श्रीचन्द्रशेखरेन्द्रसरस्वतीविश्वमहाविद्यालयः

SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA

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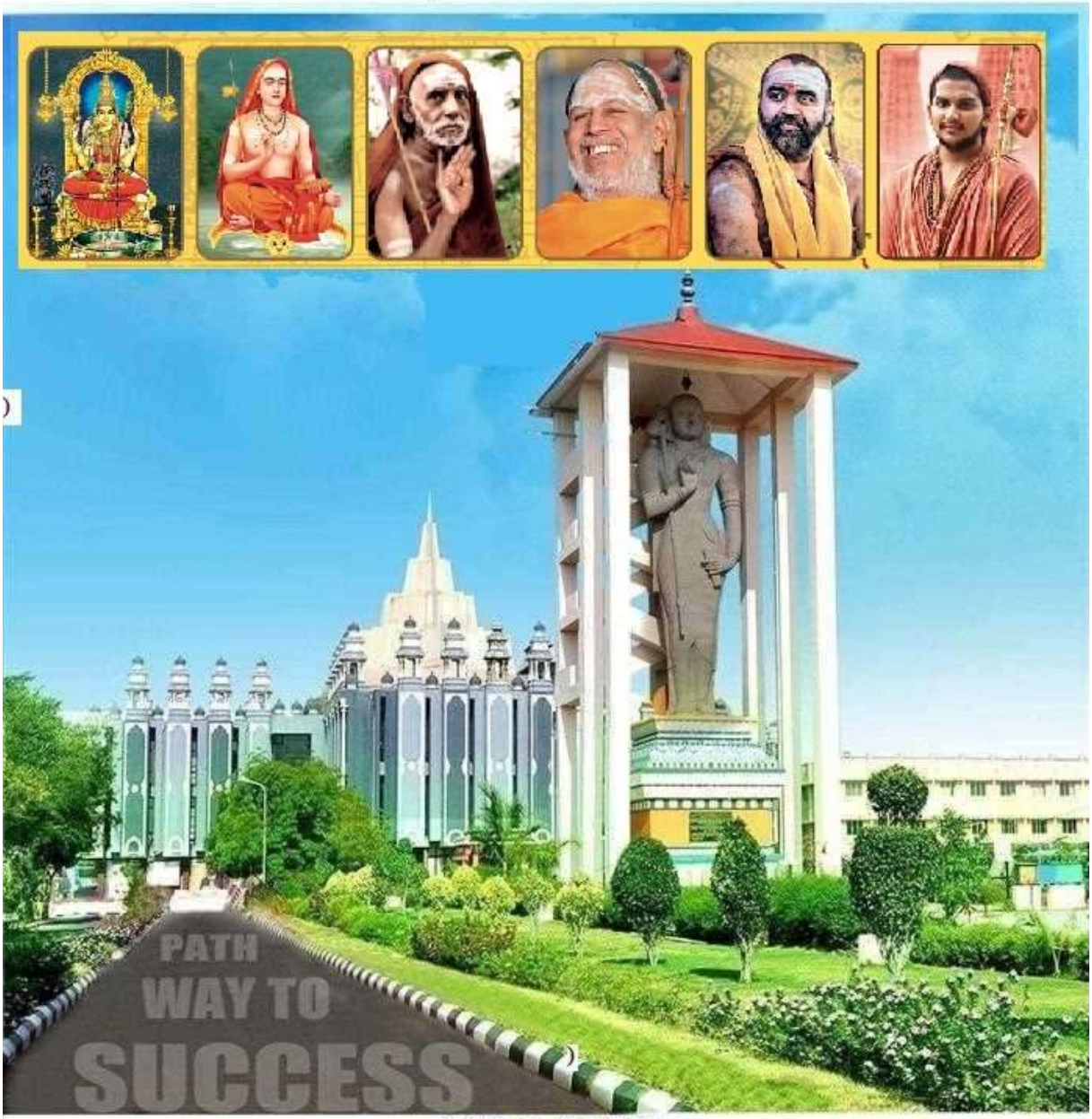

SYLLABUS

DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS

BACHELOR OF COMPUTER SCIENCE with CYBER SECURITY (B.SC. (CS with CYBER SECURITY))

CURRICULUM & CREDITS

Sem	Course Code	Category	Paper	Hrs	L	T	P	Total Credits
SEMESTER - I								
I		Multidisciplinary	Tamil - I / Hindi - I / Sanskrit - I	3	2	1	0	3
		AEC-1	Communicative English	3	2	1	0	3
		Major-1	Digital Principles & Its Applications	4	3	1	0	4
		Major-2	Problem solving Techniques in C	4	3	1	0	4
		Minor-1	Allied Mathematics-I	4	3	1	0	4
		SEC-1	Problem solving Techniques in C Lab	4	0	0	4	2
		VAC-1	Indian Culture	1	1	0	0	1
		VAC-2	Principles of Environmental Science	2	2	0	0	2
			Total	**25**	**16**	**5**	**4**	**23**
SEMESTER -II								
II		Multidisciplinary	Tamil - II / Hindi - II / Sanskrit - II	3	2	1	0	3
		AEC-2	Functional English	3	2	1	0	3
		Major-3	Data Structures and Algorithms	4	3	1	0	4
		Major-4	Cyber Crime & Mitigation Techniques	4	3	1	0	4
		Minor-2	Allied Mathematics-II	4	3	1	0	4
		SEC-2	Data Structures and Algorithms Lab	4	0	0	4	2
		VAC-3	Yoga	1	1	0	0	1
		VAC-4	Fundamentals of Human Rights	2	2	0	0	2
			Total	**25**	**16**	**5**	**4**	**23**

Sem	CourseCode	Category	Paper	Hrs	L	T	P	Total Credits
III		Multi disciplinary	Tamil - III / Hindi - III / Sanskrit – III	3	3	**0**	0	3
		AEC-3	Technical English	3	3	0	0	3
		Major-5	Ethical Hacking	4	3	1	0	4
		Major-6	Operating System and System Administration	4	3	1	0	4
		Minor-3	Object Oriented Programming in Java	4	3	1	0	4
		SEC-3	Operating System And System Administration Lab Lab	3	0	0	3	2
		SEC-4	Object Oriented Programming in Java Lab	3	0	0	3	2
		VAC-5	Soft Skills – I	1	0	1	0	1
			Total	**25**	**15**	**4**	**6**	**23**
IV		Multi Disciplinary	Tamil - IV / Hindi - IV / Sanskrit – IV	3	3	0	0	3
		AEC-4	Professional English	3	3	0	0	3
		Major-7	Data Communication and Networks	4	3	1	0	4
		Minor-4	Relational Database Management System	4	3	1	0	4
		Major-8	Criminal Laws and Cybercrimes	4	3	1	0	4
		SEC-5	RDBMS Lab	3	0	0	3	2
		SEC-6	Security and Networks Lab	3	0	0	3	2
		VAC-6	Soft Skills - II	1	0	1	0	1
			Total	**25**	**15**	**4**	**6**	**23**

Sem	CourseCode	Category	Paper	Hrs	L	T	P	Total Credits
SEMESTER - V								
V		Major-09	Programming With Python	4	3	1	0	4
		Major-10	Advanced Cyber Security	4	3	1	0	4
		Major-11	Cyber Crime Investigation and Digital Forensics	4	3	1	0	4
		Major-12	**Major Elective-1**	4	3	1	0	4
			A.Penetration Testing					
			B. Intrusion Detection and Prevention System					
		Minor-5	**Minor Elective 1**	3	3	0	0	4
			A. Software Engineering					
			B. Internet of Things					
		SEC-7	Advanced Cyber Security Lab	3	0	0	3	2
		SEC-8	Python Lab	3	0	0	3	2
		SEC-9	Industry Internship Course	0	0	0	0	2
			Total	**25**	**15**	**4**	**6**	**26**
SEMESTER - VI								
VI		Major-13	Web Technology	4	3	1	0	4
		Minor-06	**Minor Elective-2** 1. Artificial Intelligence & Machine Learning 2. Big Data Analytics	4	3	1	0	4
		Major-14	Cloud Technology & Security	4	3	1	0	4
		Major-15	**MajorElective-2**	4	3	1	0	4
			A. BiometricSecurity					
			B. Introduction to Block Chain Technology					
			C. Information Security and Audit					
		SEC-10	Web Technology Lab	4	0	0	4	2
		SEC-11	Cyber Security Project Development Lab	5	0	2	3	3
			Total	**25**	**12**	**6**	**7**	**21**

Sem	Course Code	Category	Paper	Hrs	L	T	P	Total Credits
VII		Major-16	Malware Analysis & Reverse Engineering	5	3	2	0	4
		Major-17	Disaster Risk Reduction & Management	5	3	2	0	4
		Major-18	**MajorElective-3**	5	3	2	0	4
			A. Security Architecture and Design					
			B. Soft Computing					
		Minor-07	**MinorElective-3**	4	3	1	0	4
			A. Research Methodology(NPTEL)					
			B. Graph Theory					
			C. Deep Learning					
		IAPC-1	Mini Project	6	0	0	6	6
Total				**25**	**12**	**7**	**6**	**22**
VIII		Major-19	Cyber Threats and Modeling	5	3	2	0	4
		Minor-08	**MinorElective-4**	4	3	1	0	4
			A.Research and Publication Ethics (NPTEL)					
			B. Operation Research					
			C. Quantum Computing					
		IAPC-2	Project	21	0	0	21	12
Total				**30**	**6**	**3**	**21**	**20**
				Overall Total				**181**

	LANGUAGE – I (TAMIL – I)	L 2	T 1	P 0	C 3

(For Students admitted from 2025 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

முன்னுரை

ஆளுமை மேம்பாடு மற்றும் மொழித்திறன் மற்றும் தன்னம்பிக்கையைத் தூண்டுதல்

முதற்பருவம்

Objective-1	தமிழ் இலக்கிய, இலக்கண வரலாறு அறிமுகம் தமிழ் இலக்கியப் போக்குகளையும், இலக்கணங்களையும் மாணவர் அறியுமாறு செய்து அவர்களின் படைப்பாற்றலைத் தூண்டுதல்
Objective-2	அற இலக்கியம் வாழ்வை மேம்படுத்தும் அற சிந்தனைகளை நீதி இலக்கியம் வழி ஒழுக்கங்களை கற்றுக் கொள்ளுதல்
Objective-3	பக்தி இலக்கியம் பக்தி இலக்கியங்கள் வழி சமயச் சான்றோர்களையும் பக்தி நெறிகளை உணர்த்து கொள்ளுதல்
Objective-4	உலகளாவிய மனித மதிப்புகள் மாணவர்களின் வாழ்க்கையில், தனிப்பட்ட முறையிலும், தொழில் ரீதியாகவும், மதிப்புகளின் முக்கியத்துவத்தை வலியுறுத்துவதன் மூலம் அவர்களின் முழுமையான வளர்ச்சியை வளர்க்கிறது .
Objective-5	மொழிப் பயிற்சி மொழியினைப் பிழையின்றி கற்றுக் கொள்ளுதல்

பொதுத்தமிழ்-1

தமிழ் இலக்கிய வரலாறு -1

முதலாம் ஆண்டு – முதற் பருவம்

அலகு-1 தமிழ் இலக்கிய, இலக்கண வரலாறு அறிமுகம்

1. **இலக்கணம்**

அ. தொல்காப்பியம் இறையனார் களவியல் உரை நம்பியகப் பொருள், புறப்பொருள் வெண்பாமாலை , நன்னூல் தண்டியலங்காரம் யாப்பருங்கலக்காரிகை (அறிமுகம்)

ஆ. மொழிப் பயிற்சி ஒற்றுப்பிழை தவிர்த்தல்

- வல்லினம் மிகும் இடங்கள்-வல்லினம் மிகா இடங்கள்-ஈரொற்று வரும் இடங்கள்-ஒருஓர்வரும் இடங்கள்-அது, அஃது வரும் இடங்கள்-தான் தாம் வரும் இடங்கள்

பயிற்சி வல்லினம் மிகும் இடங்கள், மிகா இடங்கள் தவறாக வரும் வகையில் ஒரு பத்தி கொடுத்து ஒற்றுப் பிழை திருத்தி எழுதச் செய்தல்

2.சங்க இலக்கியம் - எட்டுத்தொகை, பத்துப்பாட்டு

3.அற இலக்கியம் - பதினெண்கீழ்கணக்கு நூல்கள்

4.காப்பிய இலக்கியம் - ஐப்பெருங் காப்பியங்கள், ஐஞ்சிறு காப்பியங்கள் சமயக் காப்பியங்கள்

5.பக்தி இலக்கியமும் (பன்னிரு திருமுறைகள், நாலாயிர திவ்விய பிரபந்தம் – பகுத்தறிவு இலக்கியமும் (சித்தர் இலக்கியங்கள்)

அலகு-2 அற இலக்கியம்

1. திருக்குறள் - அறன் வலியுறுத்தல், தெரிந்து செயல்வகை அதிகாரம்
2. நாலடியார் பாடல்: 100, 139
3. ஆசாரக்கோவை - 1,4,10
4. கொன்றை வேந்தன் (1-20 பாடல்கள்) கதை எழுதுதல்
5. ஆத்திச்சூடி (பாரதியார்) (1-20 பாடல்கள்) கதை எழுதுதல்

அலகு -3 பக்தி இலக்கியம்

1. சமயங்கள் அறிமுகம்
2. காஞ்சி மகாபெரியவர் - தெய்வத்தின் குரல்
   - குலத்தெய்வ வழிபாடு
   - பச்சரிசி மாவில் கோலமிடுதலின் சிறப்பு
3. சைவம் :
   - திருநாவுக்கரசர் (சொற்றுணை வேதியன் சோதி வானவன்)
   - திருஞானசம்பந்தர் – (கோளாறு பதிகம் - வேயுறு தோளிபங்கன்)
   - சுந்தரர் – பித்தாபிறை சூடி பாடல்
   - மாணிக்கவாசகர் (அம்மையே! அப்பா! ஒப்பு இலா மணியே!)
4. வைணவம்:
   - பொய்கையாழ்வார் (வையத் தகளியா வார்கடலே)
   - பூதத்தாழ்வார் (அன்பே தகளியா)
   - பேயாழ்வார் (திருக்கண்டேன் பொன்மேனி கண்டேன்)

அலகு – 4 உலகளாவிய மனித மதிப்புகள்

- இலக்கியங்கள் கூறும் மனித மதிப்புகள்
- மனித உறவுகள் அறிமுகம்
- தொல்காப்பியம் காட்டும் மனித உறவுகள்
- சங்க இலக்கியங்களில் மனித உறவுகள்
- பதினெண்கீழ்க்கணக்கு நூல்களில் மனித உறவுகள்
- இக்கால இலக்கியங்களில் மனித உறவுகள்

அலகு 5 மொழிப் பயிற்சி

1. சொல் வேறுபாடு /பிழை தவிர்த்தல்

- வாசிப்பது-வாசிப்பவர்
- சுவர்- சுவரில்
- வயிறு வயிற்றில்
- கோயில் கோவில்
- கறுப்பு கருப்பு
- இயக்குநர் - இயக்குனர்
- சில்லறை சில்லரை
- மனம் மனசு மனது
- அருகில்-அருகாமையில்
- அக்கரை அக்கறை
- மங்கலம் மங்களம்.

2.பயிற்சி

அ) கொடுக்கப்பட்டுள்ள பக்திகளைப் படித்து மூன்றில் ஒரு பங்காக சுருக்கி எழுதவும்.
ஆ) லகர, ளகர, ழகர பிழைகளை நீக்கி எழுதச் செய்தல்.
இ) ணகர, னகர, நகர பிழைகளை நீக்கி எழுதச் செய்தல்.
3. தொடர் பிழை நீக்கி எழுதுதல்

பாடநூல் :

ஸ்ரீ சந்திரசேகரேந்திர சரஸ்வதி விஸ்வ மகா வித்யாலயா - பொதுத்தமிழ் - முதல் பருவம்

பார்வை நூல்

- மு.வரதராசன், தமிழ் இ லக்கிய வரலாறு, சாகித்ய அகாடமி, புதுடெல்லி.
- மது.ச.விமலானந்தன், தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.
- தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.

- தெய்வத்தின் குரல் - காஞ்சி மகாபெரியவர்
- தமிழ் இலக்கிய வரலாறு -முனைவர்.சிற்பி பாலசுப்ரமணியம், முனைவர்.சொ.சேதுபதி
- புதிய தமிழ் இலக்கிய வரலாறு- முனைவர்.சிற்பி பாலசுப்ரமணியம்,நீல.பத்மநாபன்
- தமிழ் இலக்கிய வரலாறு டாக்டர்.அ.கா.பெருமாள்
- தமிழ் இலக்கிய வரலாறு -முனைவர். ப.ச.ஏசுதாசன்
- வகைமை நோக்கில் தமிழ் இலக்கிய வரலாறு-பாக்கியமேரி
- தமிழ் இலக்கணம் - இரா. நெடுஞ்செழியன்

- Related Online Contents /Web Sources
- https://www.chennailibrary.com
- https://www.sirukathaigal.com
- https://www.tamilvirtualuniversity.org
- https://www.noolulagam.com

https://www.katuraitamilblogspot.com

	LANGUAGE –I (HINDI - I)	L 2	T 1	P 0	C 3

(For Students admitted from 2025 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

UNIT –I REFLECTION ON HINDI LANGUAGE:

a) Importance of Hindi learning & the place of Hindi as National language.
b) Cultural contexts of Hindi : an introduction &Various functional forms of Hindi
c) Hindi Phonetics – Vowels and Consonants
d) Barahkhadi & Dwitvakshar and Samyuktakshar
e) Often wrong spelt words and correction

UNIT –II HINDI VOCABULORY: made easy

a) Greetings and Introductory words
b) Basic words for daily usage – spoken purpose in particular.
c) Introduction to parts of speech in Hindi
d) Adjective noun agreements, Oblique and expressions of possession (APNA)

UNIT – III HINDIGRAMMAR: for Syntax Understanding

a) Gender and Number
b) Infinitive Verbs : commands and requests
c) Partsof speech - sentence making
d) Verb usage variations
e) Karakchihn – Introduction

UNIT –IV WRITINGAND READING SKILLS OF HINDI

a) Application of case-endings in sentences
b) Sentence formation (Gender specified)
c) Sentence formation (Number specified)
d) Changing the sentence according to the instructions (using '*Be* form')
e) Hindi – reading and writing exercises (Short stories, paragraphs etc.)

UNIT – V THE FOUNDATION FOR HINDI SPEAKING

a) Introduction of Tenses
b) Present Tense and it's variations
c) Future Tense and it's variations
d) Transcription of Paragraph
e) OVER ALL REVIEW OF WHAT WE LEARNED SO FAR

TEXT BOOKS:

1. **HINDI SOURABH,** Prepared by Department of Hindi, SCSVMV

REFERENCES:

1. “Come Let us Learn Hindi” : Dr. Alok Pandey, Published by Milind Prakashan, Hyderabad 2013
2. Pankhudiyan 1&2: Dr. Madhu Dhawan, Lekhan Prakashan, New Delhi 2011
3. SABARI HINDI BODHINI, Published by Shabari Prakasan, Selam, 2012

	LANGUAGE –I	L	T	P	C
	(SANSKRIT - I)	2	1	0	3

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Unit - I भागः - क

1. Vowels & Consonants
2. Words begin with vowels
3. Words begin with क to ण
4. Words begin with त to ह

Unit - II भागः - ख

1. Words begin with क to झ with the combination of Vowels.
2. Words begin with ट to न with the combination of Vowels.
3. Words begin with प to ह with the combination of Vowels.
4. Combined Letters.
5. Simple Sentences.

