5 (Elective V)	Basics of Ethical Hacking	4	3
5.6 (Elective VI)	Cryptography Lab- Practical's	4	3
5.7 Value Education	Value Education	2	2
5.8 Summer Internship/ Industrial Training	Mini Project- Internship	-	2
	Total	**30**	**26**

SEMESTER VI

	Title of the Paper	**Teaching hrs/week**	**Credits**
6.1 (CC XIII)	Cyber Forensics and Investigation	6	4
6.2 (CC XIV)	Security Architecture and Designs	6	4
6.3 (CC XV)	Cloud Technology and Security	6	4
6.4 (Elective VII)	Computational Intelligence	5	3
6.5 (Elective VIII)	Firewall and Internet Security	5	3
6.6 Extension Activity	Extension Activity	-	1
6.7 Professional Competency Skill	Cybercrime Investigation and Cyber Forensics Lab- Practical's	2	2

Total	**30**	**21**
Total Credits for 6 Semester (Three Years) is 140		

NOTE ON TEACHING METHODOLOGY

A. The teaching methodology adopted for the course will utilize participatory learning methods, like workshops, discussions, assignments, short education tours, seminars, peer teaching, and group work, apart from regular lectures.
B. The syllabus indicates the type of teaching mety89hod, to be adopted for a particular topic, in the footnote of the same page.
C. The method suggested is only indicative; the concerned course teacher can use other methods or a combination of many methods, in order to improve the quality of knowledge transfer.
D. Course teachers adopting participatory teaching methods may please take extra care on the following issues
    a) Set a brief, clear task rather than lecturing
    b) Use hands-on, multi-sensory materials rather than rely only on verbal communication
    c) Create an informal, relaxed atmosphere
    d) Choose growth-producing activities Evoke feelings, beliefs, needs, doubts, perceptions, aspirations
    e) Encourage creativity, analysis, planning
    f) Decentralize decision-making
E. The following portions give details of some contemporary techniques that may be followed by course teachers, who teach various subjects in criminology.

1. BRAINSTORMING

Brainstorming is a familiar technique in which the teacher asks a specific question or describes a particular scenario, and students offer many different ideas. These ideas are then usually written on a flipchart or chalkboard and considered for further discussion.

2. CASE ANALYSIS

A case study is a written scenario that usually involves an important community situation. Since it is written beforehand, it can be specifically created to address relevant local issues.

3. DEMONSTRATIONS / PRACTICAL EXPOSURE

A demonstration is a structured performance of an activity to show, rather than simply tell, a group how the activity is done. This method brings to life some information that you may have already presented in a lecture.

4. DRAMATIZATION

A dramatization is a carefully scripted play where the characters act out a scene related to

a learning situation. It is designed to bring out the important issues to be discussed or messages to be learned.

5. SMALL GROUP DISCUSSION

A small group discussion is a structured session in which three to six students exchange ideas and opinions about a particular topic or accomplish a task together. After the groups have had an opportunity to work together, they report the highlights of their work back to the large group, and the teacher helps the group process the activity. Begin the learning activity by briefly presenting a topic to the large group. Then, divide the group into smaller groups and set a clear task for the small groups to accomplish. Write directions, goals and time allotted for the task on a chalkboard, flipchart or handout. As groups are working, walk around and listen in briefly to each group. Keep groups focused by announcing the time remaining periodically. After the small group work, students typically reassemble in the large group and a representative from each small group shares their findings to the large group for a whole group discussion. Help the group process the activity to be sure the intended message was conveyed.

6. LECTURETTE

A lecturette is a short, oral presentation of facts or theory. No more than 15-20 minutes in length, the goal of a lecturette is to impart information in a direct, highly organized fashion. The course teacher presents knowledge on a topic, sometimes using flipcharts, computer software presentations or other media to guide the discussion.

7. FISHBOWL

In a fishbowl discussion, most of the students sit in a large circle, while a smaller group of students sits inside the circle.

The fishbowl can be used in two distinct ways:

- As a structured brainstorming session: Choose a specific topic based on the group's needs or interests. A handful of seats are placed inside a larger circle. Students who have something to say about the topic at hand sit in the center. Anyone sitting inside the fishbowl can make a comment, offer information, respond to someone else in the center, or ask a question. When someone from the outside circle has a point to make, he or she taps the shoulder of someone in the center and takes that person's seat. This continues, with people from the outside tapping and replacing people on the inside, as a lively brainstorm takes place. You will need to process the many ideas after the fishbowl exercise.
- For structured observation of a group process: Students in the fishbowl are given a specific task to do, while students outside the fishbowl act as observers of the group process. The inner group works on its task together, and the outer group is asked to note specific behaviours. To process the activity, ask the inner group to reflect on the group process, and ask the outer group to describe what they observed.

8. GAMES

Games are appropriate participatory tools when they are used to encourage students to take charge of their own learning, and to test and reinforce new knowledge or skills. Adapt a popular game to convey or test knowledge of a particular topic, or create a new game to test or reinforce learning. Divide the students into groups, if necessary, to play the game.

Use games after information has already been shared using another method (e.g., lecturette, demonstration, jigsaw learning, etc.) or to assess students' knowledge at the start of a learning activity.

9. JIG SAW LEARNING

In a jigsaw activity, evenly divided groups are given a topic to learn (a piece of the puzzle to master). Once these small groups have mastered the content, the groups are reorganized so that each new group contains one member from each original group (now each group contains all essential pieces of the puzzle to put together). Each new group now contains an "expert" on the content that they have mastered in the original groups, and one at a time, each expert teaches the new content to the newly formed groups. The teacher then processes the activity and emphasizes key learning.

10. PANEL DISCUSSIONS

This method usually involves the presentation of an issue by several teachers at a table in front of a group. Usually, each teacher speaks briefly on the topic and then a moderator solicits questions from the audience. The moderator introduces the presenters/ teachers, keeps the discussion on the topic and within time limits and summarizes the discussion at the end. Each teacher typically speaks for a set period of time (for example, five minutes). After all teachers have spoken, the moderator invites questions from students. At the end of the session, the moderator may summarize the discussion and thank the presenters for their participation.

11. SKIT

A skit is an impromptu performance by students to demonstrate something they know. Skits can be created by students to show concerns they have about such things as peer pressure, victim issues in their community or lack of resources. Give students a topic, the maximum length of the skit and the amount of time they have to prepare (depending on the complexity, 30 minutes or an afternoon, for example).

Reading list for Participatory Teaching Methodology

Cross, K. P. (1991). Effective College Teaching. ASEE Prism, (1)2, 27-29.

Eitington, Julius E. (2002). The Winning Trainer: Winning Ways to Involve People in Learning. Boston: Butterworth Heinemann.

Hamer, L.O. (2000). The Additive Effects of Semi-structured Classroom Activities on Student Learning: An Application of Classroom-Based Experiential Learning Techniques. Journal of Marketing Education, (22)1, 25-34.

Holzer, S. M. & Andruet, R.H. (2000). Active Learning in the Classroom. Proceedings, ASEE South-eastern Section Annual Meeting, April 2-4, 2000.

Kolb, David A. (1984). Experiential Learning. New York: Prentice-Hall, Inc.

Lyra. (1990). Tools for Community Participation: A Manual for Training Trainers in Participatory Techniques. Washington, DC: PROWWESS/UNDP.

Narayan, D. and Srinivasan, L. (1994). Participatory Development Toolkit: Materials to

Facilitate Community Empowerment. Washington: World Bank.

Newstrom, John W. (1993). Even More Games Trainers Play. New York: McGraw-Hill, Inc.

Pike, Bob and Christopher Busse. (1995). 101 Games for Trainers: A Collection of Best Activities from Creative Training Newsletter. Minneapolis, MN: Lakewood Publications.

Pretty, J N, Guijt I, Thomson, J and Scoones, I (1995). A Trainer's Guide for Participatory Learning and Action.

Silberman, Mel. (1995). 101 Ways to Make Training Active. San Francisco: Jossey-Bass Pfeiffer.

Srinivasan, (2000). Technology of Participation: Group Facilitation Methods: Effective Methods for Participation. Phoenix, AZ: Institute for Cultural Affairs.

SEMESTER-I
BASICS OF COMPUTERS AND PROBLEM SOLVING

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
Core 1		**BASICS OF COMPUTERS AND PROBLEM SOLVING**	3	1	0	4

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- To Know the Basics of Computers.
- To Understand the Basics of Operating systems
- To Understand how to solve problems using Algorithms and Flowcharts.

Course Outcomes (COs):

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

CO No.	Course Outcome	Cognitive Levels
CO1	Remember and explain the fundamental concepts of computers, computer organization, operating systems and data structures.	**K1&K2**
CO2	Apply programming language concepts, number systems, memory organization and computer devices in solving computing problems.	**K2& K3**
CO3	Analyze algorithms, flowcharts and problem-solving techniques for computational efficiency and logical design.	**K3& K4**
CO4	Evaluate and design effective problem-solving models using algorithms, pseudo codes and flowchart techniques for real-time applications.	**K5& K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

UNIT I: **Introduction to Computers**

Computer Overview- Characteristics of Computers- Block diagram of computer-Types of computers and features- Mini Computers- Micro Computers- Mainframe Computers- Super Computers. Hardware and software- Components of a computer system, including the processor, memory, storage, and input/output devices - Operating systems, their functions, and types. Introduction to Data Structures, Arrays, Stacks, Queues, Linked Lists, Trees, and Graphs.

UNIT II: **Computer Languages**

Types of Programming Languages- Machine Languages- Assembly Languages- High Level Languages-

Data Organization- Drives- Files- Directories- Number Systems-Introduction to Binary, Octal, Hexadecimal system- Conversion- Simple Addition, Subtraction, Multiplication, Division.

UNIT III: **Computer Devices**

CPU- Types of Memory (Primary and Secondary)- RAM- ROM- PROM- EPROM-Secondary Storage Devices (CD, HD, Pen drive)- I/O Devices- Scanners- Digitizers-Plotters- LCD- Plasma Display- Network Devices- Hub- Switch- Router- Bridge-Gateway- Modem- Repeater- Access Point and Ports.

UNIT IV: **Operating System and its Services**

DOS – History- Files and Directories- Internal and External Commands- Batch Files-Types of OS.

UNIT V: **Fundamentals of Problem Solving**

Concept: problem solving- Problem solving techniques (Trial & Error, Brain storming, Divide & Conquer)- Steps in problem solving (Define Problem, Analyse Problem, Explore Solution)- Algorithms and Flowcharts (Definitions, Symbols)- Characteristics of an algorithm- Conditionals in pseudo-code- Loops in pseudo code- Time complexity: Big-Oh notation, efficiency- Simple Examples: Algorithms and flowcharts (Real Life Examples)- Simple Arithmetic Problems.

RECOMMENDED READINGS

Anita Goel – *Computer Fundamentals* (2021), Pearson

Computer Networks – By Tennenbum Tata MacGrow Hill Publication

Dromy R. G., How to solve it by Computer

Cormen, Leiserson, Rivest, Stein, Introduction to algorithms

J. Glenn Brookshear & Dennis Brylow – *Computer Science: An Overview* (13th Edition, 2021), Pearson

Rajaraman V., Fundamental of Computers– B.P.B. Publications

Sinha P. K., Fundamental of Computers

Reema Thareja – *Computer Fundamentals and Programming in C* (2nd Edition, 2020), Oxford University Press

Sumitabha Das, Unix Concepts and Application

Suresh Basandra, Computer Today

Thomas H. Cormen et al. – Introduction to Algorithms (2022), MIT Press

V. Rajaraman – *Fundamentals of Computers* (2021 Edition), PHI Learning

Mapping of Course Outcomes to Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	*3*	*2*	*1*	*1*	*0*	*3*	*0*
CO2	*2*	*2*	*3*	*1*	*0*	*3*	*1*
CO3	*2*	*3*	*3*	*2*	*0*	*2*	*1*
CO4	*2*	*3*	*3*	*3*	*1*	*2*	*1*
Total Score	***9***	***10***	***10***	***7***	***1***	***10***	***3***

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO 6	PSO 7
CO1	*1*	*2*	*1*	*0*	*0*	*1*	*1*
CO2	*2*	*2*	*2*	*1*	*1*	*1*	*2*
CO3	*2*	*2*	*2*	*1*	*1*	*1*	*3*
CO4	*2*	*2*	*2*	*1*	*1*	*1*	*3*
Total Score	***7***	***8***	***7***	***3***	***3***	***4***	***9***

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

BASICS OF COMPUTER NETWORKS

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
Core 2		BASICS OF COMPUTER NETWORKS	3	1	0	4

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- To prepare students with basic networking concept.
- To understand process of data communication using protocols and standards
- To learn various topologies and applications of network.
- To understand the concept of network layer, transport layer and application layer

Course Outcomes (COs): At the end of this course of study, the students will be able to

CO No.	Course Outcome	Cognitive Levels
CO1	Remember and explain the fundamentals of computer networks, communication systems and networking devices.	**K1, K2**
CO2	Apply networking protocols, OSI/TCP-IP models, subnetting and communication standards in network configuration.	**K2, K3**
CO3	Analyze transmission protocols, routing methods and data communication mechanisms in computer networks.	**K3, K4**
CO4	Evaluate and design network communication models and troubleshoot networking issues using suitable protocols and technologies.	**K5, K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

UNIT I: Introduction to Network

Concept of communication, components of data communication (sender, receiver, message, communication media, protocols), measuring capacity of communication media (bandwidth, data transfer rate), IP address, switching techniques (Circuit switching, Packet switching). Basic Models of Network- Network Topologies- Network of Network-Modem, Ethernet card, RJ45, Repeater, Hub, Switch, Router, Gateway, WIFI card.