Unit - III भागः - ग

1. Lessons from text book 1-6.

Unit - IV भागः – घ

1. Lessons from text book 7-12.

Unit - V भागः - ङ

1.शब्दरूपाणि

1. देवः
2. मुनिः
3. गुरुः
4. पितृ
5. गो
6. छात्रा
7. मतिः
8. गौरी
9. धेनुः
10. मातृ
11. वनम्
12. अस्मद्
13. युष्मद्
14. तद्
15. एतद्
16. इदम्
17. किम

2. धातुरूपाणि (Present tense, Past tense and Future tense) परस्मैपद-आत्मनेपदधातवः

1.भू धातुः
2. पठ् धातुः
3. गम् धातुः

Text Books –

Samskrita Siksha - Part I & II, Published by Department of Sanskrit and Indian culture, SCSVMV University (Deemed University), Enathur, Kanchipuram.

	Communicative English	L	T	P	C
		2	1	0	3

(For Students admitted from 2024 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Course Objectives:

1. To differentiate and apply receptive and productive language skills in day-to-day communication.
2. To use grammar elements like phrasal verbs and concord accurately in speech and writing.
3. To enhance listening comprehension for academic and general purposes.
4. To develop oral fluency through structured conversations and short descriptions.
5. To write coherent paragraphs and official letters using appropriate format and cohesion.

Course Outcomes:

1. Apply receptive and productive communication strategies in routine contexts.
2. Use appropriate grammar structures to construct accurate sentences.
3. Understand and interpret spoken messages in academic and general situations.
4. Demonstrate oral fluency through guided conversation and descriptive practice.
5. Compose coherent paragraphs and official letters using appropriate vocabulary and format.

Unit: I (9 hours)

Language Skills

Receptive (Listening & Reading), Productive (Speaking & Writing), Interpersonal, Intrapersonal

Unit II (9 hours)

Grammar and Usage

Phrasal Verbs, Concord, Spotting Errors (identifying grammatical errors), (Modifiers, qualifiers, quantifiers), Tenses

Unit III (9 hours)

Listening Skills

Types of listening, Listening strategies, Focused listening, Listening for Details, Lectures, Announcements

Unit IV (9 hours)

Speaking Skills

Conversation Starters, participating in a small talk, conversation (formal), group discussion, making presentation – describing a product, interpreting charts, branding a product.

Unit V (9 hours)

Technical Writing (9 hours)

Types of writing, Writing emails, minutes, proposals (plan of action), reports,

Reference:

Carter, Ronald & McCarthy, Michael. *Cambridge Grammar of English*. Cambridge UP, 2006.

	PROBLEM SOLVING TECHNIQUES IN C	L	T	P	C
		3	1	0	4

(For Students admitted from 2026 onwards)

Common for B.Sc. (CS with Cyber Security)/BCA

COURSE OBJECTIVES

- To help the students to learn programming concepts using C Language
- To learn the fundamentals of PST and methodologies which are essential for building good C programs
- To demonstrate a thorough understanding of modular programming by designing programs which require the use of programmer-defined functions
- To impart the knowledge about pointers which is the backbone of effective memory handling
- To demonstrate adeptness of file access in developing solutions to problems

COURSE OUTCOMES

- Learn the fundamental programming concepts and methodologies, which are essential for building good C programs.
- Understand the modular programming by designing programs, which require the use of programmer defined functions.
- Acquire the knowledge about pointers
- Learn about the Storage Classes and building good C programs.
- Obtain the knowledge of writing programs for file access.

SYLLABUS

Unit I: Problems and Problem Instances

Types of Computational Problems- Classification of Problem- Analysis of Problems- Solution Approaches- Algorithm Development- Analysis of Algorithm - Role of Data Structures in ProblemSolving- Problem Solving Steps-Modular Programming. **12**

UNIT –II: C fundamentals:

Character set - Identifier and keywords - data types - constants- Variables - Declarations -Statements - Operators – Expressions – Built in functions – Input and Output Operations. **12**

UNIT – III: Control Structure Statements and Arrays

Flow of control - if, if else, While, do-while, for loop, Nested control structures - Switch, breakand continue, go to statement – Arrays. **12**

UNIT – IV: Functions & Structure:

Definition - Prototypes – Passing arguments – Recursion- Storage Classes – Structure-Union. **12**

UNIT – V: Pointers and File:

Declarations - Structures and Pointers - Passing pointers to Functions - Pointer and Arrays –Arrays of Pointers - Files: Creating, Processing, Opening and Closing a data file- Debugging. **12**

TOTAL: 60

TEXT BOOKS

1. Harvey Deitel and Paul Deitel, “C How to Program”, Pearson India, 9th Edition, 2015. – Unit II to IV
2. R G Dromey, “How to Solve It by Computer”, Pearson India, 2007. – Unit I

REFERENCE BOOKS

1. Brian W. Kernighan and Dennis Ritchie, “The C Programming Language”, Pearson, 2nd Edition, 2015.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/c/c-programming-language/
2. https://www.learn-c.org/
3. https://en.cppreference.com/w/c

	ALLIED MATHEMATICS-I	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

Pre-requisite:
Basic knowledge on Matrices, Trigonometry, Differentiation and Integration

Course objectives:

- To gain knowledge on eigen values and eigen vectors
- To understand expansions of trigonometric functions
- To know the differentiation of hyperbolic functions and successive differentiation
- To understand partial differentiation and apply Eulers theorem
- To acquire knowledge about solving algebraic and transcendental equations numerically
- To classify type of integral and evaluate

Unit-I Matrices
Introduction to Matrix-Matrix operations- Symmetric and Skew-Symmetric matrices - Orthogonal and Unitary matrices - Rank of a matrix -Test for Consistency of linear equations - Characteristic Equation of a matrix- Characteristic vectors of a matrix - Cayley- Hamilton theorem (without proof) - Simple problems and applications.

Unit-II Trigonometry
Introduction to Trigonometry- Expansions: Expansions of sin x, cos x, tan x in terms of x ; hyperbolic functions: hyperbolic functions and inverse hyperbolic functions

Unit-III Numerical Solution of Equations
Solution of Numerical algebraic and transcendental equation: Bisection Method- Method of false position- Newton – Raphson method. Solution of simultaneous linear algebraic equations: Direct Methods: Gauss elimination method- Gauss Jordon method; Iterative Methods: Gauss Seidel method

Unit-IV Successive Differentiation and Partial Differentiation
Successive Differentiation- n^{th} order derivatives of standard functions- Leibnitz theorem (without proof)-simple problems- Partial differentiation- Partial derivative-Higher derivatives-Homogeneous functions-Euler's theorem on Homogeneous functions- Problems on Euler's theorem

Unit-V Indefinite Integrals and Definite Integrals
Definite integrals: Properties of Definite integrals (Statement only)-Evaluation of definite integrals and indefinite integrals of types $\int \frac{1}{a+bcosx}dx$, $\int \frac{1}{a+bsi}dx$, $\int \frac{lx+m}{ax^2+bx+}dx$, $\int \frac{lx+m}{\sqrt{ax^2+bx+c}}dx$, $\int \frac{1}{a+bcosx+bsin}dx$, $\int \frac{1}{ax+b\sqrt{lx^2+mx+n}}dx$, $\int_0^{\frac{\pi}{2}} sin^n x dx$, $\int_0^{\frac{\pi}{2}} cos^n x dx$ Simple problems

Course Outcome:
At the end of the course, the students will be able to
CO:1. Compute eigen values and eigen vectors
CO:2. To expand trigonometric functions
CO:3. To solve algebraic and transcendental equations using numerical methods
CO:4. To find nth order derivative of functions
CO:5. To apply Eulers theorem on partial differentiation
CO:6. To evaluate definite and indefinite integrals

Text Books:

1. P.R.Vittal, "Allied Mathematics", Fourth Edition, 2009, Margham Publications chennai.
   Unit I: Chapter 5, Unit II: Chapter 14,
   Unit IV: Chapter 8, Chapter 9, Unit V: Chapter 15
2. P.Kandasamy, Dr.K.Thilagavathy, Dr.K.Gunavathi, "Numerical Methods", S.Chand and Company Ltd., Third Revised Edition,2013, New Delhi.
   Unit III: Chapter 3(3.1-3.4),Chapter 4 (4.1,4.2,4.9)

Reference books:

1. Numerical Methods, Problems and Solutions: M.K.Jain, S.r.K Iyengar, R.K.Jain (2003)
2. Calculus. S.Narayanan and T.K.Manicavachagom Pillay (2004). S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai.

	DIGITAL PRINCIPLES & ITS APPLICATIONS	L	T	P	C
		3	1	0	4

(For Students admitted from 2026 onwards)
Common for B.Sc. (CS) / BSc (CS with Cybersecurity)

COURSE OBJECTIVES

- To learn about the basic concepts of Digital Computer Fundamentals
- To get through knowledge about the concepts of logic gates, Boolean Algebra
- To Learn the combinational circuits and sequential logic
- To study about the various counters and memory
- To know the concepts of registers.

COURSE OUTCOMES

- Know the basics of Digital Computer Fundamentals
- Understand the theory of logic gates, Boolean Algebra
- Acquire knowledge of the combinational circuits and sequential logic
- Know about various counters and memory
- Obtain and Understand the concepts of registers

SYLLABUS

UNIT – I INTRODUCTION TO NUMBER SYSTEM

Number Systems and Codes: Number System, Base Conversion, Binary Codes. Code Conversion - Digital Logic: Logic Gates, Truth Tables, Universal Gates. **12**

UNIT – II BOOLEAN ALGEBRA:

Truth Table - theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, K-map (upto 4 Variables), Don't care conditions. **12**

UNIT – III COMBINATIONAL CIRCUITS:

Digital logic gates - Design procedure - Universal Gates – Adder – Subtractor - Encoder – Decoder – Multiplexer – Demultiplexer. **12**

UNIT – IV SEQUENTIAL CIRCUITS:

Flip flop – SR Flip flop – D Flip flop T Flip Flop- JK Flip flop - Master Slave Flip Flop. **12**

UNIT – V REGISTERS AND COUNTERS

Introduction to Registers, Shift Left Register, Shift Right Register, Introduction to Counters, Up Counter, Down Counter **12**

TOTAL : 60

TEXTBOOKS:

1. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India, Eastern Economy edition 2010.

REFERENCE BOOKS:

1. Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015. – Highly Visual

WEB REFERENCES:

1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/ - UNIT I & II
2. https://www.tutorialspoint.com/digital_circuits/index.htm
3. https://www.allaboutcircuits.com/textbook/digital/ - UNIT IV & V
4. https://nptel.ac.in/courses/108105132
5. https://nptel.ac.in/courses/106105185
6. https://circuitverse.org/ - Free browser based simulator

	PROBLEM SOLVING TECHNIQUES IN C LAB	L	T	P	C
		0	0	4	2

(For Students admitted from 2026 onwards)
Common for BCA/ B.Sc. (CS with Cyber Security)

COURSE OBJECTIVES

- To be able to get trained in programming skills using C
- To help the students to write the programs using conditional Statements and Lopping Statements.
- To learn and write the programs for Array and structure.
- To learn about the usage of functions.
- To impart the knowledge about pointers, files and effective memory handling

COURSE OUTCOMES

- Ability to implement application programs using C Language
- Able to implement structure and functions concepts
- Understand various string functions
- Knowledge on implementing the concepts of Pointers
- Create and use of the file operations.

LIST OF EXERCISES

1. Write a Program to generate a Fibonacci Series
2. Given a positive integer value n (>= 0) display number, square and cube of numbers from 1 to n in a tabular format?
3. Given an input positive integer number, display odd numbers from in the range [1,n]?
4. Compute character grade from the marks ($0 \leq$ marks ≤ 100) of a subject. Grading Scheme: 80-100: A, 60 - 79: B, 50 - 59: C, 40-49: D, 0-39: F? Solve this using switch case
5. Display following patterns of n rows (n > 0), For the below examples n = 5?

$
$$
$$$
$$$$
$$$$$

6. Check if a given positive integer number is a palindrome or not?
7. Implement your own string length and string reversal functions?
8. Write a Program to sort an array.
9. Write a Program to find the factorial of an integer using recursion.
10. Write a Program to swap two values using function pointer.
11. Write a Program to store student's information using Structure.
12. Write a Program to perform read and write operation on a file.

BCY231V07	INDIAN CULTURE	L	T	P	C
		0	1	0	1

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Unit I:

Introduction to Vedic Cultures; significance & how it is different from the other cultures. why we have to follow? Important features.

Unit II:

Literary Heritage of India – significance of Indian Literature; Chronology of Indian literature; Literature in Sanskrit and other Indian languages;

Unit III:

Early Indian Education – significance & advantages. Gurukulas and Guru-sishya parampara. Learning methods. Evolution of script and languages; important early scripts and writing materials; important early educational centers (ghattikas, universities) & their unique features. Important personalities and their Contribution – Devarishies, Maharishies, Rishies, Seers and contribution of their institutions to protect the cultural heritage.

Unit IV:

Scientific thoughts of Early Indian Sages;

Unit V

Importance and significance of Upavedas – Ayurveda, Dhanurveda, Gandhravaveda, stapatya & Arthasastra.

TEXT BOOKS:

1. Joshi,K. The Veda and Indian Culture. Rastriya Veda Vidya Pratishthana, NewDelhi, 1992(rp).
2. Kangle, R.P.. The Kautilya Arthasastra. Delhi. 1992 (rp).
3. Kulkarni, R.P. Geometry according to Sulba Sutra. Samsodhana Mandal. Pune. 1983.
4. Majumdar, R.C. Ancient India. Motilal Banarsidas Publishers. Delhi. 1994 (rp).
5. Patel, I.S. (ed) Science and the Vedas. Bombay. 1984.

REFERENCE:

1. Majumdar, R.C. The History and Culture of the Indian People. Vol I-IV.Bharatriya Vidya Bhavan. Mumbai, 1996 (ed) (rp).
2. Radhakrishna, S. Indian Philosophy. Vol I & II. Oxford University Press. Delhi, 1993(rp).
3. Sri Chandrasekarendra Sarasvati Swamihi. The Guru Tradition. Bharatiya VidyaBhavan. Bombay, 1991.
4. Sri Jayendra Saraswatiji Maharaj. The Vedas and Vedangas. Prakashan Kendra. Lucknow, 1951.
5. Winternize, M. 1996(rp). History of Indian Literature. Delhi.

BDS231V08	PRINCIPLES OF ENVIRONMENTAL SCIENCE	L	T	P	C
		0	2	0	2

(For Students admitted from 2024 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

COURSE OBJECTIVES

- To understand the basic concepts about environment.
- To be familiar with the components and nature of environment.
- To create awareness about the technological and scientific crisis faced by the world community.
- To understand the effects and remediation of various pollutions.
- To expose the students to the real-life ecological issues faced by different parts of the society

COURSE OUTCOMES

- Understanding the importance of the environment.
- Realizing the place of human in the environment and act eco-centrically.
- Inculcate the importance and benefits of biodiversity and natural resources.
- Exemplify the effects of pollution and over utilization of resources.
- Moulding the student as an environmentally responsible citizen.

UNIT-I INTRODUCTION TO ENVIRONMENT AND ENVIRONMENTAL STUDIES:

1.1 Introduction to environment – components – nature of environment - need of awareness –reasons for environmental problems – anthropocentric and eco centric views.

1.2 Environmental studies - multidisciplinary nature – scope and aim – sustainable development-principles – RRR concept-Indian environmental movements – environmental calendar.

UNIT – II ECOSYSTEM AND BIODIVERSITY:

2.1 Ecosystem – structure – functions – simplified ecosystem models (food chain and food webs and their types, energy flow) - forest – grassland – pond –ecosystems – ecological succession - ecological pyramids – Bio-geochemical cycles of water – oxygen-carbon-phosphorous and sulphur.

2.2. Biodiversity – definition – types – species – genetic and ecosystem diversities- values of biodiversity – threats to biodiversity – conservation of biodiversity – endemism – biodiversity hotspots – Indian biodiversity– endemic species of India – IUCN lists -red-green and blue data books.

UNIT – 3 NATURAL RESOURCES:

3.1 Natural resources – definition – types – forest resources – uses –deforestation- reasons - effects – water resources – dams – effects of dams - food resources – modern agriculture– ill effects -energy resources- types – hydel –nuclear – solar –wind and biomass energy - world scenario – Indian scenario.

3.2 Population and environment – reasons for over exploitation of resources – population – demography – population curves – population explosion – effects – consumerism – effects – urbanization – reasons and effects- role of an individual.

UNIT – 4 ENVIRONMENTAL POLLUTION:

4.1 Pollution – definition – types – air pollution – causes and effects – effects of CO_2 – CO – NOx –SOx – particulates – control of air pollution – water pollution – causes – effects – remedies – soil pollution – solid waste management – e waste – ill effects of e-waste – proper recycling- Noise pollution – reasons – effects – control – nuclear pollution – cases – effects and control –thermal pollution causes – effects and remedies.

4.2 Legal provisions for protecting environment – article 48 A – 51 A (g) – Environment act 1986 – Air act 1981 – Water act 1974 – wild life protection act – Forest act 1980- problems in implementation– reasons.

UNIT – 5: SOCIAL ISSUES AND ENVIRONMENTAL ETHICS

5.1 Present environmental scenario – greenhouse effect – climate change – The Kyoto Protocol – ozone layer depletion-The Montreal Protocol - acid rain – causes – effects - disparity among the nations – The Copenhagen UNFCCC summit – carbon currency- virtual water- genetically modified organisms, Disaster management.

5.2 Environmental ethics – introduction – people getting affected - resettlement and rehabilitation – issues involved –Sardhar Sarovar project – Tawa Matsya sang - Melting icebergs of Arctic.

TEXT BOOK:

1. Anubha Kaushik and C.P. Kaushik, ”Prospects of Environmental Science”, New Age International publishers, 2013.

REFERENCES:

1. Environmental Studies, N. Nandini, N. Sunitha and Sucharita Tandon, Sapna Book House, 2007.
2. Textbook of Environmental Science, Ragavan Nambiar, Scitech Publications, 2009.
3. Textbook of Environmental Chemistry and Pollution Control, S.S.Dara, S.Chand and Co., 2002.
4. Environmental Chemistry, Colin Baird, W.H.Freeman and company, New York, 1999.
5. Environmental Chemistry, Gary W. VanLoon and Stephen J.Duffy, Oxford University Press, 2000.

	LANGUAGE -II	L	T	P	C
	(TAMIL - II)	2	1	0	3

(For Students admitted from 2025 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

PREAMBLE:

Encouraging personality development and confidence in language skills

முன்னுரை

ஆளுமை மேம்பாடு மற்றும் மொழித்திறன் மற்றும் தன்னம்பிக்கையைத் தூண்டுதல்

இரண்டாம்; பருவம்

Objective-1	**புதுக்கவிதை வரலாற்றினை அறிந்து கொள்வர் பாரதியார் காலம் தொட்டு தற்கால. புதுக்கவிதைகள் வரை கவிதை இலக்கியம் அறிமுகப்படுத்தப்படுவதால் படைப்பாற்றல் திறன் பெறுதல்.**
Objective-2	தொல் பழங்கால வரலாறும் சங்ககால வரலாறும் தமிழக வரலாற்றை அறிந்துகொள்வர்..
Objective-3	கல்வியும் வாணிபமும் தமிழரின் வாழ்வியல் தொன்மையை அறிவர்
Objective-4	தமிழரின் பண்பாட்டுக் கூறுக**ள்**, ஐரோப்பியர் கால வரலாறு தமிழரின் பண்பாட்டுக் கூறுக**ள்**
Objective-5	**இலக்கணமும் மொழித்திறனும் மொழியை பிழையின்றிப் பேச எழுத கற்கத் தேவையான தமிழ் இலக்கணத்தின் இன்றியமையாமையை உணர்ந்து கொள்ளுதல்**

பொதுத்தமிழ் -2

தமிழக வரலாறும் பண்பாடும்

முதலாம் ஆண்டு – இரண்டாம் பருவம்

அலகு 1 : இக்கால இலக்கியம்

கவிதை :

1. பாரதியார் - பாரதம்
2. பாரதிதாசன் – ஆலமர கவிதைகள் (குரங்கின் அச்சம்)
3. நாமக்கல் கவிஞர் – கத்தியின்றி.
4. மீரா – கனவு கற்பனை

சிறுகதை :

- வ.வே.சு ஐயர் – குளத்தங்கக்கரை அரசமரம்.
- புதுமைப்பித்தன் – எப்போது விடியும்.
- அம்பை – *அம்மா* **ஒரு கொலை செய்தாள்**

அலகு 2: தொல் பழங்கால வரலாறும் சங்ககால வரலாறும்

- தொல் தமிழர்
- பழைய கற்காலம்
- புதிய கற்காலம்
- உலோகக் காலம்
- அகழ்வாராய்ச்சியில் தமிழும் தமிழரும் (கீழடி வரை)

அலகு 3: கல்வியும் வாணிபமும்

- திணை வாழ்வியல் (களவு வாழ்ககை கற்பு வாழ்க்கை உணவு வாணிகம் விளையாட்டுகள்)

- கல்வியும் கலைகளும்
- தமிழ் வளர்த்த சங்கம்
- சங்ககால ஆட்சி முறை
- அயல்நாட்டுத் தொடர்புகள்

அலகு 4 ஆட்சியர் வரலாறு

- மூவேந்தர் வரலாறு
- பல்லவர் வரலாறு
- நாயக்கர் ஆட்சி
- முகமதியர் ஆட்சி
- மராட்டியர் ஆட்சி
- போர்த்துக்கீசியர்
- டச்சுக்காரர்கள்
- பிரெஞ்சுக்காரர்கள்
- ஆங்கிலேயர்கள்
- பாளையக்காரர்கள்

அலகு 5 . இலக்கணம்

- எழுத்தின் விளக்கம்
- எழுத்தின் வகைகள்
- வினா எழுத்துக்கள்
- சுட்டெழுத்துக்கள்
- சொல் இலக்கணம்
- வகைகள்
- பெயர்ச்சொல்
- வினைச்சொல்
- இடைச்சொல்
- உரிச்சொல்

பாடநூல் ;

ஸ்ரீ சந்திரசேகரேந்திர சரஸ்வதி விஸ்வ மகா வித்யாலயா - பொதுத்தமிழ் - இரண்டாம் பருவம்

பார்வை நூல் ;

- தமிழக வரலாறும் பண்பாடும் - கே.கே.பிள்ளை, உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை,
- தமிழர் நாகரிகமும் பண்பாடும் - அ. தட்சிணாமூர்த்தி, யாழ் வெளியீடு, சென்னை,.
- தமிழக வரலாறும் பண்பாடும் - வே.தி. செல்லம், மணிவாசகர் பதிப்பகம், சென்னை,
- ஆதிச்சநல்லூர் முதல் கீழடி வரை நுவேதா லூயிஸ், கிழக்குப் பதிப்பகம்,
- தமிழும் பிற பண்பாடும் - தெ.பொ. மீனாட்சி சுந்தரனார், நியூ செஞ்சுரி புக் ஹவுஸ், சென்னை
- தமிழர் வரலாறும் பண்பாடும் நீலகண்ட சாஸ்திரி, ஸ்ரீசெண்பகா பதிப்பகம், சென்னை
- தமிழர் வரலாறும் தமிழர் பண்பாடும் மா.இராசமாணிக்கனார்
- தமிழர் நாகரிக வரலாறு க.த.திருநாவுக்கரசு, தொல்காப்பியர் நூலகம், சென்னை.
- Related Online Contents /Web Sources
- https://www.chennailibrary.com
- https://www.sirukathaigal.com
- https://www.tamilvirtualuniversity.org
- https://www.noolulagam.com
- https://www.katuraitamilblogspot.com

	LANGUAGE –II	L	T	P	C
	(HINDI - II)	2	1	0	3

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

UNIT –I INTRODUCTION TO HINDI GRAMMAR:

- **a)** Identification of different Tenses
- **b)** Differences of *Sakarmak* & *Akarmak* sentences
- **c)** Correction of Sentences pertaining to different tenses
- **d)** Past Tense with special context to *Ne Pratyay*
- **e)** Future Tense with examples

UNIT – II SPEAKING *Right* HINDI:

a) Conversations at different places and contexts
b) Topics related to different tenses and making sentences
c) Usage of Sentences according to the direction
d) Usage of complex sentences and different styles of expression

UNIT – III LANGUAGE WRITING IN HINDI:

a) Paragraph setting
b) Comprehensive paragraph
c) Paragraph writing
d) Simple translation of sentences

UNIT – IV HINDI LITERATURE – INTRODUCTION TO OLD POETRY:

a) Tulasi Das ke Dohe – Kanthasth evam Vyakhya bhag
b) Rahim ke Dohe- Kanthasth evam Vyakhya bhag
c) Tatparya and Kanthasthikaran
d) Summary and annotation part

UNIT – V HINDI LITERATURE-INTRODUCTION TO POETRY and PROSE:

a) Bharat ki Ekataa : Ramdhari Singh Dinkar
b) "Hum Honge Kamiyab" by Girija Kumar Mathur

TEXT BOOK:

1. **HINDI SOURABH,** (Prepared by Department of Hindi, SCSVMV)

REFERENCES:

1. "Come Let us Learn Hindi" : Dr. Alok Pandey, Published by Milind Prakashan, Hyderabad 2013
2. Pankhudiyan 1&2 : Dr. Madhu Dhawan, Lekhan Prakashan, New Delhi 2011
3. Sabari Hindi Bodhini – Shabari Prakashan, Selam, Tamil Nadu, 2012.

	LANGUAGE -II	L	T	P	C
	(SANSKRIT - II)	2	1	0	3

(For Students admitted from 2024 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Unit - I भागः - क

Poetry: सुभाषितमाला I - 1 to 6 Slokas

Prose: Lessons 1 to 3 (From Sanskrit Pravesika)

Unit - II भागः - ख

Poetry: सुभाषितमाला II - 1 to 8 Slokas

Prose: Lessons 4 to 6 (From Sanskrit Pravesika)

Unit - III भागः - ग

Grammar:

1. 1.अच्सन्धिः
2. 2.हल्सन्धिः

Unit - IV भागः - घ

Essays:

1.अस्माकं देशः
2.दीपावली महोत्सवः
3.संस्कृतप्रचारस्य आवश्यकता

Unit - V भागः - ङ

Slokas (Verses):

1. Sowndaryalahari (10 Slokas)

TEXT BOOKS:

1. **Subhashitamala**, Prepared by Dept. of Sanskrit and Indian Culture, SCSVMV University.
2. **Sowndaryalahari**

	FUNCTIONAL ENGLISH	L	T	P	C
		2	1	0	3

(For Students admitted from 2024 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Course Objectives:

1. To initiate and sustain dialogues using requests, permissions, and other social expressions.
2. To apply skimming and scanning techniques for various academic and non-academic texts.
3. To plan and deliver oral presentations with effective use of visual aids.
4. To use English in real-life social contexts such as inquiries and giving directions.
5. To integrate LSRW skills through interactive classroom activities.

Course Outcomes:

1. Engage in structured social conversations using suitable expressions.
2. Apply effective reading strategies to locate and understand key information.
3. Plan and present oral content with visual and verbal clarity.
4. Interact fluently in real-life communication scenarios like giving directions or making inquiries.
5. Participate confidently in integrative LSRW-based activities.

Unit I: (9 hours)

Conversation Skills (oral & written) (9 hours)

Placing a request, asking permissions, registering complaints, describing a process, agreeing & disagreeing.

Unit II: (9 hours)

Reading Skills

Types of reading: Intensive & Extensive,

Strategies of reading: skimming, scanning, SQ3R

Comprehending short/long technical texts

Unit III (9 hours)

Presentation Skills: identifying a topic, planning, preparing a presentation, understand the audience.

Type of Presentation: memorized, extempore, impromptu, manuscript

Mechanics of Presentation: Body language, Voice, Engaging Audience, using visual aids

Unit IV: (9 hours)

Effective Communication in Social Contexts: making enquiries, asking & giving directions, instructing & recommending

Unit V: (9 hours)

Language activities (to be included) role play, mock interview, JAM, Story Building

Reference:

1. Kumar, Sanjay. *Communication Skills*. Oxford University Press.

	CYBER CRIMES & MITIGATION TECHNIQUES	L	T	P	C
		3	1	0	4

(For Students admitted from 2026 onwards)

COURSE OBJECTIVES:

- To overview of crimes involving the use of computer technology and the internet
- To know how computer related crimes are committed and how they are investigated.
- To understand computer crime scene management and thelegal issues involved in the prosecution of computer crimes.

COURSE OUTCOMES:

On completion of the course, student will be able to:

- Identify different types of cyber crime
- Describe cybercrime and criminal groups that engage in cyber crime
- Identify and discuss the structures and characteristics of criminal groups that engage in cyber crime
- Explain and analyse the ways in which information and communication technology is used to commit cyber crime
- critically evaluate the measures used to counter cyber crime

SYLLABUS

UNIT -I Introduction to Cyber Security:

Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy. **12**

UNIT – II Fundamentals of Cyber Crime:

Cybercrime: Introduction, Motivation and Methods - The Scale of the Problem and Reasons for the Growth of Cybercrime - Profiling Cybercriminals - Challenges for Criminal Justice and Law Enforcement - The Future of Cybercrime.Emerging Threats: Expected Targets and Forms - Criminal Statues - 2.3 Other Offences Associated with Hacking. **12**

UNIT – III Injection of Malicious Code in Application:

Introduction - Types of Malicious Code - Threats Posed by Viruses, Worms, and Trojan Horses - Legislative Approaches. **12**

UNIT – IV Attempts and Impact of Phishing in Cyberworld:

The Problem of Phishing - Impact and Harm Generated by Phishing - Mechanisms of Cyberspace Phishing - Dragnet Method - Rod—and—Reel Method - Lobsterpot Method - Gillnet Phishing - Political Phishing. **12**

UNIT – V Anonymity, Privacy and Security Issues in Cyberworld:

Introduction - Anonymity in Cyberspace Impact and Harm Generated by Anonymity - Regulating Anonymity in Cyberspace -The Case Law. **12**

TEXT BOOK:

1. Studies in Computational Intelligence, Volume 593, Series editor Janusz Kacprzyk, Polish Academy of Sciences, Warsaw, Poland. Springer. – UNIT I & V (Cybercrime, Digital Forensics and Jurisdiction (SCI Vol. 593)
2. Computer Forensics: Investigating Network Intrusions and Cyber Crime – UNIT III
3. Cyber Criminology: Exploring Internet Crimes and Criminal Behavior 2011, by K. Jaishankar. –UNIT II & IV

REFERENCES:

1. The NICE Cyber Security Framework: Cyber Security Intelligence and Analytics 2019, by Izzat Alsmadi.
2. Cyber Security on Azure: An IT Professional's Guide to Microsoft Azure Security Center, 2017 Apress, by Marshall Copeland (auth.)

WEB REFERENCES

1. NIST Cybersecurity Framework – UNIT I
2. https://www.w3schools.com/cybersecurity/cybersecurity_syllabus.php - UNIT I
3. https://www.youtube.com/watch?v=LIOeHVzeLUA – UNIT III
4. https://jaipur.manipal.edu/fosta/img-fos/programs/Cyber-security/Syllabus_MSc-2026-27.pdf - UNIT III
5. https://www.ques10.com/p/49373/methods-of-phishing-1/ - UNIT IV
6. https://www.crime-research.org/articles/phishing-in-cyberspace-issues-and-solutions - UNIT IV
7. https://www.sciencedirect.com/science/article/abs/pii/S1361372305001454 - UNIT V

	ALLIED MATHEMATICS-II	L	T	P	C
		3	1	0	4

(For Students admitted from 2025 onwards)

SYLLABUS

Unit-I Partial Fractions

Introduction to Partial Fractions, Binomial Series, Exponential Series and logarithmic Series (without Proof) -Simple problems

Unit- II Solution of ODE

Differential equations of first order and higher degree: Equations solvable for *p,* Equations solvable for *y* and Equations solvable for *x* - Second order linear differential equations with constant coefficients: Linear Operator, Solution for non - homogeneous differential equations, Methods of obtaining the particular integral of e^{ax} , e^{-ax} , *sinax, cosax,* x^k and $e^{ax}.v$ where *v* is any function of *x.*

Unit-III Multiple Integrals and Beta & Gamma Functions

Double Integral: Definite Integral, Double Integral (Cartesian Co-ordinates only), simple problems - Triple Integral: Triple integral (Cartesian Co-ordinates only), simple problems - Beta and Gamma functions and their properties (without proof) – simple problems.

Unit-IV Interpolation and Numerical Integration

Finite differences - Interpolation (For Equal Intervals): Gregory-Newton's forward difference formula, Gregory-Newton's backward difference formula. Interpolation (For Unequal Intervals): Divided Differences, Newton's divided difference formula, Lagrange's interpolation formula - Numerical integration: Trapezoidal rule- Simpson's 1/3rd rule- Simpson's 3/8th rule

Unit-V Numerical solution of ODE

Numerical solution of ordinary differential equations: Taylor's Method - Euler's Method -Modified Euler's method - Runge Kutta Method.

Text Books:

1. P.R.Vittal, "Allied Mathematics", Third Edition, 2012 , Margham Publications chennai.
   Unit I- Chapter (1-4)
   Unit II - Chapter 22 – (Pg. No. 22.1- 22.10), Chapter 23
   Unit III - Chapter 20, 30
2. P.Kandasamy, Dr.K.Thilagavathy, Dr.K.Gunavathi, "Numerical Methods", S.Chand and Company Ltd., Third Revised Edition,2013, New Delhi.
   Unit IV: 5.1, 5.2, 6.1-6.3 8.1,8,2,8.5, 8.7, 9.7, 9.9, 9.13, 9.14
   Unit V: 11.5, 11.9, 11.11, 11.12, 11.13

Reference books:

1. M.D. Raisinghania, Ordinary and Partial Differential Equations, S.Chand and Co., (2001)
2. Numerical Methods, Problems and Solutions: M.K.Jain, S.r.K Iyengar, R.K.Jain (2007).
3. S.Narayanan and T.K.Manicavachagom Pillay,Calculus. S.Viswanathan Printers & Publishers Pvt. Ltd. Chennai (2004).
4. Singaravelu. A, Algebra and Trigonometry, Vol.-I & II Meenakshi Agency, Chennai. (2003)

	DATA STRUCTURES AND ALGORITHMS	L	T	P	C
		3	1	0	4

(For Students admitted from 2026 onwards)

Common for B.Sc. (CS) / B.Sc. (CS with Data Science) / B.Sc. (CS with Cyber Security)

OBJECTIVES

- To gain knowledge in designing algorithms to solve problems.
- To understand the concept of linear and nonlinear data structures.
- To know the concept of various sorting and searching techniques.
- To apprehend the tree traversal and searching
- To acquire knowledge in graph traversal and searching.

OUTCOMES

- Compute and Analyze algorithms for efficiency using asymptotic notations.
- Develop knowledge about basic data structures like arrays, linked list, trees.
- Solve problems by applying suitable data structure.
- Define graph and illustrate graph traversal.
- Design and develop projects requiring implementation of the data structure.

SYLLABUS

UNIT – I

Definition of a Data structure - primitive and composite Data Types- Asymptotic notations. Arrays - Operations on Arrays. **12**

UNIT – II

Sorting - Bubble sort - Insertion sort - Selection sort - Quick sort - Merge sort - Searching - Linear search - Binary search.. **12**

UNIT – III

Stacks – Operations on Stack-Applications of Stack - Infix to Postfix Conversion -recursion - Queues - Operations on Queues, Circular Queue. **12**

UNIT – IV

Introduction to single and double Linked lists - Representation – operations on single linked list - Linked stacks and queues. **12**

UNIT – V

Trees - Binary Trees - Memory representation - Traversal algorithms - Binary search trees - Graph - Definition, Types of Graphs, Graph Traversal – BFS and DFS. **12**

TOTAL: 60

TEXT BOOKS:

1. Seymour Lipsuschutz Theory and Problems of Data Structures, Tata Mc.Graw Hill First Edition, Reprint 2013 – UNIT I to IV
2. Jean-Paul Tremblay, Paul G. Sorenson, 'An Introduction to Data Structures with Application', TMH, 2017. – UNIT V

REFERENCE BOOKS:

1. E. Horowitz and S. Shani Fundamentals of Data Structures in C++, Galgotia Pub. 1999, E- book 2012. – UNIT II to IV
2. R. Kruse C.L. Tondo and B. Leung, Data Structures and Program design in C, PHI, 2nd Edition, 1997. – UNIT I, III, IV

WEB RESOURCES:

1. https://www.geeksforgeeks.org/data-structures/ - UNITS I to IV
2. https://visualgo.net/en simulator for UNIT IV, V

	DATA STRUCTURES & ALGORITHMS LAB	L	T	P	C
		0	0	4	4

(For Students admitted from 2026 onwards)

COURSE OBJECTIVES

- To be able to get trained in programming skills using C++.
- To help the students to write the programs for Array operations.
- To learn and write the programs for Stack and Queue operations.
- To learn and write the programs for Sorting Techniques.
- To impart the knowledge to write the program for Binary Search

COURSE OUTCOMES

- Ability to implement application programs using C++ Language
- Able to implement Array operations.
- Understand and implement Stack and Queue operations.
- Knowledge on implementing the Sorting Techniques.
- Knowledge on implementing Binary Search

LIST OF EXERCISES

1. Program for Implementation of Stack using Array
2. Program for Implementation of Queue using Array
3. Program to Implement Circular Queue.
4. Program to Implement Linked list.
5. Program to Implement Doubly Linked list.
6. Program To Arrange the list of numbers in ascending order using Bubble Sort
7. Program to arrange the list of numbers in ascending order using Insertion Sort.
8. Program to Implement Quick sort.
9. Program to Implement Linear search.
10. Program to implement Binary Search

	YOGA	L	T	P	C
		0	1	0	1

(For Students admitted from 2026 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

COURSE OBJECTIVES

- To impart the students with basic concepts of Yoga for health and wellness.
- To familiarize the students with health-related Exercise and Yoga for Overall growth and development
- To create a foundation for the professionals in Physical Education and Yoga.
- To impart the basic knowledge and skills to teach Yoga activities.