Network topologies and Network types: types of networks (PAN, CAN, LAN, MAN, WAN, WLAN), networking topologies (Bus, Star, Tree).

Wired communication media (Twisted pair cable, Co-axial cable, Fibre-optic cable), Wireless media (Radio waves, Micro waves, Infra-Red waves). Cloud computing.

UNIT II: OSI / TCPIP Model

Introduction to OSI Model with all layers and Devices required at each layer TCP/IP Protocol Suite Addressing-Physical, Logical, Port addresses and Special addresses. Subnetting - Subnet Masks and Network Prefix- Address Classes (A, B, C, D, E) - Private IP Addresses and NAT - Variable Length Subnet Mask (VLSM) and CIDR Notation - Subnet Design and Address Allocation - Subnetting and Routing - Broadcast and Multicast Addresses – Ipv4 Addressing and Subnetting (brief introduction).

TCP/IP Model- MAC Address representation- Organisationally Unique Identifier-Internet Protocol- Versions and Header lengths- IP Identification- IP Flags- IP fragmentation and reassembly structure- Transport Layer protocols- Port numbers-TCP Flags- Segmentation- TCP 3- way handshake and Options- encapsulation and De-encapsulation- Payload.

UNIT III:Physical Layer: Protocols

Analog and Digital data, Analog and Digital signals, Digital Signals-Bit rate, Bit length Baseband Transmission, Broadband Transmission, Transmission Impairments–Attenuation, Distortion and Noise Data Rate Limits– Noiseless channel: Nyquist‘s bit rate, noisy channel : Shannon‘s law Performance of the Network Bandwidth, Throughput, Latency(Delay),Bandwidth – Delay Product, Jitters Line Coding Characteristics, Line Coding Schemes–Unipolar -NRZ, Polar-NRZ-I, NRZ-L, RZ-Transmission Modes, Parallel Transmission and Serial Transmission– Asynchronous and Synchronous Switching-Circuit Switching, Message Switching and Packet Switching.

UNIT IV: Data Link Layer: Protocols

Subnetting IP network- Class A, B, C subnetting- Classless Inter-domain Routing (CIDR)- Subnet mask- Wild card mask- WAN Technologies- Frame Relay- Data link Connection Identifiers (DLCI)- Committed Information Rate (CIR)- Permanent Virtual Circuits (PVCs)- Multiprotocol Label Switching (MPLS)- Edge Routers- Label Switching- CE and PE Routers- Data Terminal Equipment (DTE)- Data Communication Equipment (DCE)- Clock speed.

Framing–Concept, Methods–Character Count, Flag bytes with Byte Stuffing, Starting & ending Flags with Bit Stuffing Error detection code– Hamming Distance, CRC Elementary data link protocols - Simplex stop & wait protocol, Simplex protocol for noisy channel, PPP, HDLC Sliding Window Protocols– 1-bit sliding window protocols, Pipelining – Go-Back N and Selective Repeat Random Access Protocols - ALOHA– pure and slotted, CSMA-1- persistent, p-persistent and non-persistent CSMA/CD,CSMA/CA Controlled Access - Reservation, Polling and Token Passing Channelization – Definitions – FDMA, TDMA and CDMA.

UNIT V: Network Layer and Transport Layer: Protocols

IPv4 addresses: Address space, Notation, Classful addressing, Classless addressing, NAT, Sub netting, Super netting IPv4: Datagram, Fragmentation, checksum, options IPv6 addresses: Structure, address space, IPv6: packet format, Extension

headers. Process-to-Process Delivery, Multiplexing and De-multiplexing User Datagram Protocol (UDP) - Datagram Format, Checksum, Transmission Control Protocol (TCP) - TCP Services –Process to-Process Communication, Stream Delivery Service, Sending and Receiving Buffers, Segments, Full –Duplex Communication, Connection oriented service, Reliable service TCP Features, TCP Segment Format TCP Vs UDP Static and Dynamic Routing- IP Routing Protocols- Classful and Classless Routing-RIPv1- RIPv2, Broadcast and Multicast domain- OSPF, EIGRP- Network Address Translation- IP Classes- Private IP- Public IP- Reserved IP- APIPA.

RECOMMENDED READINGS

Andrew S. Tanenbaum & David J. Wetherall – Computer Networks (2021), Pearson

Andrew S. Tanenbaum, Pearson, Andrew S. Tanenbaum, Computer Networks,Fifth Edition, ISBN-13: 978-0-13- 212695-3.

Behrouz A. Forouzan – Data Communications and Networking (Updated Reprint 2021), McGraw Hill

Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., —Enterprise Cyber security How to Build a Successful Cyber defense Program against Advanced Threats‖, Apress, 1st Edition, 2015.

Kurose & Ross – *Computer Networking: A Top-Down Approach* (8th Edition, 2021), Pearson

Larry Peterson & Bruce Davie – *Computer Networks: A Systems Approach* (2021), Morgan Kaufmann

McGraw Hill, Behrouz Forouzan, Data Communications and Networking,Fifth Edition, ISBN 978-0-07-337622-6.

Nina Godbole, Sumit Belapure, —Cyber Security‖, Willey, 2011.

William Stallings – *Data and Computer Communications* (11th Edition, 2022), Pearson

Mapping of Course Outcomes to Programme Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	*3*	*2*	*1*	*1*	*0*	*3*	*0*
CO2	*2*	*3*	*3*	*1*	*0*	*3*	*1*
CO3	*2*	*3*	*3*	*2*	*0*	*3*	*1*
CO4	*2*	*3*	*3*	*2*	*1*	*3*	*2*
Total Score	***9***	***11***	***10***	***6***	***1***	***12***	***4***

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO 6**	**PSO 7**
CO1	*1*	*3*	*1*	*0*	*0*	*1*	*1*
CO2	*2*	*3*	*2*	*1*	*1*	*1*	*2*
CO3	*2*	*3*	*2*	*1*	*1*	*1*	*3*
CO4	*2*	*3*	*2*	*1*	*1*	*1*	*3*
Total Score	***7***	***12***	***7***	***3***	***3***	***4***	***9***

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

FUNDAMENTALS OF OPERATING SYSTEMS

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
Elective 1		**FUNDAMENTALS OF OPERATING SYSTEMS**	3	1	0	3

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- To understand the principles of Operating Systems
- To study different system calls, system programs, functions and services of Operating System
- To understand the concept of process, memory and deadlock handling.

Course Outcomes (COs): At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Levels
CO1	Gain knowledge and basic understanding of Array and Structure	**K1**
CO2	Critically identify, analyse and gain knowledge of algorithms.	**K2, K4**
CO3	Understand the functioning of the operating systems and evaluate memory management	**K2, K5**
CO4	Learn and apply scheduling algorithms and synchronization create solution to Handle Deadlock and Demand Paging	**K3, K5,K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

UNIT I: Basics of Operating Systems

Definition- Operating System (OS); Types of Operating Systems- Interaction between OS- Time- Sharing Systems, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems- System Components hardware and software's- Operating System Services- System Calls- System Programs.

UNIT II: Processes and CPU Scheduling

Process Concepts- Process Scheduling- Operations on Processes- Cooperating Processes- Threads- Basic Concepts of CPU Scheduling- Scheduling Criteria- Scheduling Algorithms.

UNIT III: Concurrency: Mutual Exclusion and Synchronization

Principles of Concurrency- Mutual Exclusion: Hardware Support- Semaphores- Monitors- Message Passing- Readers/Writers Problem.

UNIT IV: Deadlocks and File System

Resources- Deadlocks- Deadlock Detection and Recovery- Deadlock Avoidance- Deadlock Prevention- Other Issues connected to deadlocks.

File concept- File Access Methods- Directory Structure- File System Structure- File Allocation Methods- Free-Space Management

UNIT V: Memory Management and Virtual Memory

Defining Memory and its forms- Background- Logical versus Physical Address Space Swapping- Contiguous Allocation- Paging- Segmentation- Segmentation with Paging- Demand Paging- Performance of Demand Paging- Page Replacement- Page Replacement Algorithms.

RECOMMENDED READINGS

Andrew Tanenbaum (2015). Modern Operating Systems (5th edition). Prentice-Hall

Dhotre I.A and AA Puntambekar (2023). Operating Systems. Technical Publications, India.

Gokul K and S. Karthigai (2022). System Software- An Introduction to System Programming. Notion Press

Harvey M. Deitel, Deitel and Choffnes (2007). Operating Systems (3rd Edition). Pearson Education

Naresh Chauhan (2014). Principles of Operating System. III Edition. Pearson Education

Remzi Arpaci- Dusseau and Andrea Arpaci- Dusseau (2018). Operating Systems- Three Easy Pieces. Amazon Digital Publishers.

Shriram K. Vasudevan, Subhashri Vasudevan, Sunandhini and Velusamy (2015). Modern Operating Systems. IK International Publication, India

Silberschatz and Galvin (2013). Operating System Concepts Essentials (2nd Edition). Wiley publication

Swati D. Shirke, Shailesh P. Bendle, Nilam K. Kadale and Priyanka D. Patil (2015). Embedded Operating Systems. Nirali Prakashan, India.

William Stallings (2018). Operating Systems: Internals and Design Principles, Seventh Edition, Pearson Education.

Mapping of Course Outcomes to Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	1	0	3	0	3	0
CO2	2	2	2	3	3	3	2
CO3	2	2	2	3	3	3	3
CO4	2	2	3	2	3	3	3
Total Score	**8**	**7**	**7**	**11**	**9**	**12**	**8**

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO 6	PSO 7
CO1	0	1	0	0	0	1	0
CO2	2	3	2	3	1	3	3
CO3	2	3	3	3	2	3	3
CO4	3	3	2	3	3	3	3
Total Score	**7**	**10**	**7**	**9**	**6**	**10**	**9**

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

NETWORK LAB AND KALI LINUX LAB- Practical's

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
SEC 1		**NETWORK LAB AND KALI LINUX LAB- Practical's**	0	0	2	2

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- To get hands-on Kali and Ubuntu Linux.
- To get acquainted with various algorithms in operating systems.
- The student learns to work with various Redundancy Check Algorithms, Sliding Window Protocol, Routing Algorithm, Subnetting Procedures.

Course Outcomes (COs): At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Levels
CO1	Remember and explain the basic concepts of computer networks, Linux operating systems and network security tools.	**K1&K2**
CO2	Apply networking protocols, subnetting techniques and communication models using practical networking tools and Linux commands.	**K2&K3**
CO3	Analyze network communication, routing protocols and error detection mechanisms through practical implementation and troubleshooting.	**K3& K4**
CO4	Evaluate and design secure networking solutions using Kali Linux tools, socket programming and network administration techniques.	**K5&K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

List of Programs:

1. To detect Errors using Vertical Redundancy Check (VRC).
2. To detect Errors using Longitudinal Redundancy Check (LRC).
3. To detect Errors using Cyclic Redundancy Check (CRC).
4. Socket programming to implement Asynchronous Communication.
5. Socket programming to implement Isochronous Communication.
6. To implement Stop & Wait Protocol.
7. To implement Sliding Window Protocol.
8. To implement the Shortest Path Routing using Dijkstra algorithm.

9. Socket Programming to Perform file transfer from Server to the Client.
10. To implement Remote Procedure call under Client / Server Environment.
11. Code simulating PING and TRACEROUTE commands
12. Implementing of Subnetting.

Note: Any 8 practical's or more as per choice of the teacher and resources available.

RECOMMENDED READINGS

Course Faculty to share the material, E-sources, books and practical guide including instructions for this course.

Mapping of Course Outcomes to Programme Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	*2*	*1*	*1*	*1*	*0*	*3*	*0*
CO2	*1*	*2*	*3*	*1*	*0*	*3*	*1*
CO3	*1*	*3*	*3*	*2*	*0*	*3*	*1*
CO4	*1*	*3*	*3*	*2*	*1*	*3*	*2*
Total Score	***5***	***9***	***10***	***6***	***1***	***12***	***4***

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO 6**	**PSO 7**
CO1	*2*	*2*	*1*	*0*	*0*	*1*	*1*
CO2	*3*	*3*	*2*	*1*	*1*	*1*	*2*
CO3	*3*	*3*	*2*	*1*	*1*	*1*	*3*
CO4	*3*	*3*	*2*	*2*	*1*	*1*	*3*
Total Score	***11***	***11***	***7***	***4***	***3***	***4***	***9***

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

BASICS OF PROGRAMMING- C++

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
Skill Enhancement Foundation Course		**BASICS OF PROGRAMMING- C++**	2	0	0	2

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- Understand the process of programming
- Appreciate the functions of programming
- Examine the important concept in programming.
- Explain the primary concepts of C.
- Describe the primary concepts of C ++.