COURSE OUTCOMES

- Students will be able to understand the basic principles and practices of Yoga.
- Students will be able to instruct Yoga practices for Healthy Living.
- To develop professionalism among students to conduct, organize Yoga events at schools and community level.

SYLLABUS

Introduction to Yoga

1. Basic Principles of Yogic practices
2. Word meaning and definitions of Yoga
3. Different schools of Yoga
4. Mithahara, Pathya Apatyha in Yogabhyasa.
5. Ashtanga Yoga
6. Shitalikarna Vyayama/Physical Cultural Exercises
7. Introduction to Pranayama
8. Yoga to enhance memory and concentration.

Practical demonstration of Yoga

1. Shitalikarna Vyayama/Physical Cultural Exercises
2. Suryanamaskara
3. Standing Asanas- Ardhachakrasana, Padahasthasana, Ardhakatichakrasana, Trikonasana.
4. Sitting Asanas – Paschimottasana, Bhadrasana, Vakrasana, Vajrasana.
5. Prone posture Asanas – Makarasana, Bhujangasana, Shalabhasana, Dhanurasana.
6. Supine posture Asanas – Ardha pavana Mukthasana, Purna Pavana Mukthasana, Sethubhandasana, Uttanapadasana.
7. Pranayama- Nadishodhana Pranayama, Bhastrika Pranayama, Bramari Pranayama.
8. Dhyana – Shavasana.

Total: 20

TEXT BOOKS:

1. Dr Nagendra H. R. & Dr Nagarathna R., Samagra Yoga Chikitse. Swami Vivekananda Yoga Prakasana, Bengaluru, 2002.
2. Dr Nagendra H. R. & Dr Nagarathna R. Integrated approach of Yoga Therapy for Positive Health, Swami Vivekananda Yoga Prakasana, Bengaluru, 2006.

REFERENCES:

1. Kumar, Ajith, Yoga Pravesha. Bengaluru: Rashtrothanna Prakashana., 1984.
2. D.M Jyoti, Yoga and Physical Activities, lulu.com3101, Hills borough, NC27609, United State, 2015.

	FUNDAMENTALS OF HUMAN RIGHTS	L	T	P	C
		0	2	0	2

(For Students admitted from 2026 onwards)

COURSE OBJECTIVES:

- To sensitize the students to various aspects of Human Rights.
- To learn the concepts of Moral and Legal Rights.
- To learn the concepts of Civil and Political Rights.
- To learn the concepts of Theories of Human Rights.
- To learn the concepts of UN Laws.

COURSE OUTCOMES:

- Acquire the basic knowledge of human rights.
- Able to implement Moral and Legal Rights in Human life.
- Understand and implements Civil and Political Rights in Human life.
- Acquire the knowledge on Theories of Human Rights in Human life.
- Understand the concepts of UN Laws in Human life.

SYLLABUS

UNIT I

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

12

UNIT II

Evolution of the concept of Human Rights Magana carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

12

UNIT III

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

12

UNIT IV

Human Rights in India – Constitutional Provisions / Guarantees.

12

UNIT V

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabilityd persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.

12

TOTAL: 60

TEXT BOOK:

1. Kapoor S.K., “Human Rights under International law and Indian Laws”, Central Law Agency, Allahabad, 2014.

REFERENCES:

1. Chandra U., “Human Rights”, Allahabad Law Agency, Allahabad, 2014.
2. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi

	LANGUAGE –III (TAMIL –III)	L 2	T 1	P 0	C 3

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

PREAMBLE:

Encouraging personality development and confidence in language skills

முன்னுரை

ஆளுமை மேம்பாடு மற்றும் மொழித்திறன் மற்றும் தன்னம்பிக்கையைத் தூண்டுதல்

மூன்றாம்; பருவம் **-**

Objective-1	**காப்பியங்கள்** (அறிமுகம்) காப்பிய இலக்கியங்கள் கூறும் செய்திகளை அறிந்து கொள்ளுதல்
Objective-2	**சிற்றிலக்கியம்** **சிற்றிலக்கியங்களின் வழி இலக்கியச் சுவைகளையும், பண்பாட்டு அறிவினையும் பெறுவர்**
Objective-3	**தமிழரின் அறிவியல் சிந்தனை** தமிழ் புலவர்கள் இயற்றிய இலக்கியங்களின் வழி கணித அறிவியல் சார்ந்த செய்திகளைக் கற்றுக் கொடுத்தல்
Objective-4	**மனித உரிமைகள்** தனி மனிதன் உரிமைகள் பற்றிய மாணவர்களை அறியச் செய்தல் .
Objective-5	**மொழிப் பயிற்சி** மொழியினைப் பிழையின்றி கற்றுக் கொள்ளுதல். தமிழ் இலக்கியம் சார்ந்த போட்டித் தேர்வுகளுக்கு ஏற்ப கற்பித்தல் நடைமுறைகளை மேற்கொள்ளுதல்

பொதுத்தமிழ் 3

இரண்டாமாண்டு – மூன்றாம் பருவம்

அலகு – 1 காப்பியங்கள் (அறிமுகம்)

- ஐம்பெரும்காப்பியம்,
- ஐஞ்சிறு காப்பியம்
- கம்பராமாயணம்
- பெரியபுராணம்
- இயேசு காவியம்
- சீறாப்புராணம்

அலகு -2 சிற்றிலக்கியம்

- தமிழ்விடுதூது (1-10 கண்ணிகள்)
- அபிராமி அந்தாதி - கலையாத கல்வியும் குறையாத வயதும் (பதினாறு செல்வங்கள்)
- நந்திக் கலம்பகம் (நந்திநின் நெடுங்கண்)
- பிள்ளைத்தமிழ்(அறிமுகம்)
- உலா (அறிமுகம்)

அலகு – 3 தமிழரின் அறிவியல் சிந்தனை

- நிலவியல்
- வானவியல்
- உளவியல்
- இணையத் தமிழ் பயன்பாடு – அறிமுகம்
- இணையத்தமிழ்க் கல்விக்கழகம்
- இணைய நூலகம்

இலக்கியமும் கணித அறிவியல் சிந்தனை

- போதையனார் கர்ணம் கண்டறிதல்
- குறுக்கையூர் காரி நாயனார் கணக்கதிகாரம் : வெற்றிலை கணக்கு - பலா கணக்கு

அலகு – 4 மனித உரிமைகள்

- மனித உரிமை பற்றிய புரிதல்.
- வாழ்வுரிமை
- சம உரிமை
- கல்வி உரிமை
- சமூக உரிமை
- பெண்கள் உரிமை
- குழந்தைகளுக்கான உரிமைச் சட்டங்கள்
- மனித உரிமை கோட்பாடுகள்

அலகு -5: மொழிபயிற்சி

- நிறுத்த குறிகள் -கலைச்சொற்கள் - இலக்கண குறிப்பு- நேர்காணல்
- மொழிப்பெயர்ப்பு
- பிறமொழிச் சொற்களை நீக்கி எழுதுதல்
- பின்வரும் பாடலைப் படித்து பொருள் உணர்ந்து கீழ்வரும் வினாக்களுக்கு விடை எழுதுக

பாடநூல் :

ஸ்ரீ சந்திரசேகரேந்திர சரஸ்வதி விஸ்வ மகா வித்யாலயா - பொதுத்தமிழ் - மூன்றாம் பருவம்

பார்வை நூல்

- மு.வரதராசன், தமிழ் இலக்கிய வரலாறு, சாகித்ய அகாடமி, புதுடெல்லி.
- தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.
- தமிழ் இலக்கிய வரலாறு -முனைவர்.சிற்பி பாலசுப்ரமணியம், முனைவர்.சொ.சேதுபதி
- முனைவர் ஜெ. தியாகராஜன் மனித உரிமைகள் நிர்மலா பதிப்பகம் மதுரை.
- கணக்கு அதிகாரம் கொறுக்கையூர் காரி நாயனார் திருநெல்வேலி தென்னிந்திய சைவ சித்தாந்த நூல் பதிப்பு கழகம் திருநெல்வேலி.
- தமிழ் இலக்கணம் - இரா. நெடுஞ்செழியன்
- தமிழ் சொல்வளமும் நடைமுறையும் – செ. இராசாரவணபெருமாள்

- Related Online Contents /Web Sources
- https://www.chennailibrary.com
- https://www.sirukathaigal.com
- https://www.tamilvirtualuniversity.org
- https://www.noolulagam.com
- https://www.katuraitamilblogspot.com

	LANGUAGE –III (HINDI –III)	L 2	T 1	P 0	C 3

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

UNIT –I INTRODUCTION TO VOCABULARY:

a) Sabd Rachana and Sabd Vichar
b) Prefix and Suffix practices
c) Correction of Sentences pertaining to NE pratyay
d) *Chahiye* and *Apna* Usage

UNIT – II HINDI LITERATURE – OLD POETRY:

a) Kabir ke Dohe
b) Vrind Ke Dohe
c) Kanthasthikaran aur Vyakhya bhag

UNIT – III HINDI LITERATURE – MODERN POETRY:

a) "Jhanda ooncha rahe Hamara" by Shyam lal Parshad
b) Selected 2 poems from Famous Hindi poets (Nirala and Dinkar)

UNIT – IV HINDI LITERATURE- PROSE:

a) Mundan : Harishankar parsaayee
b) Teen kahaaniyaan (Bhoot, Galib and others)

UNIT – V HINDI Grammar:

a) Translation of Sentences
b) Different Usage of tense
c) Tense Changing
d) Sentence changing as per given direction (Ling and Vachan)

TEXT BOOKS:

1. **HINDI SOURABH** (Prepared by Department of Hindi, SCSVMV)

REFERENCES:

1. Dinkar ka Kavya : Jagmohan sharma, Rashtriya Hindi Sahitya Parishad, New Delhi 2016
2. Hindi Kavya me Rashtriya Ekatha : Krishna Bhavuk, Hindi Sahitya Parishad, New Delhi 2016
3. Rashtriyatha aur Hindi Cinema : Kumar Bhaskar, Hindi Sahitya parishad, New Delhi

	LANGUAGE –III (SANSKRIT–III)	L	T	P	C
		2	1	0	3

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Unit - I भागः - क

Eloquence of Mahabharata 1-15 Verses

Unit - II भागः - ख

Eloquence of Mahabharata 16-30 Verses

Unit - III भागः - ग

Hitopadesa - Prologue

Stories - 1. Old Tiger and Traveller
2. Cat and Vulture

Unit - IV भागः - घ

Hitopadesa - Stories - 1. Pair of Crows
2. Pair of Tittibhas
3. Rabbits and Elephant

Unit - V भागः - ङ

Hitopadesa - Stories - 1. Jackal
2. Crane and Crab
3. Camel

Text Books:

1. **Eloquence of Mahabharata**, Prepared by Dept. of Sanskrit and Indian Culture, SCSVMV University.
2. **Hitopadesa** - Complied by Dept. of Sanskrit and Indian Culture, SCSVMV University.

	TECHNICAL ENGLISH	L	T	P	C
		2	1	0	3

(For Students admitted from 2024 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Course Objectives:

1. To understand and produce media content appropriate for print, electronic, and digital platforms.
2. To apply persuasive language techniques in marketing and promotional communication.
3. To draft professional emails and formal letters for workplace correspondence.
4. To prepare for job interviews with awareness of formats, expectations, and delivery.
5. To write structured and logically organized reports using academic conventions.

Course Outcomes:

1. Analyze and create content appropriate for media platforms.
2. Use persuasive and descriptive language in marketing and business contexts.
3. Compose formal emails and letters for professional communication.
4. Prepare and respond to interviews through structured techniques.
5. Develop logically organized and formatted technical reports.

Unit I: (9 hours)

English for Media

Print: Writing a movie review, letter to the editor, writing news stories & features

Digital Media: blogging, tweeting, writing for webpages

Unit II: (9 hours)

English for Marketing

Branding & Promoting products: creating ads, posters, taglines, responding to customer complaints (oral & written), persuading customers

Unit III: (9 hours)

Email Writing

Parts of emails, email templates, jargons, email etiquettes, netiquettes, drafting formal/informal email (letters, enquiries, and complaints)

Unit IV: (9 hours)

Job Interview

Types of interviews, answering FAQs, how to prepare for an interview, SWOC, writing covering letter & resume

Unit V: (9 hours)

Report Writing

Types of Reports (event, accident/incident, analytical, feasibility, complaint), formats of reporting, structuring & revising

Reference:

- Ceramella, Nick & Elizabeth Lee. *Cambridge English for the Media*. Cambridge UP, 2008.
- Sharma, R.C. & Krishna Mohan. *Business Correspondence and Report Writing*. Tata McGraw-Hill, 2002.

	ETHICAL HACKING	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES

- To know the theory and practices of finding the vulnerabilities.
- To find the different attacks and then defining the appropriate security policy.
- To take action to detect or prevent the attacks and thus reduce the damages.
- To understand the concept of Web Server Hacking.
- To understand the concept of Firewalls.

COURSE OUTCOMES

- To describe the basics of the ethical hacking.
- Ability to learn technical foundations of hacking.
- Able to perform the footprinting and scanning.
- Demonstrate the techniques for system hacking.
- Characterize the malware and their attacks.

SYLLABUS

UNIT–I INTRODUCTION TO ETHICAL HACKING

Security Fundamental - Security Testing - Hacker and Cracker – Descriptions - Test Plans - keeping it legal - Ethical and Legality - Process - The Ethical Hacker's Process. **12**

UNIT–II FOOTPRINTING AND SCANNING

Information Gathering - Determining the Network Range - Finding Open Ports and Access Points - OS Fingerprinting Services - Mapping the Network Attack Surface. **12**

UNIT–III MALWARE THREATS AND SESSION HIJACKING

Viruses and Worms - Trojans - Covert Communication - Keystroke Logging and Spyware – Malware Counter Measures - Sniffers - Session Hijacking - Denial of Service. **12**

UNIT–IV WEB SERVER HACKING AND ATTACK

Web Server Hacking - Web Application Hacking - Database Hacking - Wireless Technologies – Mobile Security and Attacks: Wireless Technologies – Wireless LANs. **12**

UNIT–V CASE STUDY

Intrusion Detection Systems - Firewalls - Honeypots - Physical Security - Social Engineering – Case Studies: Intrusion detection Real Secure Tripwire Dragon Snort. **12**

TEXTBOOKS:

1. Michael Gregg, "Certified Ethical Hacker", Pearson IT Certification, 3rdEdition, 2019. – UNIT I to IV
2. Roger Grimes,"Hacking the Hacker",Wiley, 1st Edition, 2017 – UNIT I & V

REFERENCES:

1. Ankit Fadia, "The Unofficial Guide to Ethical Hacking", Laxmi Publications, 2nd Edition, 2006. – UNIT II, III
2. Randy Weaver, Dawn Weaver, Dean Farwood, "Guide to Network Defense and Counter measures", Cengage Learning, Third edition, 2012. – UNIT III, V

WEB RESOURCES:

Unit I: Introduction to Ethical Hacking & Legality

- NPTEL: Ethical Hacking Course: An outstanding, university-grade video lecture archive from IIT Kharagpur covering legal boundaries, test plans, and the fundamental process differences between hackers and crackers.
- EC-Council CEH Official Resources: The best platform to read up-to-date documentation on compliance, scope of work, and maintaining strict legality before performing penetration tests.

Unit II: Footprinting and Scanning

- TryHackMe: Nmap Network Scanning Module: An exceptional browser-based interactive room where you can safely map live targets, scan for open ports, determine network ranges, and practice OS fingerprinting.
- Nmap Project Official Documentation: The absolute gold standard reference guide for learning active network scanning syntax and mapping out an organization's structural attack surface.

Unit III: Malware Threats and Session Hijacking

- TryHackMe: Introduction to Malware & Sniffers: Provides guided labs explaining the operational anatomy of Trojans, worms, and spyware, alongside practical Wireshark sniffing exercises.
- Malware Bazaar Database: A collaborative online repository great for checking malware signatures, analyzing covert communications, and reviewing industry-standard countermea

Unit IV: Web Server Hacking and Attack

- PortSwigger: Free Web Security Academy: The world's leading free platform for practicing web server, database (SQL injection), and web application security testing inside safe laboratory environments.
- **OWASP Foundation Top 10 Web Risks**: The definitive industry framework detailing critical vulnerabilities like broken access control, cross-site scripting, and database misconfigurations.

Unit V: Case Study (IDS, Firewalls, & Honeypots)

- Snort Official Intrusion Detection System Portal: Perfect for studying real-world rule-based traffic analysis, alert creation, and packet matching configurations.
- Tripwire Open Source Integrity Documentation: Excellent for understanding host-based file integrity monitoring (FIM) to track unauthorized server modifications during a system intrusion.
- HackerTarget: Practical Snort Deployment Guide: Offers concrete command line cheat-sheets and configuration walkthroughs matching your exact tool case studies.

	OPERATING SYSTEM AND SYSTEM ADMINISTRATION	L	T	P	C
		3	1	0	4

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS)/BCA/ B.Sc. (CS with Cyber Security)

COURSE OBJECTIVES:

- To impart knowledge on different types of Operating System
- To learn and implement the concept of Process Management
- To observe the concept of storage management
- To understand the concept of I/O and file systems
- To learn the basics of Linux Programming

COURSE OUTCOMES:

- Understand the fundamental components of a computer operating system.
- Apply the concepts of CPU scheduling, synchronization and deadlocks in real computing problems.
- Demonstrate the different memory and I/O management techniques used in Operating Systems.
- Design and construct the Memory management systems in the modern operating system.
- Have practical exposure to the concepts of Windows, Linux and shell Programming

SYLLABUS

UNIT – I INTRODUCTION

Introduction - Operating system structures - System components - OS services - System calls - System structure -Resources Processes - Threads - Device management. **12**

UNIT – II PROCESS MANAGEMENT

Processes - Process concepts - Process scheduling - Operations on processes - Cooperating processes - CPU scheduling -Basic concepts -Scheduling criteria - Scheduling algorithms. **12**

UNIT – III SYNCHRONIZATION AND DEADLOCKS

The critical section problem - Semaphores - Classic problems of synchronization - Critical regions - Monitors-Dead locks -Deadlock characterization -Prevention - Avoidance - Detection - Recovery.**12**

UNIT – IV MEMORY MANAGEMENT

Storage Management Strategies - Contiguous Vs. Non-Contiguous Storage Allocation - Fixed and Variable Partition Multiprogramming - Paging -Segmentation - Paging/Segmentation Systems - Page Replacement Strategies. 12

UNIT – V WINDOWS, LINUX ADMINISTRATION

LINUX Security – LINUX Protection System – LINUX Authorization – LINUX Security Analysis – LINUX Vulnerabilities – Windows Security – Windows Protection System – Windows Authorization – Windows Vulnerabilities. **12**

TOTAL: 60

TEXT BOOKS:

1. Abraham Silberschatz, Peter Galvin and Gagne, "Operating System Concepts", Addison Wesley, 10th Edition, 2018. – UNIT I to IV
2. Harvey M. Deitel," Operating System", Addison Wesley, 3rd Edition, 2004. – UNIT I, II, IV

REFERENCES:

1. Gary Nutt," Operating System, A modern perspective", Addison Wesley, 3rd Edition, 2004.
2. Richard Peterson, "Linux: The Complete Reference", Tata McGraw Hills, 6th Edition, 2008.