Course Outcomes (COs):

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

CO No.	Course Outcome	Cognitive Levels
CO1	Remember and explain the fundamental concepts related to the subject domain.	**K1, K2**
CO2	Apply theoretical and practical knowledge for solving domain-specific problems.	**K2, K3**
CO3	Analyze systems, techniques and procedures associated with the subject area.	**K3, K4**
CO4	Evaluate and design suitable solutions and models for real-time applications.	**K5, K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

UNIT I: Basics of C Programming

C fundamentals Character set - Identifier and keywords - data types - constants - Variables - Declarations - Expressions - Statements - Arithmetic, Unary, Relational and logical, Assignment and Conditional Operators - Library functions. Data input output functions - Simple C programs - Flow of control - if, if-else, while, do-while, for loop, Nested control structures - Switch, break and continue, go to statements - Comma operator.

UNIT II: Definitions & Functions

Proto-types- Passing arguments - Recursions. Storage Classes - Automatic, External, Static, Register Variables- Multi-file programs. Arrays - Defining and Processing - Passing arrays to functions – multi-dimension arrays- Arrays and String. Structures - User defined data types- Passing structures to functions - Self-referential structures – Unions - Bit wise operations. Pointers- Declarations - Passing pointers to Functions - Operation in Pointers - Pointer and Arrays - Arrays of Pointers - Structures and Pointers - Files: Creating, Processing, Opening and Closing a data file.

UNIT III: Introduction to C++

Tokens, Keywords, Identifiers, Variables, Operators, Manipulators, Expressions and Control Structures in C++; Pointers - Functions in C++ Main Function Function Prototyping Parameters Passing in Functions - Values Return by Functions - Inline Functions - Friend and Virtual Functions

Classes and Objects; Constructors and Destructors; and Operator Overloading and Type Conversions - Type of Constructors - Function overloading. Inheritance : Single Inheritance Multilevel Inheritance Multiple Inheritance Hierarchical Inheritance Hybrid Inheritance. Pointers, Virtual Functions and Polymorphism; Managing Console I/O operations.

UNIT IV: Working with Files

Classes for File Stream Operations Opening and Closing a File End of File Deduction File Pointers Updating a File Error Handling during File Operations Command line Arguments. Data Structures: Definition of a Data structure primitive and composite Data Types, Asymptotic notations, Arrays, Operations on Arrays, Order.

UNIT V: DATA STRUCTURES USING C++ (Lab practice)

1. Implement PUSH, POP operations of stack using Arrays.
2. Implement PUSH, POP operations of stack using Pointers.
3. Implement add, delete operations of a queue using Arrays.
4. Implement add, delete operations of a queue using Pointers.
5. Conversion of infix to postfix using stack operations
6. Postfix Expression Evaluation.
7. Addition of two polynomials using Arrays and Pointers.
8. Creation, insertion, and deletion in doubly linked list.
9. Binary tree traversals (in-order, pre-order, and post-order) using linked list.
10. Depth First Search and Breadth first Search for Graphs using Recursion.

Note: Select Lab Work- Demonstration and practice only (No need for record), however during examinationquestions may give in internal and external assessment.

RECOMMENDED READINGS

Balaguruswamy E., 1995, Programming in ANSI C, TMH Publishing Company Ltd. Kernighan B.W., and Ritchie D.M., 1988,The C Programming Language, 2nd Edition, PHI.

Bjarne Stroustrup – Programming: Principles and Practice Using C++ (2024), Addison-Wesley

Cangsam, Auguenstein, Tenenbaum. Data Structures using C & C++,PHI

D. S. Malik – *C++ Programming: From Problem Analysis to Program Design* (9th Edition, 2021), Cengage

D. Samantha, 2005, Classic Data Structures, PHI,New Delhi.

E. Balagurusamy – *Object Oriented Programming with C++* (8th Edition, 2020), McGraw Hill

Horowitz E., and Shani S.,1999, Fundamentals of Data Structures in C++, Galgotia Pub.

Kanetkar Y., 1999, Let us C, BPB Pub., New Delhi.

Kruse C.L. Tondo R., and Leung B.,1997, Data Structures and Program design in C, PHI.

Reema Thareja – *Programming in C++* (2021), Oxford University Press

Robert Lafore, Object Oriented Programming in Microsoft C++, Galgotia publication. Schildt H., C++,1998,The Complete Reference-1998-TMH Edition, 1998

Schildt C. H., 2004, The Complete Reference, 4th Edition, TMH iii. Gottfried,B.S, 1996, Programming with C, Second Edition, TMH Pub. Co. Ltd., New Delhi.

Yashavant Kanetkar – *Let Us C++* (2020 Edition), BPB Publications

Mapping of Course Outcomes to Programme Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	*3*	*1*	*1*	*1*	*0*	*2*	*0*
CO2	*2*	*2*	*3*	*1*	*0*	*3*	*1*
CO3	*2*	*3*	*3*	*2*	*0*	*2*	*1*
CO4	*2*	*3*	*3*	*2*	*1*	*2*	*1*
Total Score	***9***	***9***	***10***	***6***	***1***	***9***	***3***

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO 6**	**PSO 7**
CO1	*1*	*1*	*1*	*0*	*0*	*0*	*2*
CO2	*2*	*2*	*1*	*0*	*0*	*1*	*3*
CO3	*2*	*2*	*2*	*1*	*0*	*1*	*3*
CO4	*2*	*2*	*2*	*1*	*1*	*1*	*3*
Total Score	***7***	***7***	***6***	***2***	***1***	***3***	***11***

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

SEMESTER-II

INTRODUCTION TO CYBER SECURITY

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
Core 3		**INTRODUCTION TO CYBER SECURITY**	3	1	0	4

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- Identify Key concept and Terminology of Cyber Security.
- Examine the concept of privacy and its legal protections.
- Explain the primary concepts involving encryption.
- Describe the social implications of cyber security.
- Understand the risks and benefits of social networks.

Course Outcomes (COs): At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Levels
CO1	Remember and explain the fundamental concepts related to the subject domain.	**K1, K2**
CO2	Apply theoretical and practical knowledge for solving domain-specific problems.	**K2, K3**
CO3	Analyze systems, techniques and procedures associated with the subject area.	**K3, K4**
CO4	Evaluate and design suitable solutions and models for real-time applications.	**K5, K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

UNIT I: **Basics of Cyber Security**

Introduction to Cyber Security - Importance and challenges in Cyber Security- Cyberspace - Cyber threats - Cyber warfare - CIA Triad - Cyber Terrorism- Cyber Security of Critical Infrastructure - Cyber security -Organizational Implications.

UNIT II: Vulnerability in Cyber Space and Security

Types of Hackers- Hackers and Crackers - Cyber-Attacks and Vulnerabilities- Malware threats- Sniffing - Gaining Access - Hiding Files - Covering Tracks- Worms - Trojans-Viruses- Backdoors. Vulnerabilities- Overview, Vulnerabilities in Software, System administration, Threat Actors, Attacks, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband

communications. Cyber Security Safeguards-Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT III: Ethical Hacking and Social Engineering

Ethical Hacking Concepts and Scopes- Threats and Attack Vectors - Information Assurance- Threat Modeling- Enterprise Information Security Architecture- Vulnerability Assessment and Penetration Testing- Types of Social Engineering- Insider Attack- Preventing Insider Threats- Social Engineering Targets and Defence Strategies.

UNIT IV: **Cyber Forensics and Auditing**

Introduction to Cyber Forensics- Computer Equipment and associated storage media-Role of forensics Investigator- Forensics Investigation Process - Collecting Network based Evidence- Writing Computer Forensics Reports - Auditing - Plan an audit against a set of audit criteria- Information Security Management System Management. Introduction to ISO 27001:2013.

UNIT V: Architecture of Cyberspace

Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Complex,Network ,Architectures, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.

RECOMMENDED READINGS

Charles J. Brooks et al. – *Cyber Security Essentials* (2nd Edition, 2023), Wiley

Donaldson, S., Siegel, S., Williams, C.K., and Aslam, A. (2015). —Enterprise Cyber security -How to Build a Successful Cyber defense Program againstAdvanced Threats‖, Apress, 1st Edition.

Franke, Don Cyber Security Basics: Protect your organization … (Paperback)

Nina Godbole, Sumit Belapure, (2011). —Cyber Security‖, Willey.

Joseph Migga Kizza – *Guide to Computer Network Security* (6th Edition, 2020), Springer

Michael E. Whitman & Herbert J. Mattord – *Principles of Information Security* (7th Edition, 2021), Cengage

Nina Godbole & Sunit Belapure – Cyber Security (2021), Wiley India

Roger Grimes, —Hacking the Hacker‖, Wiley, 1st Edition, 2017.

Yuri Diogenes & Erdal Ozkaya – *Cybersecurity Attack and Defense Strategies* (3rd Edition, 2022), Packt

Yuri Diogenes and Erdal Ozkaya (2018). Cyber security– Attack and Defense

Strategies: 2nd Edition Paperback.

Mapping of Course Outcomes to Programme Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	*3*	*2*	*1*	*1*	*1*	*3*	*0*
CO2	*2*	*3*	*3*	*1*	*1*	*3*	*1*
CO3	*2*	*3*	*3*	*2*	*1*	*3*	*1*
CO4	*2*	*3*	*3*	*2*	*2*	*3*	*2*
Total Score	***9***	***11***	***10***	***6***	***5***	***12***	***4***

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO 6**	**PSO 7**
CO1	*3*	*2*	*1*	*1*	*1*	*2*	*1*
CO2	*3*	*3*	*2*	*1*	*2*	*2*	*2*
CO3	*3*	*3*	*2*	*2*	*2*	*2*	*3*
CO4	*3*	*3*	*3*	*2*	*3*	*2*	*3*
Total Score	***12***	***11***	***8***	***6***	***8***	***8***	***9***

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

ADVANCED NETWORKING AND COMMUNICATION PROTOCOLS

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
Core 4		**ADVANCED NETWORKING AND COMMUNICATION PROTOCOLS**	4	0	0	4

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- To prepare students with basic networking concept.
- To understand process of data communication using protocols and standards
- To learn various topologies and applications of network.
- To understand the concept of network layer, transport layer and application layer

Course Outcomes (COs): At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Levels
CO1	Remember and explain the fundamental concepts related to the subject domain.	**K1, K2**
CO2	Apply theoretical and practical knowledge for solving domain-specific problems.	**K2, K3**
CO3	Analyze systems, techniques and procedures associated with the subject area.	**K3, K4**
CO4	Evaluate and design suitable solutions and models for real-time applications.	**K5, K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

UNIT I: SessionLayers

Introduction to the Session Layer and its functions, including establishing, managing, and terminating sessions between applications. Overview of the Session Layer protocols, NetBIOS, RPC, and ZIP, and their features and uses. Overview of the Session Layer services, dialog control, token management, and synchronization. Introduction to the

UNIT II: Presentation and Application Layers

Presentation Layer and its functions, including data representation, data encryption,

and data compression. Overview of the Presentation Layer protocols, including JPEG, MPEG, and ASCII, and their features and uses. Overview of the Presentation Layer services, including data conversion, data compression, and data encryption. Introduction to application layer Protocol: Domain Name System (DNS), WWW–Architecture, HTTP Transaction.

UNIT III: Protocols in Network

Introduction to IPv4 Addressing and Subnetting- Subnet Masks and Network Prefix-Address Classes (A, B, C, D, E) - Private IP Addresses and NAT - Variable Length Subnet Mask (VLSM) and CIDR Notation - Subnet Design and Address Allocation - Subnetting and Routing - Broadcast and Multicast Addresses - IPv6 Addressing and Subnetting.

Network protocol: HTTP, FTP, PPP, SMTP, TCP/IP, POP3, HTTPS, TELNET, VoIP.

UNIT IV: Protocols and Services

Communication protocols- Address Resolution Protocol (ARP)- Reverse Address Resolution Protocol (RARP)- Internet Control Message Protocol (ICMP)- Internet Protocol (IP)- Transmission Control Protocol (TCP)- User Datagram Protocol (UDP)-American Standard Code for Information Interchange (ASCII)- Hypertext Transfer Protocol (HTTP)- File Transfer Protocol (FTP)- Simple Mail Transfer Protocol (SMTP)- Telnet- Trivial File Transfer Protocol (TFTP)- Post Office Protocol version 3 (POP3) - Internet Message Access Protocol (IMAP)- Simple Network Management Protocol (SNMP)- Domain Name System (DNS)- DNS Flags- Dynamic Host Configuration Protocol (DHCP).

Virtual LANs- Access links and Trunk links- Switchport modes- Vlan Trunking- Server, Client and Transparent modes- VTP Domain- Configuration Revision numbers- Inter Vlan Communications- Broadcast domain- Collision Domain

UNIT V: Principles of Web Services

WWW, Hyper Text Markup Language (HTML), Extensible Markup Language (XML), domain names. Web services- URL, website, web browser, web servers, web hosting.

RECOMMENDED READINGS

Andrew S. Tanenbaum – *Computer Networks* (6th Edition, 2021), Pearson

Andrew S. Tanenbaum,Computer Networks, Fifth Edition, ISBN-13: 978-0-13-212695-3, Pearson

Behrouz A. Forouzan – *TCP/IP Protocol Suite* (5th Edition, 2021), McGraw Hill

Behrouz Forouzan,Data Communications and Networking, Fifth Edition, ISBN 978-0-07-337622-6 McGraw Hill.

Donaldson, S., Siegel, S., Williams, C.K., Aslam, A., —Enterprise Cyber security -How to Build a Successful Cyber defense Program against Advanced Threats‖, Apress, 1st Edition, 2015.