WEB REFERENCE:

1. https://www.geeksforgeeks.org/operating-systems/ - UNIT I to IV
2. https://nptel.ac.in/courses/106106144 - UNIV I to IV
3. https://www.tldp.org/HOWTO/Security-HOWTO.html UNIT V

	OBJECT ORIENTED PROGRAMMING IN JAVA	L	T	P	C
		3	1	0	4

(For Students admitted from 2026 onwards)

COURSE OBJECTIVES:

- Understand the fundamentals of Java programming and the principles of object-oriented programming.
- Develop Java applications using classes, objects, inheritance, polymorphism, interfaces, packages, and wrapper classes.
- Apply exception handling, collections, file handling, and multithreading concepts to develop robust Java applications.
- Design graphical user interface (GUI) applications using Java Swing components and layout managers.
- Implement event-driven programming techniques to develop interactive desktop applications using Java Swing.

COURSE OUTCOMES:

At the end of the course, students will be able to:

- Explain Java programming fundamentals, Java architecture, and object-oriented programming concepts.
- Design and develop Java applications using classes, objects, constructors, inheritance, polymorphism, abstraction, interfaces, and packages.
- Apply exception handling, collection framework, file handling, and multithreading techniques to build efficient and reliable Java applications.
- Design and develop graphical user interfaces using Java Swing components, containers, and layout managers.
- Develop event-driven desktop applications by implementing Swing event handling mechanisms and applying object-oriented programming principles.

SYLLABUS

UNIT I – Introduction to Java Programming

Features of Java -Java Architecture (JDK, JRE, JVM) - Compilation and Execution Process - Structure of a Java Program - Keywords and Identifiers -Data Types -Variables and Constants - Operators -Input and Output - Control Statements - Arrays - Command Line Arguments -Strings and StringBuffer. **12**

UNIT II – Object-Oriented Programming in Java

Introduction to OOP - Classes and Objects -Constructors -this Keyword -Static Variables and Methods -Encapsulation - Data Hiding - Access Modifiers - Inheritance -super Keyword - Method Overloading -Method Overriding - Abstract Classes -Interfaces -Packages -Wrapper Classes. **12**

UNIT III – Exception Handling, Collection Framework

Exception Handling - try, catch, finally, throw and throws - User-defined Exceptions - Collection Hierarchy - ArrayList - Vector - HashSet - HashMap - Iterator - File Handling-File Class -Byte Streams -Character Streams -Buffered Streams –Serialization. **12**

UNIT IV – Multithreading and Swing Components

Multithreading -Thread and Runnable -Thread Life Cycle –Synchronization - Swing Components-AWT Vs Swing - JFrame -JPanel -JLabel -JButton -JTextField -JTextArea -JCheckBox -JRadioButton -JComboBox -JList -JTable -JScrollPane -JOptionPane -JMenuBar -JMenu -JMenuItem -Layout Managers-FlowLayout -BorderLayout -GridLayout –BoxLayout. **12**

UNIT V – Event Handling in Swing

Event Delegation Model -Event Classes -Event Sources -Event Listeners -ActionListener -ItemListener -MouseListener -MouseMotionListener -KeyListener -WindowListener -Adapter Classes -Anonymous Inner Classes - Lambda Expressions for Event Handling. **12**

Recommended Text Books

1. Herbert Schildt, Java: The Complete Reference, 13th Edition, McGraw-Hill Education, 2025.
2. Cay S. Horstmann, Core Java, Volume I: Fundamentals, 14th Edition, Pearson, 2025.

Reference Books

1. Kathy Sierra, Bert Bates, and Trisha Gee, Head First Java, 3rd Edition, O'Reilly Media, 2022.
2. Paul Deitel and Harvey Deitel, Java: How to Program, 12th Edition, Pearson, 2020. UNIT IV, V

WEB REFERENCES:

1. https://docs.oracle.com/javase/tutorial/
2. https://www.geeksforgeeks.org/java/ UNIT I, II, III

	OPERATING SYSTEM AND SYSTEM ADMINISTRATION LAB	L	T	P	C
		0	0	3	2

(For Students admitted from 2026 onwards)

COURSE OBJECTIVES:

- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Linux commands, system call interface for process management, inter-process communication and I/O in UNIX.
- Student will learn various process and CPU scheduling Algorithms through simulation programs
- Student will have exposure to System calls and simulate them.
- Student will learn deadlocks and process management & Inter Process communication and simulate

COURSE OUTCOMES:

- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Linux commands, system call interface for process management, inter process communication and I/O in UNIX.
- Student will learn various process and CPU scheduling Algorithms through simulation programs
- Student will have exposure to System calls and simulate them.
- Student will learn deadlocks and process management & Inter Process communication and simulate them.

LIST OF EXERCISES

(Linux with C)

1. Linux & DOS Basic Commands
2. Shell Script for File/Directory Checking Using Command-Line Arguments
3. Linux File and Directory Operations Using C System Calls
4. Process Creation and Management
5. Signal Handling in Linux
6. Inter-Process Communication using Pipes and FIFO
7. Inter-Process Communication using Shared Memory
8. CPU Scheduling Algorithms
9. Memory Management – Page Replacement Algorithms
10. Linux File Permissions and File Information

	OBJECT ORIENTED PROGRAMMING IN JAVA LAB	L	T	P	C
		0	0	3	2

(For Students admitted from 2026 onwards)

COURSE OBJECTIVES:

- Todevelop OOP programsusingcorejava.
- Todevelop programs using exception handling.
- To implement the Thread concepts.
- To develop a web application form using Swing Components.
- To understand Exception Handling operations.

COURSE OUTCOMES:

- Implement the basic java programming concept and OOPs concept like Encapsulation, Polymorphism and inheritance.
- Applying an interface, exception and user define packages.
- Implement the String and Stringbuffer classes.
- Develop a web application using Swing Components and Events.
- To perform Exception Handling operations.

LISTOFEXERCISES

1. Java Program Fundamentals: Write programs using variables, data types, operators, input/output statements, and control structures.

2. Arrays and Strings: Develop programs using one-dimensional and two-dimensional arrays, String, and StringBuffer classes.

3. Classes and Objects: Create Java classes, objects, methods, constructors.

4. Inheritance and Polymorphism: Implement single, multilevel, and hierarchical inheritance, method overloading, and method overriding.

5. Interfaces and packages: Develop programs using interfaces, packages.

6. Exception Handling: Write programs using try, catch, finally, throw, throws, and user-defined exceptions.

7. Multithreading: Create multithreaded applications using Thread class, Runnable interface,

8: Introduction to Swing: Create basic GUI applications using JFrame, JPanel, JLabel, JButton, JTextField, and JTextArea.

9. Swing Controls: Develop applications using JCheckBox, JRadioButton, JComboBox, JList, JTable, JScrollPane, and JOptionPane.

10. Event Handling: Implement event-driven applications using ActionListener, ItemListener, MouseListener, MouseMotionListener, KeyListener, and WindowListener.

BCY233V07	SOFT SKILLS – I	L	T	P	C
		0	1	0	1

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA/B.Sc. (Data Science)/B.Sc. (Cyber security)

COURSE OBJECTIVES

- To understand the basic English Grammar usage and Vocabulary.
- To sensitize students the significance of nonverbal communication and academic writing.
- To improve students ability to speak fluently and interactively.
- To learn basic concepts of number system
- To understand basic idea about general aptitude

COURSE OUTCOMES

- Use basic grammar in both short conversation and writing.
- Convey information and thoughts in a good manner
- Communicate fluently.
- Able to solve number problems
- Able to understand and solve different quantitative problems

SYLLABUS

UNIT – I GRAMMAR-I:

Parts of Speech-Tenses-Modal Verbs-Vocabulary – One word substitution, Homophones and Homonyms, phrasal verbs

UNIT – II WRITING AND COMMUNICATION:

Forms of Non-Verbal Communication – Kinesics, Proxemics, chronemics and effective use of Body language -Effective use of Audio-visual aides and modes of presentation-Note-making, Precise writing, structure of paragraph, Review a book/journal

UNIT – III SPEAKING:

Introducing Oneself -Greetings and Introduction-Short Group Conversations-Extempore speech – Practice

UNIT – IV APTITUDE SKILLS – I:

Numbers – H.C.F & L.C.M – Decimal Fractions – Simplifications – Square root & Cube roots

UNIT – V APTITUDE SKILLS – II:

Problems on Ages – Percentage – Surds & Indices – Profit & Loss – Ratio & Proportion

TEXT BOOKS:

1. Greenbaum, Sidney, "The Oxford English Grammar", Clarendon Press, 1996.
2. Hartley and Bruckmann, "Business Communication", Routledge, 2006.
3. R S Aggarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand Publications,2017

REFERENCES:

1. R S Aggarwal,"A Modern Approach to Non-Verbal Reasoning", S.Chand Publications,2017.

	LANGUAGE -IV (TAMIL -IV)	L	T	P	C
		2	1	0	3

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

PREAMBLE:

Encouraging personality development and confidence in language skills

முன்னுரை

ஆளுமை மேம்பாடு மற்றும் மொழித்திறன் மற்றும் தன்னம்பிக்கையைத் தூண்டுதல்

நான்காம் பருவம்:; -

Objective-1	பகுத்தறிவு இலக்கியம் பகுத்தறிவு இலக்கியங்களைக் கற்பதன வழி நல்லிணக்கத்தையும் தெரிந்து பின்பற்றுவர்
Objective-2	நாட்டுபுற இலக்கியம் மக்களுடைய வாழ்க்கை முறை, கலாச்சாரம், நம்பிக்கைகள் போன்றவற்றை பிரதிபலிக்கிறது. அது சமூக மற்றும் கலாச்சார ரீதியிலான தகவல்களையும், பழக்க வழக்கங்களையும் கற்றுத் தரப்படுகிறது.
Objective-3	கலைகள் மற்றும் விளையாட்டுகள் கைவினைப் பொருட்கள் குறித்த தொழில்நுட்பத்தைக் கற்றுக்கொடுத்தல் மாணவர்களுக்கு மன அழுத்தம் நீங்கவும் உற்சாகத்தை பெரும் நோக்குடன் கலைகள் மற்றும் விளையாட்டுகள் கற்றுத் தரப்படுகிறது
Objective-4	அரங்க வரலாறு அரங்க அமைப்பு மற்றும் நாடக உத்தியைக் கற்றுக் கொள்ளுதல்
Objective-5	கடிதம் மற்றும் கட்டுரை எழுதுதல் கடிதம் கற்றலின் விளைவாக மாணவர்கள் சுய விண்ணப்ப படிவங்களையும் வேலை தொடர்பான கடிதங்களை எழுதும் திறன் படைத்தவராகத் திகழ்வார்கள்.

பொதுத்தமிழ் 4

இரண்டாமாண்டு – நான்காம் பருவம்

அலகு 1. பகுத்தறிவு இலக்கியம்

சித்தர் இலக்கியம்

- திருமூலர்-திருமந்திரம் (270,271)
- பட்டினத்தார் – திருவிடை மருதூர் (279,280)
- கடுவெளி சித்தர் – பாபஞ்செய் யாதிரு மனமே(பாடல் – 4,9)

அர்த்தமுள்ள இந்து மதம்

- நல்ல நண்பன்
- உறவு

அலகு -2 நாட்டுபுற இலக்கியம்

- நாட்டுப்புறப் பாடல்கள் – தாலாட்டு, ஒப்பாரி
- நாட்டுப்புறகதைப் பாடல்கள்
- நாட்டுப்புறக் கதைகள்
- பழமொழி (பழமொழிகளை வாக்கியத்தில் அமைத்தல்)
- விடுகதை
- நம்பிக்கை

- பழக்க வழக்கங்கள்
-

அலகு – 3 கலைகள் மற்றும் விளையாட்டுகள்

- மண்பாண்டம் செய்தல்
- மூங்கில் குடைகள் வரைதல்
- பட்டு நெசவு செய்து
- கூடை பின்னுதல்
- தெருக்கூத்து
  - கரகாட்டம்
  - வில்லுப்பாட்டு
  - ஒயிலாட்டம்
  - தோல்பாவை கூத்து
  - சிலம்பாட்டம்
  - புலியாட்டம்

அலகு -4 : நாடக அரங்கம்

- அரங்கம் வரையறை விளக்கம்
- உடல் மொழித் தமிழ்ச் சூழல்
- தமிழரங்கம் அன்றும் இன்றும்
- நவீன நாடகம் செய்முறை பயிற்சி
- பாரி படுகளம் - பிரளயன்

அலகு -5: கடிதம் மற்றும் கட்டுரை எழுதுதல்

- முறைக் கடிதப் பயிற்சி
- அலுவலகக் கடிதப் பயிற்சி
- விண்ணப்பப் படிவம் எழுதும் பயிற்சி
- தன் விவரப் படிவம் எழுதும் பயிற்சி
- கருத்து விளக்கக் கட்டுரைகள் எழுதும் பயிற்சி
- பதிரிக்கைகளுக்குக் கட்டுரை எழுதும் பயிற்சி

2.சிறிய பத்தி ஒன்றை ஆங்கிலத்தில் கொடுத்து அதனைத் தமிழில் மொழிபெயர்க்க செய்தல்.

3. சுருக்கக் குறியீடுகளை அறிந்து கொள்ள செய்தல்

பாடநூல் :

ஸ்ரீ சந்திரசேகரேந்திர சரஸ்வதி விஸ்வ மகா வித்யாலயா - பொதுத்தமிழ் - நான்காம் பருவம்

பார்வை நூல்

- மு.வரதராசன், தமிழ் இலக்கிய வரலாறு, சாகித்ய அகாடமி, புதுடெல்லி.
- தமிழண்ணல், புதிய நோக்கில் தமிழ் இலக்கிய வரலாறு, மீனாட்சி புத்தக நிலையம், மதுரை.
- தமிழ் இலக்கிய வரலாறு -முனைவர்.சிற்பி பாலசுப்ரமணியம், முனைவர்.சொ.சேதுபதி
- நாட்டுப்புறவியல் ஆய்வுவானமாமலை
- சு சக்திவேல் மணிவாசகர் பதிப்பகம் பாரிமுனை சென்னை 108
- தமிழர் நாட்டுப் பாடல்கள் நியூ செஞ்சுரி புத்தக நிறுவனம்.
- தமிழரின் நாடக வரலாறு – பேராசிரியர் முனைவர் அ. சிவத்தம்பி
- நாடகக் கலையும் அரங்க மரபும் – புலவர் கே. வீரமணி
- நவீன நாடகம் பாரி படுகளம் – பிரளயன்
- காஞ்சிபுரம் ஒரு தரிசன வழிகாட்டி தங்கத்தாமரை பதிப்பகம் அடையாறு சென்னை 20

- Related Online Contents /Web Sources
- https://www.chennailibrary.com
- https://www.sirukathaigal.com
- https://www.tamilvirtualuniversity.org
- https://www.noolulagam.com
- https://www.katuraitamilblogspot.com

	LANGUAGE –IV (HINDI –IV)	L	T	P	C
		2	1	0	3

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

UNIT –I INTRODUCTION TO FUNCTIONAL HINDI:

a) Raj Bhasha Rashtra Bhasha and Sampark Bhasha
b) Functional Hindi- Introduction

UNIT – II INTRODUCTION TO OFFICIAL LANGUAGE TERMINOLOGY:

a) Technical usage of Official Terminology
b) Introduction to Official Language – Glossary

UNIT – III HISTORY OF HINDI LITERATURE:

a) Introduction to History of Hindi Literature
b) The different periods of Hindi Literature – an Outlook
c) Pakshiyon se udnaa seekha : Abdul Kalam

UNIT – IV HISTORY OF HINDI LITERATURE- FAMOUS PERSONALITIES:

a) Famous Hindi Poets
b) Famous Hindi Prose Writers

UNIT – V LETTER WRITING:

a) Different models of Letters – Practice
b) Personal Letters- Practice
c) Official Letters - Practice

TEXT BOOKS:

1. **HINDI SOURABH** (Prepared by Department of Hindi, SCSVMV) & material of Translation prepared by Department of Hindi.

REFERENCES:

1. Hindi Sahitya ka naya Ithihas : Dr. Ramkumar Varma, Rajkamal Prakashan 1997.
2. Pramukh Kala Jayi Hindi kavi : KrishnaDev Jhari, Hindi Sahitya Parishad, New Delhi 2016.
3. Aadhunik Hindi Kavitha : Dr. Jagadish Chandra Sharma, Hindi Sahitya parishad, New Delhi 2016.

	LANGUAGE –IV (SANSKRIT –IV)	L	T	P	C
		2	1	0	3

(For Students admitted from 2024 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Unit - I भागः - क

Ramodantam - Balakanda 1-20 Verses

Unit - II भागः - ख

Ramodantam - Balakanda 21-30 Verses

Unit - III भागः - ग

Vyasavacanabhagavatam (From Kathamukham to Putanavadha)

Unit - IV भागः - घ

Vyasavacanabhagavatam (From Sakatabhanga to Devendragarva Bhanga)

Unit - V भागः - ङ

Poets of Sanskrit - Kalidasa, Bharavi, Magha, Sriharsa.

Text Books:

1. **Ramodantam** - R.S. Vadhyar & Son, Palaghat.
2. **VyasavacanaBhagavatam** - K.Srinivasacari, The little flower & Co, Madras.
3. **History of Sanskrit literature.**

	PROFESSIONAL ENGLISH	L	T	P	C
		2	1	0	3

(For Students admitted from 2024 onwards)
Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

Course Objectives:

1. To examine key models and barriers in communication and apply strategies to overcome them.
2. To demonstrate telephone etiquette and manage real-time verbal interactions effectively.
3. To develop job-related communication such as resume writing, interviews, and group discussions.
4. To structure and deliver formal presentations with clarity, poise, and impact.
5. To analyze and present speeches of global leaders for style, vocabulary, and influence.

Course Outcomes:

1. Explain core communication processes, networks, and barriers in workplace contexts.
2. Display confidence and etiquette in telephonic conversations and digital communication.
3. Demonstrate job-readiness through resumes, interviews, and group discussion skills.
4. Organize and deliver impactful presentations using verbal and non-verbal tools.
5. Analyze the content and delivery of influential speeches and emulate techniques in personal presentations.

Unit I: (9 hours)

Communication

Types of communication, process of communication, communication networks, communication barriers, Strategies to overcome barriers

Unit II: (9 hours)

Telephonic Skills

Telephonic etiquettes, Handling Calls, Customer Queries (booking an appointment, follow up, invitation, negotiation, apologizing, clarifying, information/instruction, reporting, returning a missed call)

Unit III: (9 hours)

Career Skills

Resume writing, STAR model, writing objectives, identifying specific domains, setting short/long term goals, discussion skills, brainstorming.

Unit IV: (9 hours)

Presentation Skills

Elements of presentation skills: opening and closing presentation, time management, Q&A sessions,

dress code and body language, presentation DEMOs, giving feedback on presentation.