Douglas Comer – *Internetworking with TCP/IP Volume 1* (6th Edition, 2021), Pearson

Kurose & Ross – *Computer Networking: A Top-Down Approach* (8th Edition, 2021), Pearson

Nina Godbole, Sumit Belapure, —Cyber Security‖, Willey, 2011.

William Stallings – *Data and Computer Communications* (11th Edition, 2022), Pearson

Mapping of Course Outcomes to Programme Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	*3*	*2*	*1*	*1*	*0*	*3*	*0*
CO2	*2*	*3*	*3*	*1*	*0*	*3*	*1*
CO3	*2*	*3*	*3*	*2*	*0*	*3*	*1*
CO4	*2*	*3*	*3*	*2*	*1*	*3*	*2*
Total Score	***9***	***11***	***10***	***6***	***1***	***12***	***4***

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO 6**	**PSO 7**
CO1	*1*	*3*	*1*	*0*	*0*	*1*	*1*
CO2	*2*	*3*	*2*	*1*	*1*	*1*	*2*
CO3	*2*	*3*	*2*	*1*	*1*	*1*	*3*
CO4	*2*	*3*	*2*	*1*	*1*	*1*	*3*
Total Score	***7***	***12***	***7***	***3***	***3***	***4***	***9***

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

FORMS OF CYBER CRIME

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
lective 2		**FORMS OF CYBER CRIME**	3	1	0	3

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- This course will expose the introductory concepts of cyber crimes
- The impact of cybercrimes and its counter measures
- The contemporary challenges in cyberspace.
- List the preventive and precautious measure.

Course Outcomes (COs): At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Levels
CO1	Appreciate the forms of cybercrimes and critically analyse the counter measures for cybercrimes	**K1, K4**
CO2	Understand, identify and analyse modus operandi of the cyber criminals	**K2, K3, K4**
CO3	Profile the cybercriminals-based on types, crimes, locations and etc with workable problem solutions	**K3, K6**
CO4	Evaluate the impact of cybercrime in real space and create real-time solutions.	**K4, K5**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

UNIT I: Cyber Crimes- Overview

Introduction– History and Development– Definition, Nature and Extent of Cyber Crimes in India and other countries- Classification of Cyber Crimes– Trends in Cyber Crimes across the world.

UNIT II: Forms of Cyber Crimes and Cyber Frauds

Hacking, cracking, DoS– viruses, works, bombs, logical bombs, time bombs, email bombing, data diddling, salami attacks, phishing, steganography, cyber stalking, spoofing, pornography, defamation, computer vandalism, cyber terrorism, cyber warfare, crimes in social media, malwares, adware, scareware, ransomware, social engineering, credit card frauds & financial frauds, telecom frauds. Cloud based crimes– understanding fraudulent behaviour, fraud triangle, fraud detection techniques, Intellectual Property Rights and

Violation of Intellectual Property rights, Ecommerce Frauds and Recent forms.

UNIT III: Modus Operandi of various Cybercrimes and Frauds

Definition of various types of cyber frauds– Modus Operandi- Fraud Triangle– Fraud Detection Techniques Including Data Mining and Statistical References - Countermeasures.

UNIT IV: Profile of Cyber criminals

Cyber Crime Psychology– Theories dealing with cybercrimes- Theories dealing with cyber criminals.

UNIT V: Impact of Cybercrimes

Impact on Individual, Property and to the Corporates/ Industries/ Hospitality Sector/ Companies, to Government and the Nation (s).

RECOMMENDED READINGS

Albert J. Marcellaa and Robert S. Greenfiled (Ed) (2002) Cyber Forensics, A Field Manual for collecting, examining and preserving evidence of computer crimes, Auerbach publications.

Debtoru Chatterjee (2024). Cyber Crime and its Prevention- In Easy Steps. Khanna Book Publishing Co Pvt., Ltd, India.

Derek Atkins et. al., (1997). Internet Security: Professional Reference, TechMedia, Daryaganj, New Delhi

Hill, J., & Marion, N. (2016). Introduction to cybercrime. Westport, CT: Praeger

Hynson, C. (2012). Cybercrime. Mankato, MI: Smart Apple Media.

Information Technology Act (2000). Bare Act

Madhava Somasundaram and Syed Umarhathab (2011). Cyber Crime and Digital Disorder. MS University Publication, Tamil Nadu, India.

Praksh Prasad (2017). A Brief Introduction on Cybercrime Cases. CreateSpace Independent Publishing Platform, India.

Seymour Goodman and Abraham Soafer (ed.) (2002) The Transnational dimensions of cybercrime, Hoover Institution Press Washington.

Shelly L. Clevenger and Cathrine D. Marcum (2023). The Link Between Specific Forms of Online and Offline Victimisation. Atlantic Publisher and Distributors, India.

Will Gragido (2011). Cybercrime and Espionage: An Analysis of Subversive Multivector Threats. Illustrated Edition- Syngress Media Inc.

Mapping of Course Outcomes to Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	2	3	1	3	3
CO2	3	2	2	3	1	3	3
CO3	3	3	2	3	2	3	3
CO4	3	3	2	3	3	3	3
Total Score	**12**	**11**	**8**	**12**	**7**	**12**	**12**

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO 6	PSO 7
CO1	3	1	2	3	1	3	2
CO2	3	3	2	3	1	3	3
CO3	3	3	3	3	1	3	2
CO4	3	3	3	3	1	3	3
Total Score	**12**	**10**	**10**	**12**	**4**	**12**	**10**

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

ADVANCE PROGRAMMING- PYTHON

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
SEC 2		ADVANCE PROGRAMMING- PYTHON	1	0	1	2

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- To learn the systematic way of solving problem
- To understand the different methods of programming in organizing large amount of data
- To efficiently implement the different data structures
- To efficiently implement solutions for specific problems.

Course Outcomes (COs): At the end of this course of study, the student will be able to

CO No.	Course Outcome	Cognitive Levels
CO1	Remember and explain the fundamental concepts of Python programming, data types, operators and control structures.	**K1, k2**
CO2	Apply Python programming techniques, functions and data structures to solve computational problems.	**K2, K3**
CO3	Analyze Python programs using strings, lists, recursion, object-oriented programming and file handling techniques.	**K3, K4**
CO4	Evaluate and develop efficient Python-based solutions using suitable algorithms, data structures and object-oriented approaches for real-time applications.	**K5, K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

UNIT I Introduction to Python

Define Python - Advantages of Python - History - Features - Uses - Variable and Data Types - Python Interpreter - Identifiers and keywords - Literals – Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator) - Defining Functions.

UNIT II Objects and Data Structure

Structure of a Python Program - Elements of Python Input and Output Statements - Control statements (Branching, Looping, Conditional Statement) - Exit function, Difference between break, continue and pass.) - Default arguments - Multiple assignment - while statement - for statement - A find function - Looping and counting.