Unit V: (9 hours)

Lessons from lectures

Barrack Obama We are the change we seek

APJ Abdul Kalam My Vision for India

Malala Yousafzai Speech at UN in 2013 (key takeaways from the speeches)

References:

- Tyagi, Kavita & Misra, Padma. *Professional Communication*. PHI Learning Pvt. Ltd., 2011.
- Ramesh, M.S. *Business Communication*. R. Chand & Co., 2003

	DATA COMMUNICATION AND NETWORKS	L	T	P	C
		3	1	0	4

(For Students admitted from 2024 onwards)

COURSE OBJECTIVES:

• To study about the physical arrangement of networks, types and modes of networks, data conversions and transmission medium.
• To study the detection and correction of errors, link control and protocols of data link layer.
• Understanding the error checks and deduction methods in Data link layer.
• To study about the access method and implementation of different networks, types of Routing.
• To study the logic of link mechanisms used in networks and different layers of TCP/IP.

COURSE OUTCOMES:

• Describe the building blocks of Computer Networks.
• Describe the various signal and switching Techniques used in transmission.
• To implement the error checks and deduction methods in Data link layer.
• Determine the Logical addressing and various types of transmission protocol and services.
• Illustrate the generation of telecommunication systems in wireless networks.

SYLLABUS

UNIT – I DATA COMMUNICATION

Introduction: Networks – Components- Data Representation-Data Flow-Physical structures-Network Types-Switching-The Internet-Internet Standards and Administration-TCP/IP Protocol Suite-Addressing- The OSI Model. **12**

UNIT – II PHYSICAL LAYER

Data and signals-Digital Signals-Transmission Impairment-Digital to Digital conversion-Analog to Digital Conversion- Multiplexing and De Multiplexing-Transmission media- Guided media-Unguided media-Circuit Switching-Message Switching-Packet Switching. **12**

UNIT – III DATA LINK LAYER

Introduction-Link Layer Addressing-Error Detection and Correction-Cyclic codes-DLC Services-Data Link Layer protocols-HDLC-Point to point Protocol-Media Access control (MAC) - Channelization-Standard Ethernet-ATM-IEEE 802.11 Project-Bluetooth-WiMAXVirtual LANS. **12**

UNIT – IV NETWORK AND TRANSPORT LAYER

Introduction to Network Layer-Packet Switching-IPV4 Addresses-Internet Protocol-ICMPv4-Mobile IP-Routing Algorithms-Unicast and Multicast Routing-Transport Layer-Introduction-Transport layer Protocols-User Datagram Protocols-Transmission control Protocols-Services. **12**

UNIT – V WIRELESS COMMUNICATION

Introduction - Spread Spectrum: Transmission. Medium Access Control: Motivational for a Specialized MAC - Space Division Multiple Access (SDMA) - Frequency Division MultipleAccess (FDMA) - Time Division Multiple Access (TDMA) - Code Division Multiple Access (CDMA).Mobile Telecommunication Systems: GSM Architecture, Services and Protocols. **12**

TEXT BOOKS:

1. Behrouz A. Forouzan, "Data communication and Networking", Fifth Edition, Tata McGraw Hill publishing Company, New Delhi, 2018 UNIT I to IV
2. Schiller Jochen, "Mobile Communications", 2nd Edition, Pearson Education, New Delhi, 2012. – UNIT V

REFERENCES:

1. William Stallings. "Data and computer Communication", 8th Ed, Pearson Education, 2013/PHI.
2. Andrew Tannenbaum.S. "Computer Networks", Pearson Education, 4th Edition, 2013 / PHI.

WEB REFERENCES:

1. https://www.geeksforgeeks.org/computer-network-tutorials/ - UNIT I to IV
2. https://www.tutorialspoint.com/wireless_communication/index.htm - UNIT V

	RELATIONAL DATABASE MANAGEMENT SYSTEM	L	T	P	C
		3	1	0	4

(For Students admitted from 2024 onwards)

Common for B.Sc. (CS) / BCA/ B.Sc. (CS with Cyber Security)

COURSE OBJECTIVES

- To introduce the fundamental concepts of data, databases, and Database Management Systems.
- To understand Entity Relationship (ER) modeling and relational database design.
- To develop SQL and PL/SQL programming skills for database creation, manipulation, and retrieval.
- To apply relational algebra and normalization techniques for efficient database design.
- To develop procedural database programming using PL/SQL constructs.

COURSE OUTCOMES

After successful completion of this course, students will be able to:

- Explain the architecture, components, and data models of Database Management Systems.
- Design ER diagrams and transform them into relational schemas.
- Develop SQL queries using DDL, DML, joins, subqueries, views, and advanced SQL features.
- Apply relational algebra operations and normalization techniques to design efficient relational databases.
- Develop PL/SQL programs using cursors, procedures, functions, packages, and triggers.

SYLLABUS

UNIT – I: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

Data and Information – DBMS: Definition, Characteristics, Advantages and Limitations – File System versus DBMS – Database Users – Database Administrator (DBA) – Three-Level Architecture – DDL, DML, DCL and TCL – Data Dictionary – Data Models: Hierarchical, Network, Relational and Object-Oriented Data Models. **12**

UNIT – II: DATA MODELING USING ER MODEL

Database Design Process – Entity Relationship (ER) Model – Entities, Entity Sets, Attributes and Relationships – Types of Attributes – Types of Relationships – Cardinality and Participation Constraints – Keys: Primary Key, Composite Key and Foreign Key – Weak Entity – ER Diagram – Mapping ER Model to Relational Schema. **12**

UNIT – III: SQL and ADVANCED SQL

Structured Query Language (SQL): SQL Fundamentals – Data Types – Constraints – DDL Commands (CREATE, ALTER, DROP, TRUNCATE) – DML Commands (INSERT, UPDATE, DELETE) – SELECT Statement – Aggregate Functions (COUNT(), SUM(), AVG(), MIN(), MAX()) – Operators – Predicates (LIKE, BETWEEN, IN, DISTINCT, IS NULL) – Clauses (WHERE, GROUP BY, HAVING, ORDER BY) – Joins: Inner Join, Outer Join, Self Join, Cross Join and Equi Join – Subqueries – Views – Indexes. **12**

UNIT – IV: RELATIONAL ALGEBRA AND NORMALIZATION

Introduction to Relational Algebra – Basic Operations: Selection, Projection, Union, Intersection, Difference, Cartesian Product and Rename – Join Operations – Division Operation – Derived Operations – Functional Dependencies – Closure of Functional Dependencies – Normal Forms: 1NF – 2NF - 3NF – Boyce-Codd Normal Form (BCNF) – 4NF – Denormalization. **12**

UNIT – V: PL/SQL PROGRAMMING

Introduction to PL/SQL – Structure of a PL/SQL Block – Variables, Constants and Data Types – Operators – Control Structures: Conditional Statements (IF, CASE), Iterative Statements (LOOP, WHILE, FOR) – Exception Handling – Cursors: Implicit and Explicit Cursors – Stored Procedures – Functions – Packages – Triggers. **12**

TOTAL :60

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, 7th Edition, McGraw-Hill Education, 2020. UNIT I, II, IV
2. Ivan Bayross, SQL, PL/SQL: The Programming Language of Oracle, BPB Publications, Latest Edition. UNIT III, V

REFERENCE BOOKS

1. Steven Feuerstein, Oracle PL/SQL Programming, 6th Edition, O'Reilly Media. – UNIT V
2. Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson Education, 2017. UNIT II, IV

WEB REFERENCES:

1. https://www.geeksforgeeks.org/dbms/
2. https://www.w3schools.com/sql/

	CRIMINAL LAWS AND CYBERCRIMES	L	T	P	C
		3	1	0	4

(For Students admitted from 2026 onwards)

Course Objectives

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

- Understand the fundamental principles of criminal law and their application to cyber crimes.
- Explain the legal framework governing cyber crimes in India and international perspectives.
- Identify various cyber offences, cyber investigations, and digital evidence handling procedures.
- Analyze cyber crime cases using relevant criminal laws and cyber security regulations.
- Apply legal, ethical, and forensic principles to investigate and prevent cyber crimes.

Course Outcomes

At the end of the course, students will be able to:

- Explain the principles of criminal law and cyber crime legislation.
- Interpret the provisions of the Bharatiya Nyaya Sanhita (BNS), Information Technology Act, and other cyber laws.
- Analyze various cyber crimes, investigation procedures, and digital evidence.
- Apply cyber forensic techniques and legal procedures in cyber crime investigations.
- Evaluate emerging cyber crime challenges and legal responses in the digital environment.

SYLLABUS

UNIT I – Fundamentals of Criminal Law

Introduction to Criminal Law – Sources and Classification of Criminal Law – Elements of Crime: Actus Reus and Mens Rea – Stages of Crime – Criminal Liability – Types of Punishments – Cognizable and Non-Cognizable Offences – Bailable and Non-Bailable Offences – Introduction to the Bharatiya Nyaya Sanhita (BNS), 2023, Bharatiya Nagarik Suraksha Sanhita (BNSS), 2023, and Bharatiya Sakshya Adhiniyam (BSA), 2023 – Role of Law Enforcement Agencies. **12**

UNIT II – Cyber Crimes and Legal Framework

Introduction to Cyber Crimes – Classification of Cyber Crimes – Cyber Crimes against Individuals, Property, Organizations, and Government – Identity Theft – Phishing – Email Spoofing – Online Banking and UPI Fraud – Ransomware – Malware – Cyber Stalking – Cyber Bullying – Social Engineering – Relevant provisions of the Information Technology Act, 2000 (as amended) and applicable provisions of the BNS, 2023 – Landmark Cyber Crime Cases. **12**

UNIT III – Cyber Crime Investigation and Digital Evidence

Cyber Crime Investigation Process – Registration of Cyber Crime Complaints – Search, Seizure, and Arrest Procedures – Digital Evidence: Identification, Collection, Preservation, and Chain of Custody – Electronic Records and Admissibility of Evidence under the Bharatiya Sakshya Adhiniyam, 2023 – Computer, Mobile, and Network Forensics (Overview) – Cyber Forensic Tools – Incident Reporting – National Cyber Crime Reporting Portal – Case Studies. **12**

UNIT IV – Cyber Laws, Privacy and Digital Rights

Information Technology Act, 2000 and Amendments – Electronic Records and Digital Signatures – Cyber Contracts – Intellectual Property Rights in Cyberspace – Data Privacy and the Digital Personal Data Protection Act, 2023 (Overview) – Social Media and Legal Issues – Cloud Computing and Legal Compliance – Artificial Intelligence, Deepfakes, and Legal Challenges – Ethical Issues in Cyberspace. **12**

UNIT V – Emerging Trends in Cyber Crimes

Cyber Terrorism – Cyber Warfare – Dark Web – Cryptocurrencies and Financial Crimes – Blockchain and Smart Contracts (Legal Perspective) – Internet of Things (IoT) Crimes – Artificial Intelligence-enabled Cyber Crimes – Deepfake-enabled Fraud – International Cyber Laws and Cooperation – Cyber Security Policies – Cyber Crime Prevention Strategies – Recent Cyber Crime Case Studies. **12**

Total: 60 Hrs

Text Books (Latest Editions)

1. Pavan Duggal, **Cyber Law: Indian and International Perspectives**, Saakshar Law Publications, Latest Edition. UNIT I, II, IV
2. Nina Godbole and Sunit Belapure, **Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives**, Wiley India, 2021. ISBN: **978-8126562176**. UNIT II, III, V
3. Vakul Sharma, **Information Technology Law and Practice**, Universal Law Publishing, Latest Edition. UNIT I, IV

Reference Books

1. Justice Yatindra Singh, **Cyber Laws**, Universal Law Publishing, Latest Edition.
2. Marjie T. Britz, **Computer Forensics and Cyber Crime**, 4th Edition, Pearson. UNIT III
3. Chris Reed, **Internet Law: Text and Materials**, Cambridge University Press.
4. Matthew Lavy, **The Law of Cybersecurity and Data Protection**, Oxford University Press.

WEB REFERENCES:

1. https://www.meity.gov.in/
2. https://www.cert-in.org.in/ - UNIT III, V
3. https://cybercrime.gov.in/ - UNIT III

	SECURITY AND NETWORKS LAB (in Linux Platform)	L	T	P	C
		0	0	4	2

(For Students admitted from 2026 onwards)

COURSEOBJECTIVES:

- To develop programs using Core Java to explore network and security essentials.
- To develop programs using java.net for TCP/UDP, and javax.crypto, java.security, java.util.gzip packages.
- To develop programs using Core Java to send lines from the keyboard and print the server reply.
- To develop programs using Core Java to support multiple clients using threads.
- To develop programs using Core Java to implement a UDP broadcast server.

COURSEOUTCOMES:

Students will be familiar with:

- The insights of TCP/UDP socket implementations
- De/Compression implementations
- Security Algorithm usage/applications
- Fundamentals on what to test, expected results in Security Testing.
- Encrypt/decrypt a text file.

LIST OF EXERCISES

(java.net, javax.crypto, java.security, java.util.gzip)

1. Write the client to send lines from the keyboard and print the server reply.
2. Client selects a file and sends it to a TCP server, Server saves it to disk.
3. Implement a UDP server that echoes datagrams.
4. Implement UDP Broadcast server sends small messages to test packet behavior.
5. UDP Time Server: Server sends current timestamp upon receiving any packet and Client prints the received timestamp.
6. Cryptography (javax.crypto, java.security): Read a string or file, and Output SHA-256 hash using MessageDigest.
7. AES Symmetric Encryption (CBC mode), Encrypt a file using AES/CBC/ PKCS5Padding.
8. Encrypt/decrypt a text file.
9. Generate RSA key pair (2048 bits), and save public/private keys to files.
10. Use GZIPOutputStream and GZIPInputStream, to Compress and decompress any given file.
11. Send requested text file to client as encrypted-compressed and client to receive decompress/decrypt and display/store contents.

	RDBMS LAB	L	T	P	C
		0	0	4	2

(For Students admitted from 2026 onwards)
Common for B.Sc. (CS) / BCA/ B.Sc. (CS with Cyber Security)

COURSE OBJECTIVES

- To understand the fundamentals of databases and Database Management Systems.
- To design relational databases using Entity Relationship (ER) modeling.
- To develop SQL skills for database definition, manipulation, and querying.
- To apply relational algebra and normalization techniques for efficient database design.
- To develop PL/SQL programs using control structures, cursors, procedures, functions, packages, and triggers.

COURSE OUTCOMES

After successful completion of the course, students will be able to:

- Explain the concepts, architecture, and data models of Database Management Systems.
- Design ER diagrams and transform them into relational database schemas.
- Construct SQL queries using DDL, DML, joins, subqueries, views, and indexes.
- Apply relational algebra operations and normalization techniques to design efficient relational databases.
- Develop PL/SQL applications using control structures, cursors, procedures, functions, packages, and triggers for database programming.

Exercises - Oracle

1. Database Creation and Table Definition – Create database tables using DDL commands (CREATE, ALTER, DROP, TRUNCATE) with appropriate constraints.
2. Data Manipulation and Retrieval – Perform data manipulation using DML commands (INSERT, UPDATE, DELETE, SELECT), operators, functions, and clauses.
3. SQL Joins and Subqueries – Implement INNER, OUTER, NATURAL, SELF, CROSS, and EQUI joins along with nested queries.
4. Views and Indexes – Create, modify, retrieve, and delete views and indexes.
5. PL/SQL Blocks and Control Structures – Develop PL/SQL programs using variables, IF-ELSE, CASE, LOOP, WHILE LOOP, and FOR LOOP.
6. PL/SQL Cursors and Exception Handling – Implement implicit and explicit cursors with exception handling.
7. PL/SQL Procedures – Create and execute stored procedures with parameters.
8. PL/SQL Functions – Create and execute user-defined functions.
9. PL/SQL Triggers – Create row-level and statement-level triggers for INSERT, UPDATE, and DELETE operations.
10. PL/SQL Packages – Create and execute PL/SQL packages containing procedures and functions for modular database programming.

	SOFT SKILLS – II	L	T	P	C
		0	1	0	1

(For Students admitted from 2025 onwards)

Common for B.Sc. (CS) / BCA / B.Sc. (Data Science) / B.Sc. (Cyber Security)

COURSE OBJECTIVES

- To familiarize students the importance and appropriate usage of grammatical structures.
- To impart knowledge on various interpersonal, intrapersonal communication and the qualities of leadership.
- To introduce students to various technologies that influence our communication conduct in order to achieve targeted communication goals and objectives.
- Effort has been made to accommodate fundamental, mathematical aspects to instil confidence among students
- To demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions

COURSE OUTCOMES

- Use grammatical structures in extended conversations and discussions
- Comprehend the significance of various types of communication and its application.
- Interact effectively and uprightly.
- Use their logical thinking and analytical thinking to solve quantitative questions
- Enhance the aptitude round clearing ability in interview process

SYLLABUS

UNIT – I REMEDIAL ENGLISH GRAMMAR AND USAGE:

Prepositions and words followed by prepositions-Concord (Agreement of the Verb with the Subject) - Error Analysis (Correction of Errors in a given sentence - errors in the use of words -Errors of Indianisms - use of slang - errors in punctuation)-Words commonly misspelt-Often confused words

UNIT – II SOFT SKILLS FOR LEADERSHIP AND TEAM MANAGEMENT:

Qualities of a Good Leader - Decision Making- Intrapersonal skills - Interpersonal skills Problem solving - Critical thinking - Negotiation skills

UNIT – III ELECTRONIC COMMUNICATION:

Internet, e-mail - Video conferencing - Blogging and Websites - Phone calls and Voice messages - Text Messages

UNIT – IV APTITUDE SKILLS – III:

Problems on Numbers – Partnership – Time & Work – Time & Distance – Problems on Trains

UNIT – V APTITUDE SKILLS – IV:

Permutation & Combination – Probability – True Discounts – Banker's Discount – Odd Man out & Series

TEXT BOOKS:

1. Raman Meenakshi and Prakash Singh, "Business Communication", 2nd Edition, Oxford Press, 2012.
2. Simon Sweeney, "English for Business Communication", Cambridge University Press, 2003.
3. R S Aggarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand Publications, 2017

REFERENCES:

1. Jaggan Saneja, "Quantitative Aptitude Simplified", 1st Edition, Notion Press, 2017.

	ADVANCED CYBER SECURITY	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES

- To introduce the implementation concepts of cyber security
- To acquire knowledge on cyber threats and attacks
- To become aware of significant security technologies and tools
- To impart knowledge on cipher methods and cryptographic algorithms
- To explore various protocols for establishing secured communication

COURSE OUTCOMES

At the end of the courseStudents can able to

- Explain the basic concepts, need, approaches, principles and components ofsecurity.
- Explain the various cyber threats and attacks.
- Describe the various Security Technologies and Tools.
- Explain the basic principles of cryptography and algorithms.
- Examine the various protocols for secure communication.