UNIT III Functions, Strings and Lists

Strings and Lists – String Manipulation - Accessing Strings - Basic Operations with String slices - Function and Methods - Recursion, Stack diagrams for recursive functions. List - Working with list - List values - Accessing elements - List membership - List operations - List deletion - Cloning lists - Nested lists - Using Python as calculator - Python shell - Indentation and Atoms.

UNIT IV Object Oriented Programming

Introduction to Classes - Objects and Methods - Standard Libraries - Tuples - Accessing tuples - Exception handling - Iteration - Conditional execution - Return statement and Operations – Opening and closing file - Reading and writing files - Dictionaries - Working with dictionaries - Exception Handling - Except clause - Try ? Finally, clause.

UNIT V CASE STUDIES

Basic Syntax - Setting up path - Working with Python– CGI– Networking– Multithreading- Generators and closures- Importing module- Math module- Packages- Composition– Sample Programs- Analyze Sales Outcome in Business- Automate the School Details to Analyze Performance.

LIST OF PROGRAMS: For practice

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. First n prime numbers
8. Multiply matrices
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file
11. Simulate elliptical orbits and bouncing ball using in Pygame

RECOMMENDED READINGS

Allen B. Downey – *Think Python* (3rd Edition, 2024), O'Reilly

Data Structure and Algorithmic Thinking with Python: Data Structure and Algorithmic

Puzzles by Karumanchi, Narasimha

Data Structures using C and C++--YedidyahLangsam, Moshe J. Augenstein, Aaron M. Tenenbaum

Data Structures using Python 2021 Edition by Dr Shriram K. Vasudevan

Eric Matthes – Python Crash Course (2023), No Starch Press

Fundamentals of Computer Algorithms--Horowitz, Sahani--Computer Science Press

Fundamentals of Data Structures--Horowitz, Sahani—Galgotia

Hands-On Data Structures and Algorithms with Python_second Edition by Benjamin Baka Dr Basant Agarwal Dr. Basant Agarwal

Introduction to Algorithms- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein- MIT Press

Introduction to Data Structures using C, Ashok Kamthane, Pearson Education

John Zelle – *Python Programming: An Introduction to Computer Science* (3rd Edition, 2021), Franklin Beedle

Mark Lutz – *Learning Python* (6th Edition, 2022), O'Reilly

Reema Thareja – *Python Programming Using Problem Solving Approach* (2022), Oxford University Press

Mapping of Course Outcomes to Programme Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	*3*	*1*	*1*	*1*	*0*	*2*	*0*
CO2	*2*	*2*	*3*	*1*	*0*	*3*	*1*
CO3	*2*	*3*	*3*	*2*	*0*	*2*	*1*
CO4	*2*	*3*	*3*	*2*	*1*	*2*	*1*
Total Score	***9***	***9***	***10***	***6***	***1***	***9***	***3***

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO 6**	**PSO 7**
CO1	*1*	*1*	*1*	*0*	*0*	*0*	*2*
CO2	*2*	*2*	*1*	*0*	*0*	*1*	*3*
CO3	*2*	*2*	*2*	*1*	*0*	*1*	*3*
CO4	*2*	*2*	*2*	*1*	*1*	*1*	*3*
Total Score	***7***	***7***	***6***	***2***	***1***	***3***	***11***

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High

SQL AND INTERNET SECURITY LAB- Practical's

Course Code	Subject Code	TITLE OF THE COURSE	L	T	P	C
SEC 3		**SQL AND INTERNET SECURITY LAB- Practical's**	0	0	2	2

L: Lecture T: Tutorial P: Practical C: Credits

Course Objectives:

The main objectives of this course are

- To present the concepts and techniques relating to query processing
- To acquire a knowledge of procedures and functions supported by SQL and python.
- To make use of PL/SQL and python language component, variables and data types.
- To understand the scope of the Block, Nested blocks and Labels.
- The student learns to work with various Redundancy Check Algorithms, Sliding Window Protocol, Routing Algorithm, Subnetting Procedures.

Course Outcomes (COs): At the end of this course of study, the student will be able to

CO No.	Course Outcomes	Cognitive Levels
CO1	Remember and explain the fundamental concepts of SQL commands, database management systems and internet security principles.	**K1, k2**
CO2	Apply SQL queries, database operations and internet security tools for managing and securing digital information.	**K2, k3**
CO3	Analyze database transactions, web security mechanisms and network vulnerabilities through practical implementation and testing.	**K3, k4**
CO4	Evaluate and develop secure database applications and internet security solutions using appropriate tools, queries and security techniques	**K5, K6**
K1: Remember **K2:** Understand **K3:** Apply **K4:** Analyze **K5:** Evaluate **K6:** Create		

Course Outline:

List of Programs:

1. Creation of database and use SQL queries to retrieve information from the database.
2. Performing insert, delete, modify, alter, update operations based on conditions using SQL
3. Study of PL/SQL block
4. Write a PL/SQL block to satisfy some conditions after accepting input from the user.
5. Write a PL/SQL block that handles all types of exceptions.

6. Perform packet sniffing and spoofing using Python.
7. Develop a Python script that can scan a network for open ports and identify potential vulnerabilities.
8. Develop a Python script that can capture and analyse network traffic in real-time, using tools like Scapy and Wireshark.
9. To bypass firewall using VPN
10. Authentication and access control, password and attack methods
11. Firewall, experimenting security tools and software's.
12. Analyse the security vulnerabilities of E-commerce services.
13. Analyse the security vulnerabilities of any email application.

Note: Any 8 practical's or more as per choice of the teacher and resources available.

RECOMMENDED READINGS

Course Faculty to share the material, E-sources, books and practical guide including instructions for this course.

Mapping of Course Outcomes to Programme Outcomes

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
CO1	*2*	*1*	*1*	*1*	*0*	*3*	*0*
CO2	*1*	*2*	*3*	*1*	*0*	*3*	*1*
CO3	*1*	*3*	*3*	*2*	*0*	*3*	*1*
CO4	*1*	*3*	*3*	*2*	*1*	*3*	*2*
Total Score	***5***	***9***	***10***	***6***	***1***	***12***	***4***

Level of Correlation between CO's and PO's

0- No Correlation 1- Low 2- Medium 3- High

Mapping of Course Outcomes to Programme Specific Outcomes (PSOs)

	PSO1	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO 6**	**PSO 7**
CO1	2	2	1	0	0	1	1
CO2	3	3	2	1	1	1	2
CO3	3	3	2	1	1	1	3
CO4	3	3	2	2	1	1	3
Total Score	***11***	***11***	***7***	***4***	***3***	***4***	***9***

Level of Correlation between CO's and PSO's

0- No Correlation 1- Low 2- Medium 3- High