SYLLABUS

UNIT I – INTRODUCTION TO CYBER SECURITY

Introduction to Cyber Security – Need for Information Security – Goals of Security – Confidentiality, Integrity, and Availability (CIA Triad) – Security Principles – Security Governance – Security Policies and Standards – Risk Management Concepts – Components of Information Security – Software Development Life Cycle (SDLC) – Secure Software Development Life Cycle (SSDLC). **12**

UNIT II – CYBER THREATS AND ATTACKS

Cyber Threat Landscape – Threats and Vulnerabilities – Intellectual Property Theft – Malware: Virus, Worm, Trojan Horse, Spyware, Adware, Ransomware – Social Engineering Attacks – Phishing, Spear Phishing, Whaling – Password Attacks – Denial of Service (DoS) and Distributed Denial of Service (DDoS) – Insider Threats – Web-based Attacks – Zero-Day Attacks – Advanced Persistent Threats (APT). **12**

UNIT III – SECURITY TECHNOLOGIES AND TOOLS

Security Architecture – Access Control Mechanisms – Authentication and Authorization – Multi-Factor Authentication (MFA) – Firewalls – Virtual Private Networks (VPNs) – Intrusion Detection Systems (IDS) – Intrusion Prevention Systems (IPS) – Honeypots and Honeynets – Security Monitoring and Logging – Vulnerability Assessment and Penetration Testing - **Security Tools -** Framework -Nessus - OWASP ZAP -Kali Linux. **12**

UNIT IV – CRYPTOGRAPHY AND SECURITY MECHANISMS

Introduction to Cryptography – Cryptology Terminology – Classical Cipher Techniques – Symmetric Key Cryptography – Asymmetric Key Cryptography – Block and Stream Ciphers – Data Encryption Standard (DES) – Advanced Encryption Standard (AES) – RSA Algorithm – Diffie-Hellman Key Exchange – Hash Functions – Message Authentication Codes (MAC) – Digital Signatures – Public Key Infrastructure (PKI) – Cryptographic Attacks – Physical Security Controls. **12**

UNIT V – SECURE COMMUNICATION PROTOCOLS

Fundamentals of Secure Communication – Secure Socket Layer (SSL) – Transport Layer Security (TLS) – Hypertext Transfer Protocol Secure (HTTPS) – Secure Shell (SSH) – Secure/Multipurpose Internet Mail Extensions (S/MIME) – Pretty Good Privacy (PGP) – Internet Protocol Security (IPSec) – Wireless Security Protocols: WEP, WPA, WPA2, WPA3 – Email Security Mechanisms – Secure Network Architecture. **12**

TOTAL :60

TEXT BOOKS

1. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, 7th Edition, Cengage Learning, Boston, 2022. UNIT I, II, III
2. William Stallings, Cryptography and Network Security: Principles and Practice, 8th Edition, Pearson Education, New Delhi, 2023. Units IV and V

REFERENCE BOOKS

1. William Stallings and Lawrie Brown, Computer Security: Principles and Practice, 5th Edition, Pearson Education, New Delhi, 2024. UNIT I, II, III
2. William Stallings, "Network Security Essentials: Applications and Standards" 6th Edition, Pearson Education, New Delhi, 2017. Units III and V

WEB RESOURCES:

1. CISA (Cybersecurity and Infrastructure Security Agency) Shields Up Hub: Units I and II with authoritative real-world material on the modern cyber threat landscape, active ransomware vectors, insider threats, and Advanced Persistent Threats (APTs).
2. OWASP (Open Web Application Security Project) Foundation Portal: Unit III
3. Kali Linux Tools Documentation
4. CryptoSmith Cryptography Visual Learning Aids: Unit IV with beautiful interactive block diagrams, step-by-step operational visualisations of block/stream ciphers, and algorithmic walkthroughs of AES and DES.
5. SSL Labs / Qualys Technical Guide Documentation: Unit V

	CYBER CRIME INVESTIGATION AND DIGITAL FORENSICS	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

- To understand the basic concepts of cybercrime and forensics,
- To understand the basic concepts of Computer Crime
- To create the awareness through simple practical tips and tricks.
- The students to learn how to avoid becoming victims of cybercrimes.
- They have familiar with forensics tools and learn to analyze and validate forensics data.

COURSE OUTCOMES:

- Understand the types of cybercrime and fundamentals.
- Illustrate the concepts of Internet theft.
- Describe the types of cybercrime offenses and attacks.
- Design an approach to prevent cybercrime offenses.
- Assess the methods and tools used in digital forensics.

SYLLABUS

UNIT – I INTRODUCTION TO CYBERCRIME

Introduction-Classifications of Cybercrimes: E-Mail Spoofing-Spamming-Cyber defamation- Internet Time Theft-Newsgroup Spam-Crimes from Usenet Newsgroup-Industrial Spying. **12**

UNIT – II CYBER OFFENSES

Cyber offenses: How Criminals Plan that attack-Categories of Cybercrime, Passive Attack, Active AttacksScanning/Scrutinizing gathered Information-Attack on Gaining and Maintaining the System Access. **12**

UNIT – III INTRODUCTION TO COMPUTER FORENSICS

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques – Incident and incident response methodology. **12**

UNIT – IV DIGITAL FORENSICS

Introduction to Digital Forensics - Forensic Software and Hardware - Analysis and Advanced Tools - Forensic Technology and Practices - Forensic Ballistics and Photography - Face, Iris and Fingerprint Recognition - Audio Video Analysis. **12**

UNIT – V LAWS AND CASE STUDY

Laws and Ethics - Digital Evidence Controls - Evidence Handling Procedures - Basics of Indian Evidence ACT IPC and CrPC- Electronic Communication Privacy ACT - Legal Policies. **12**

TOTAL: 60

TEXT BOOKS:

1. Nina Godbole, SunitBelapur, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Publications, April, 2011. UNIT I, II, III, V
2. Bill Nelson, Amelia Phillips, and Christopher Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009. UNIT III, IV, V

REFERENCES:

1. James Graham, Richar Howard, Ryan Olson, “Cyber Security Essentials”, CRC Press, Tailor and Francis Group, 2011.
2. Robert Jones, “Internet Forensics: Using Digital Evidence to Solve Computer Crime”, O’Reilly Media, October, 2005.

WEB RESOURCES:

1. CERT-In (Indian Computer Emergency Response Team) Incident Response Guidelines - UNIT III
2. MeitY Digital Evidence Arbitrator Documentation – UNIT V
3. GeeksforGeeks Cyber Crime and Laws Tutorial – UNIT I, II
4. SANS Digital Forensics and Incident Response Faculty Blog UNIT IV

	PROGRAMMING WITH PYTHON	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)
(Common to B.Sc. (CS with CY) / B.C.A)

COURSE OBJECTIVES

- To provide strong foundation in Python programming
- To develop problem-solving skills using Python
- To introduce file handling and exception handling
- To enable GUI-based application development
- To integrate Python with database systems

COURSE OUTCOMES

- Understand Python fundamentals and syntax
- Apply control structures and data structures
- Implement modular programming using functions.
- Develop GUI applications using Tkinter.
- Create database-driven applications.

SYLLABUS

UNIT I: Fundamentals of Python

Introduction to Python and its features – Installation of Python and Python environment (IDLE, VS Code) – Python syntax, comments and indentation – Tokens, keywords, identifiers – Variables and data types – Operators (Arithmetic, Relational, Logical, Assignment, Membership and Identity) and expressions – Input and Output functions – Type conversion – Decision making (if, if-else, nested if) – Looping constructs (for, while) – Jump statements (break, continue, pass). **12**

UNIT II: Data Structures and Functions

Functions: Definition, function call, arguments, return values – Variable scope (Local and Global) – Lambda functions – Recursion – Strings and string manipulation – Lists, Tuples, Sets and Dictionaries **12**

UNIT III: Packagesand File Handling

Modules and packages – Creating and importing modules – Introduction to NumPy arrays – Introduction to Pandas (Series and DataFrame) – Basic data visualization using Matplotlib – File handling (text and binary files) – Exception handling (try, except, else, finally and user-defined exceptions). **12**

UNIT IV: GUI Programming using Tkinter

Introduction to GUI programming – Tkinter architecture – Widgets: Label, Button, Entry, Text, Frame, Checkbutton, Radiobutton and Combobox – Layout managers (pack, grid and place) – Event handling – Menus, Message Boxes and File Dialogs – Developing simple GUI applications. **12**

UNIT V: Database Programming & Application Development

Introduction to DBMS concepts – SQLite connectivity using Python – Executing SQL queries and parameterized queries – CRUD operations (Create, Read, Update and Delete) – Developing GUI-based database applications using Tkinter and SQLite (Student Information System/Library Management System/Employee Record Management). **12**

TOTAL:60

TEXT BOOKS

1. R. N. Rao, Core Python Programming, 3rd ed. New Delhi, India: DreamTech Press,2021. UNIT I, II, IV, V

2. Boschetti, A., & Massaron, L. (2018). Python Data Science Essentials: A Practitioner's Guide Covering Essential Data Science Principles, Tools, and Techniques (3rd ed.). Packt Publishing Gowrishankar S., & Veena A. (2018). - UNIT III

REFERENCE BOOKS

1. B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd ed. Sebastopol, CA, USA: O'Reilly Media, 2016. UNIT I, II, III
2. Lutz, M. (2025). Learning Python: Powerful object-oriented programming (6th ed.). O'Reilly Media. ISBN 978-1-09817-1308. UNIT I, II, III
3. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

WEB REFERENCES

1. Python Software Foundation, "Python Documentation," [Online].Available:https://docs.python.org/3/.
2. W3Schools, "Python Tutorial," [Online]. Available: https://www.w3schools.com/python/.
3. GeeksforGeeks, "Python Programming Language," [Online]. Available: https://www.geeksforgeeks.org/python-programming-language/.

	PENETRATION TESTING	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

Understand the principles, methodologies, standards, and ethical considerations of penetration testing.

- Configure and manage a penetration testing laboratory using virtualization technologies and Kali Linux.
- Perform reconnaissance, enumeration, vulnerability assessment, and exploitation using industry-standard penetration testing tools.
- Assess the security of networked systems and web applications by identifying and validating common vulnerabilities.
- Analyze penetration testing results, document findings, and prepare professional security assessment reports with appropriate remediation recommendations.

COURSE OUTCOMES:

At the end of the course, students will be able to:

- Explain the penetration testing lifecycle, methodologies, legal requirements, and ethical responsibilities involved in security assessments.
- Configure and manage a penetration testing environment using virtualization platforms, Kali Linux, and essential penetration testing tools.
- Conduct information gathering, reconnaissance, network enumeration, and vulnerability assessment using standard security tools and techniques.
- Perform penetration testing of network and web applications by identifying, validating, and documenting security vulnerabilities using appropriate methodologies.
- Prepare comprehensive penetration testing reports that include risk analysis, evidence, mitigation strategies, and professional recommendations in accordance with industry best practices.

SYLLABUS

UNIT I - Penetration Testing Fundamentals

Introduction to Penetration Testing - Penetration Testing Methodology - Legal and Ethical Considerations - Setting up a Virtual Penetration Testing Lab - Installing Kali Linux - VMware/VirtualBox Installation -Laboratory Network Configuration. **12**

UNIT II - Linux and Penetration Testing Tools

Kali Linux Environment - Linux Command Line - File System and Permissions - Bash Scripting Basics - Networking Commands - Netcat - SSH - Package Management **12**

UNIT III- Information Gathering and Vulnerability Assessment

Open Source Intelligence (OSINT) - DNS Enumeration - Host Discovery - Nmap Scanning - Nmap Scripting Engine - Nessus - OpenVAS - Metasploit Basics. **12**

UNIT IV – Web Penetration Testing

HTTP Protocol - Burp Suite - Authentication Testing -SQL Injection - Cross-Site Scripting (XSS) - Cross-Site Request Forgery (CSRF) - File Inclusion - Command Injection **12**

UNIT V – Exploitation, Post-Exploitation and Reporting

Exploitation Methodology -Privilege Escalation Concepts -Post-Exploitation -Evidence Collection -Report Writing -Mitigation Recommendations -Professional Penetration Testing Practices. **12**

TEXT BOOKS

1. Glen D. Singh, "The Ultimate Kali Linux Book", 3rd Edition, Packt Publishing, 2024 Units I, III, IV, and V
2. OccupyTheWeb, Linux Basics for Hackers, 2nd Edition, No Starch Press, 2025. UNIT II

REFERENCE BOOKS

1. Andrew Hoffman, Web Application Security, O'Reilly Media, 2020. UNIT IV
2. Peter Kim, The Hacker Playbook 3: Practical Guide to Penetration Testing, Secure Planet LLC. UNIT III, IV, V
3. Georgia Weidman, Penetration Testing: A Hands-On Introduction to Hacking, No Starch Press (methodology reference). UNIT I, III, V

WEB RESOURCES:

1. Kali Linux Official Documentation & Tools Matrix – UNIT I, II, III
2. PortSwigger Web Security Academy: Unit IV

	INTRUSION DETECTION AND PREVENTION SYSTEM	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

Course Objectives

- To understand the fundamentals of intrusion detection and prevention.
- To study different IDS and IPS architectures and deployment models.
- To analyze network- and host-based intrusion detection techniques.
- To gain hands-on experience with IDS/IPS tools and alert analysis.
- To understand evasion techniques and countermeasures.

Course Outcomes

On successful completion of the course, students will be able to:

- Explain intrusion concepts and security threats in networks.
- Differentiate IDS and IPS types and architectures.
- Deploy and configure IDS/IPS solutions.
- Analyze alerts, logs, and intrusion patterns.
- Apply IDS/IPS techniques to secure real-world systems.

UNIT – I: Introduction to Intrusion Detection

Security threats and attacks. Intrusion concepts. Goals of intrusion detection. IDS terminology. Types of intrusions. IDS components and functions. IDS vs IPS. Challenges in intrusion detection. **12**

UNIT – II: **IDS Architectures and Models**

IDS architectures. Host-based IDS (HIDS). Network-based IDS (NIDS). Hybrid IDS. Signature-based detection. Anomaly-based detection. Specification-based detection. Deployment strategies **12**

UNIT – III: Intrusion Prevention Systems

Intrusion prevention concepts. IPS architecture. Inline vs passive IPS. Network IPS and Host IPS. Policy creation and enforcement. False positives and false negatives. Performance considerations **12**

UNIT – IV: **IDS/IPS Tools and Technologies**

Snort architecture and rule writing. Suricata overview. OSSEC and host-based monitoring. Log analysis and alert management. SIEM integration. Case studies using IDS/IPS tools. **12**

UNIT – V: **Advanced Topics and Evasion Techniques**

IDS evasion techniques. Encrypted traffic challenges. Machine learning in intrusion detection. Cloud-based IDS/IPS. IoT intrusion detection. Future trends in intrusion detection and prevention. **12**

Text Books

1. Carl Endorf, Eugene Schultz, Jim Mellander, Intrusion Detection and Prevention, McGraw-Hill, 2003. UNIT I to IV
2. Paul E. Proctor, Intrusion Detection Systems, Prentice Hall, 2000.

REFERENCE BOOKS:

1. NIST Special Publication 800-94: Guide to Intrusion Detection and Prevention Systems (IDPS): Covers Units I, II, III, and IV

WEB RESOURCES:

1. OWASP Foundation Network Evasion Techniques Cheat Sheet: Unit V
2. GeeksforGeeks: Intrusion Detection System (IDS) Tutorial: Units I and II
3. SANS Institute Reading Room: Inside Intrusion Prevention: Unit III

	SOFTWARE ENGINEERING	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

Common for B.Sc.(CS)/BCA/B.Sc. (CS with Data Science)/B.Sc. (CS with Cyber Security)

COURSE OBJECTIVES

- To provide insight into the process of the Software Development Life Cycle (SDLC).
- To gain basic knowledge about the prerequisites for planning a software product.
- To learn how to design software.
- To study the basic ideas of architectural design.
- To gain knowledge about software testing strategies.

COURSE OUTCOMES

- Apply various phases of the software development lifecycle to address a given problem.
- Analyze requirements systematically and develop the corresponding model.
- Demonstrate the ability to design and implement software projects effectively.
- Exhibit skills in designing and developing software architecture.
- Develop and apply various software testing strategies to ensure quality and functionality.

SYLLABUS

UNIT–I SOFTWARE AND SOFTWARE ENGINEERING

Introduction – The Nature of Software – Software Process – Software Engineering Practice – Software Myths - Software Process Models: Waterfall Model, Prototype Model, Increment Model, Spiral Model, RAD model, Win-Win model, Agile Model **12**

UNIT – II UNDERSTANDING REQUIREMENTS AND REQUIREMENTS MODELING

Requirements engineering, Requirement Elicitation Techniques - Software Requirement Specification – Data Modeling Concepts - Flow Oriented modeling – Creating a Behavioral Model. **12**

UNIT–III DESIGN ENGINEERING

Design within the context of software engineering–Design Process and Design Quality-Design Concepts – The Design Model **12**

UNIT–IV CREATING AN ARCHITECTURAL DESIGN

Software Architecture – Data Design – Architectural Styles and Patterns–Architectural Design – Transform Flow Mapping – Transaction Flow Mapping **12**

UNIT–V SOFTWARE TESTING

Software Testing fundamentals, Whitebox testing - Black box testing - A Strategic Approach to Software Testing - System Testing. **12**

TEXTBOOKS:

1.Roger S. Pressman,"Software Engineering:A Practitioners Approach",7th Edition, Tata McGraw Hill, 2010.

REFERENCES:

1. Richard Fairley, Software Engineering Concepts–TataMcGrawHill,2010.
2. Wamans Jawadekar, Software Engineering Principles & Practices, Tata McGraw Hill, 2010.

WEB REFERENCES:

1. GeeksforGeeks Software Engineering Tutorial
2. Tutorialspoint Software Engineering Guide: Units II, III, and IV
3. Agile Alliance Official Resource Library: Covers Unit I

	INTERNET OF THINGS	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)
Common for BCA /B.Sc. (CS with Cyber security)

COURSE OBJECTIVES:

- Understand the basic concepts of the Internet of Things (IoT).
- Learn IoT communication and networking technologies.
- Develop IoT applications using Arduino and Raspberry Pi.
- Understand IoT data handling, cloud computing, and analytics.
- Apply IoT concepts to real-world applications such as smart homes, healthcare, and agriculture.

COURSE OUTCOMES:

- Explain the basic concepts, architecture, and components of IoT.
- Use Arduino and Raspberry Pi to build simple IoT systems.
- Analyze IoT communication protocols and data processing techniques.
- Develop IoT solutions using cloud platforms and connected devices.
- Apply IoT technology to solve real-world problems in different domains.

SYLLABUS

UNIT-I: Introduction to Internet of Things

Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation , Basics of Networking , Communication Protocols, Sensor Networks. **12**

UNIT – II: Machine-to-Machine Communications

Introduction to M2M, Difference between IoT and M2M, Interoperability in IoT, Introduction to Software Defined Network (SDN), SDN for IoT, Data Handling and Analytics. **12**

UNIT-III: Introduction to Arduino Programming

Introduction to Arduino, Types of Arduino, Arduino Toolchain ,Arduino Programming Structure, Sketches , Pins – Input/Output From Pins Using Sketches , Introduction to Arduino Shields , Integration of Sensors and Actuators with Arduino. **12**

UNIT – IV: Implementation of IoT with Raspberry Pi

Introduction to Open platform: Raspberry Pi,Architecture of Raspberry Pi, Programming , Interfacing Raspberry Pi with basic peripherals , Accessing GPIO Pins , Sending and Receiving Signals Using GPIO Pins ,Connecting to the Cloud.. **12**

UNIT-V: Application Development of IoT with Cloud Computing

Development of IoT Applications ,Sensor-Cloud , Smart Cities and Smart Homes , Connected Vehicles , Smart Grid , Industrial IoT. Case Study : Agriculture , Healthcare , Activity Monitoring **12**

TOTAL:60

TEXTBOOKS:

Arshdeep Bahga & Vijay Madisetti, Internet of Things: A Hands-on Approach, VPT Publications, 2015.

REFERENCES:

1. Raj Kamal, Internet of Things: Architecture and Design Principles, McGraw Hill, 2nd Edition, 2022.
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton & Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press, 2017.(Unit- I, II, V)
3.Michael Margolis, Arduino Cookbook, O'Reilly, 3rd Edition. (Unit-III)

WEB RESOURCES

1. NPTEL – Introduction to Internet of Things, IIT Kharagpur
   https://www.nptel.ac.in/courses/10 106105166
2. Arduino Official Documentation
   https://docs.arduino.cc/
3. Arduino Language Reference
   https://docs.arduino.cc/language-reference/
4. Raspberry Pi Official Documentation
   https://www.raspberrypi.com/documentation/computers/raspberry-pi.html
5. Raspberry Pi OS and GPIO Documentation
   https://www.raspberrypi.com/documentation/computers/os.html
6. Wokwi – Online Electronics Simulator
   https://wokwi.com/
7. MQTT Official Website
   https://mqtt.org/

	ADVANCED CYBER SECURITY LAB	L	T	P	C
		0	0	4	2

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES

- To provide practical exposure to fundamental cybersecurity concepts and security mechanisms.
- To develop skills in identifying and analyzing cyber threats, vulnerabilities, and attacks using Python.
- To implement cryptographic techniques for securing information and communication.
- To gain hands-on experience with network security, authentication, and access control mechanisms.
- To develop and use cybersecurity tools for vulnerability assessment, monitoring, and secure communication.

COURSE OUTCOMES

At the end of the course, students will be able to:

- Develop Python programs to implement basic cybersecurity concepts and security controls.
- Analyze and detect common cyber threats and security vulnerabilities.
- Implement cryptographic algorithms and security mechanisms using Python.
- Develop network security applications for monitoring and secure communication.
- Utilize cybersecurity tools and techniques for security assessment and protection.

LIST OF EXERCISES

1. Implement threat identification and vulnerability analysis for an information system.
2. Implement phishing email analysis and detection techniques.
3. Implement analysis of password attacks and account lockout mechanisms.
4. Implement multi-factor authentication (MFA) for secure user authentication.
5. Implement vulnerability assessment using Nessus.
6. Implement classical encryption and decryption techniques.
7. Implement symmetric key encryption using the AES algorithm.
8. Implement asymmetric key encryption using the RSA algorithm.
9. Implement secure communication using SSL/TLS protocols.
10. Implement secure email communication using S/MIME and PGP.

Software Tools Required

Operating System

- Windows 10/11 or Linux (Ubuntu/Kali Linux)

Programming Environment

- Python 3.11 or higher
- Visual Studio Code / PyCharm

Python Libraries

- socket
- hashlib
- cryptography
- pycryptodome
- ssl
- scapy
- requests
- pandas

Cyber Security Tools

- Wireshark
- Nmap
- Burp Suite
- OWASP ZAP
- Metasploit Framework

Laboratory requirements

Hardware

- Intel i3/i5/i7 Processor or equivalent
- Minimum 8 GB RAM
- 20 GB Free Disk Space
- Internet Connectivity

Software Installation

1. Python 3.x
2. VS Code / PyCharm
3. Kali Linux Virtual Machine (Optional)
4. Required Python Packages:

	PYTHON LAB	L	T	P	C
		0	0	4	2

(For Students admitted from 2023 onwards)
(Common to B.C.A/B.Sc (CS with Cy) Syllabus)

COURSE OBJECTIVES

- To provide hands-on experience in Python programming
- To develop problem-solving skills through practical exercises
- To implement concepts of control structures, functions, and data structures
- To practice file handling and exception handling techniques
- To design and develop GUI-based applications using Tkinter

COURSE OUTCOMES

- Develop Python programs using basic constructs and control structures
- Apply functions and data structures to solve computational problems
- Implement file handling and exception handling in applications
- Design GUI-based applications using Tkinter
- Develop database-driven applications using Python

LIST OF EXPERIMENTS

1. Basics of Python

- Performing arithmetic operations
- Swapping two numbers
- Finding the largest of three numbers

2. Control Structures

- Checking even or odd numbers
- Calculating factorial using loops
- Generating multiplication tables

3. Looping Applications

- Generating Fibonacci series
- Checking prime numbers
- Calculating sum of digits

4. Functions

- Implementing functions for basic operations
- Recursive implementation of factorial/Fibonacci
- Palindrome checking using functions

5. Strings

- Counting vowels and consonants
- Reversing a string
- Checking anagrams

6. Lists, Tuples, Sets

- Performing list operations
- Removing duplicates using sets
- Working with tuples

7. Dictionaries

- Creating and managing student records
- Sorting dictionary elements
- Counting word frequency

8. File Handling

- Writing data to files
- Reading data from files
- Copying file contents

9. Exception Handling

- Handling runtime errors
- Managing multiple exceptions
- Creating user-defined exceptions

10. Database Programming

- Creating database and tables
- Performing CRUD operations
- Displaying records

11. GUI Programming

- Designing basic forms using Tkinter
- Creating calculator interface
- Designing login interface

REQUIRED SOFTWARE

- Python 3.x
- Tkinter
- SQLite / MySQL IDE (VS Code / PyCharm / IDLE)

	WEB TECHNOLOGY	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

(Common to B.C.A/B.Sc (CS with CySec))

COURSE OBJECTIVES

- To understand the structure and design of web pages
- To develop static and responsive web pages using HTML and CSS
- To implement client-side scripting using JavaScript
- To build server-side applications using PHP
- To develop database-driven dynamic web applications

COURSE OUTCOMES

- Design structured web pages using HTML
- Apply CSS for layout and responsive design
- Develop interactive web pages using JavaScript
- Implement server-side scripting using PHP
- Create database-driven web applications

SYLLABUS

UNIT I: HTML Fundamentals

Introduction to Internet, WWW, Web browsers and servers - Structure of HTML document - Text formatting tags: headings, paragraphs, bold, italic, lists - Hyperlinks: internal, external, email links - Images: image formats, attributes, image maps - Multimedia elements: audio and video embedding - Semantic HTML elements (header, footer, section, article) **12**

UNIT II: HTML Forms & CSS

Tables: structure, attributes, styling - Forms: input types, labels, buttons, validation basics - Introduction to CSS: inline, internal, external styles - CSS selectors: element, class, id, group, universal - CSS properties: colors, fonts, text styling - Box model: margin, padding, border - Layout design: float, display, positioning - Intro to responsive design and media queries. **12**

UNIT III: JavaScript

Introduction to JavaScript and its role in web pages -Variables, data types, operators- Control structures: if, switch, loops - Functions and event handling - Form validation techniques - DOM manipulation: accessing and modifying elements. **12**

UNIT IV: PHP Programming

Introduction to PHP and server-side scripting - Embedding PHP in HTML - Variables, constants, data types -Operators and control structures -Functions and scope - Form handling using GET

and POST methods - Sessions and cookies for state management - File handling in PHP.

12

UNIT V: PHP with Database

Introduction to MySQL database - Creating database and tables - Connecting PHP with MySQL (mysqli/PDO)- CRUD operations (Insert, Select, Update, Delete) - Form validation and database interaction - Building dynamic web pages - Introduction to simple web application development.

12

TOTAL:60

TEXT BOOKS

1. J. Duckett, HTML and CSS: Design and Build Websites. Hoboken, NJ, USA: Wiley, 2011 UNIT I, II
2. R. Nixon, Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5, 6th ed.Sebastopol, CA, USA: O'Reilly Media, 2021. UNIT III, IV, V

REFERENCES

1. J. Duckett, JavaScript and JQuery: Interactive Front-End Web Development. Hoboken, NJ, USA: Wiley, 2014. UNIT III
2. L. Welling and L. Thomson, PHP and MySQL Web Development, 5th ed. Boston, MA, USA: Addison-Wesley, 2016. UNIT IV, V

WEB RESOURCES:

1. MDN Web Docs: HTML Structuring the Web: Unit I
2. W3Schools CSS Layout Learning Hub: UNIT I, II
3. JavaScript.info (The Modern JavaScript Tutorial): Unit III
4. PHP Official Interactive Documentation UNIT IV
5. GeeksforGeeks PHP and MySQL Application Guide UNIT V

	Artificial Intelligence and Machine Learning	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

- To train the students to understand different types of AI agents.
- To understand various AI search algorithms.
- Fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation.
- To introduce the basic concepts and techniques of machine learning and the need for Machine learning techniques for real world problem
- To provide understanding of various Machine learning algorithms and the way to evaluate the performance of ML algorithms

COURSE OUTCOMES:

- Understand the informed and uninformed problem types and apply search strategies to solve them.
- Apply difficult real life problems in a state space representation so as to solve those using AI techniques like searching and game playing.
- Apply machine learning techniques in the design of computer systems
- To differentiate between various categories of ML algorithms
- Design and make modifications to existing machine learning algorithms.

SYLLABUS

UNIT - I: Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening). 12

UNIT - II: Advanced Search: Constructing Search Trees, Stochastic Search, AO* Search Implementation, Minimax Search, Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining 12

UNIT - III: Machine-Learning: Introduction. Machine Learning Systems, Forms of Learning: Supervised and Unsupervised Learning, reinforcement – theory of learning – feasibility of learning 12

UNIT - IV: Supervised Learning: Regression: Linear Regression, multi linear regression, Polynomial Regression, logistic regression, Non-linear Regression, Model evaluation methods. Classification: – support vector machines (SVM), Naïve Bayes classification 12

UNIT - V: Unsupervised learning Nearest neighbor models – K-means – clustering around medoids – silhouettes – hierarchical clustering – k-d trees, Clustering trees 12

TEXT BOOKS:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, PrenticeHall, 2010. UNIT I, II
2. MACHINE LEARNING an Algorithmic Perspective 2nd Edition, Stephen Marsland,2015, by Taylor & Francis Group, LLC UNIT III, IV, V

REFERENCES:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009. UNIT I, II
2. Introduction to Machine Learning, Second Edition, Ethem Alpaydın, the MIT Press, Cambridge, Massachusetts, London, England. UNIT IV, V
3. Machine Learning, Tom M. Mitchell, McGraw-Hill Science, ISBN: 0070428077 UNIT III, IV

WEB REFERENCES

1. GeeksforGeeks Artificial Intelligence Tutorial – UNIT I, II
2. Scikit-Learn Machine Learning Documentation Guides: Units IV and V
3. StatQuest with Josh Starmer YouTube Machine Learning Playlist: Units III and IV
4. Visualizing K-Means and Hierarchical Clustering via Naftali Harris: Unit V

	INTRODUCTION TO BLOCK CHAIN TECHNOLOGY	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

- To study the basics of Blockchain technology.
- To learner will explore various aspects of Blockchain technology
- To develop application in Blockchain Technology.
- To understand Bitcoin Network concepts.
- To understand hyper ledger concepts.

COURSE OUTCOMES:

- Analyze and explore the working of Blockchain technology.
- Analyze the working of Bitcoin.
- Understand and analyze the working of Hyperledger.
- Apply the learning of solidity and de-centralized apps on Blockchain.
- Apply the real world application of Blockchain technology.

SYLLABUS

UNIT-I

Introduction to Blockchain Technology – Distributed systems – The history of blockchain – Introduction to blockchain – CAP theorem and blockchain – Benefits and limitations of blockchain – Decentralization using blockchain - Methods of decentralization – Routes to decentralization **12**

UNIT-II

Cryptography in Blockchain: Introduction – cryptographic primitives – Assymetric cryptography – public and private keys -line interface – Bitcoin improvement proposals (BIPs) – ConsensusAlgorithms. **12**

UNIT-III

BitCoin - Introduction – Transactions – Structure - Transactions types – The structure of a block– The genesis block – The bitcoin network– Wallets and its types– Bitcoin payments– Bitcoin investment and buying and selling bitcoins – Bitcoin installation – Bitcoin programming and the command-line interface – Bitcoin improvement proposals (BIPs). **12**

UNIT-IV

Ethereum - Ethereum block chain- Elements of the Ethereum block chain– Precompiled contracts – Accounts and its types – Block header- Ether – Messages – Mining - Clients and wallets – Trading and investment – The yellow paper - The Ethereum network - Applications

developed on Ethereum - Scalability and security issues **12**

UNIT-V

Smart Contract and Hyper ledger – History of Smart Contract – Ricardian contracts - The DAO. Hyper ledger projects – Hyperledger as a protocol – Fabric - Hyperledger Fabric - Sawtooth lake – Corda Architecture. **12**

TEXT BOOKS:

1. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, Birmingham: Packt Publishing, 2018. UNIT I, II, IV, V

2. Andreas M. Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", First Edition, O 'Reilly – UNIT II, III

REFERENCE BOOKS:

1. Zheng et al., "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends" (IEEE): Units I, II, and III

WEB REFERENCES:

1. GeeksforGeeks Blockchain Technology Tutorial: Units I and II
2. Bitcoin Developer Documentation Portal: Unit III
3. Ethereum Official Developer Resources & Documentation: Unit IV
4. Hyperledger Fabric Official Architecture Documentation: Unit V.

	BIOMETRIC SECURITY	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

Course Objectives

- To understand the concept of biometrics and the basic functioning of a biometric system.
- To study different types of biometrics and their benefits in identification systems.
- To understand threats to biometric systems and methods for improving biometric security.
- To understand the concept of biometric attacks and their impact on system security.
- To learn about the legal and ethical concerns associated with the use of biometrics.

Course Outcomes

After completing this course, students will be able to:

- Understand the fundamentals of biometric and authentication systems.
- Study and explain face recognition and other human recognition methods.
- Analyze different evaluation metrics used for biometric systems.
- Understand and analyze biometric security mechanisms and various biometric attacks.
- Understand privacy challenges and legal concerns associated with biometric technologies.

SYLLABUS

UNIT–I FUNDAMENTALS AND ARCHITECTURE

Biometric Fundamentals: Introduction – Different authentication system technologies – Benefits of biometrics over traditional authentication systems – Biometric architecture – Applications. **12**

UNIT–II RECOGNITION METHODS

Biometric systems based on fingerprint recognition – Iris recognition – Face identification and localization in images – Retina recognition methods. **12**

UNIT–III EVALUATION METRICS

Quantitative analysis on the biometrics – Performance evaluation in Biometrics – False acceptance rate – False rejection rate. **12**

UNIT–IV SYSTEM SECURITY

Multimodal Biometric systems: Theory and applications – Biometric System Security: Biometric attacks / tampering – Solutions – Biometric encryption. **12**

UNIT–V POLICY AND CASE STUDY

Privacy, Policy and Legal Concerns Raised by Biometrics – Case studies on physiological, behavioral and multifactor biometrics in identification systems. **12**

TEXTBOOKS:

1. David Check Ling Ngo,Andrew Beng Jin Teoh,Jiankun Hu "Biometric Security", Cambridge Scholars,2015 UNIT I to IV

2. Patrizio campisi "Security and Privacy in Biometrics", Springer 2013 UNIT IV, V

REFERENCE BOOKS:

1. Els. J.Kindt, “Privacy and data protection issues of Biometric Applications “, Springer,2013. UNIT V

2. Eliza Yinzi Du, “Biometrics from fiction to practice”, Panstandford Publishers 2012 UNIT I, II, III

WEB REFERENCES:

1. GeeksforGeeks: Biometrics Overview and Technologies: Units I and II
2. NIST (National Institute of Standards and Technology) Biometrics Portal: Unit III and Unit IV
3. Biometrics Institute Security and Vulnerability Guidelines: Units IV and V

	CLOUD TECHNOLOGY & SECURITY	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

Course Objectives

- Understand the fundamentals, architecture, and service models of cloud computing.
- Explain cloud deployment models, virtualization, and cloud infrastructure.
- Explore cloud storage, computing, networking, and popular cloud services.
- Understand cloud application development, containerization, and serverless computing.
- Recognize basic cloud security concepts, threats, and best practices for secure cloud computing.

Course Outcomes

At the end of the course, students will be able to:

- Explain the concepts, characteristics, and architecture of cloud computing
- Describe cloud service models, deployment models, and virtualization technologies
- Apply cloud storage, networking, and computing concepts to cloud-based solutions.
- Explain cloud application development, containers, and serverless computing concepts
- Describe cloud security principles, threats, and security best practices

SYLLABUS

UNIT I – Introduction to Cloud Technology: Definition, Evolution and Applications – Characteristics, Benefits and Challenges of Cloud Computing – Cloud Architecture – Cloud Service Providers – Cloud Service Models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) – Cloud Deployment Models: Public, Private, Hybrid and Community Cloud – Applications of Cloud Computing. **12**

UNIT II – Cloud Infrastructure and Virtualization: Cloud Infrastructure: Data Centers – Virtualization Concepts – Types of Virtualization – Hypervisors – Virtual Machines – Containers and Containerization – Resource Provisioning – Elasticity and Scalability – Load Balancing – Cloud Storage: Object, Block and File Storage – Backup and Storage Management. **12**

UNIT III – Cloud Services and Application Development: Cloud Services: Compute, Storage, Database and Networking Services – Cloud Databases – APIs and Web Services – Cloud Application Development – Microservices Architecture – Serverless Computing – Introduction to DevOps – Cloud-native Applications. **12**

UNIT IV – Modern Cloud Technologies: Overview of Amazon Web Services (AWS), Microsoft Azure and Google Cloud Platform (GCP) – Cloud Monitoring – Container Orchestration using Kubernetes – Edge Computing – Internet of Things (IoT) and Cloud – Artificial Intelligence and Machine Learning Services – Cloud Applications and Case Studies. **12**

UNIT V – Introduction to Cloud Security: Cloud Security Fundamentals and Shared Responsibility Model – Security Challenges and Threats – Identity and Access Management (IAM) – Authentication and Authorization – Data Encryption – Cloud Security tools - Backup

and Disaster Recovery – Shared Responsibility Model – Privacy, Compliance and Cloud Security Best Practices. **12**

TOTAL: 60

Text Books:

1. Thomas Erl, Ricardo Puttini, and Zaigham Mahmood, Cloud Computing: Concepts, Technology & Architecture, 2nd Edition, Pearson, 2023. UNIT I, II, III, V
2. Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi, Mastering Cloud Computing, 2nd Edition, McGraw-Hill Education, 2023. UNIT II, III, IV

Reference Books:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley India. UNIT I, II, V
2. Michael J. Kavis, Architecting the Cloud, Wiley. UNIT III, IV, V

WEB REFERENCES:

1. Amazon Web Services (AWS) Architecture Center: Units III, IV, and V.
2. GeeksforGeeks Cloud Computing Tutorial Workspace: Units I, II, and III
3. Kubernetes Official Interactive Documentation Library: Units II and IV

	MOBILE AND WEB APPLICATION SECURITY	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

- Understand the architecture, security principles, and common threats associated with web and mobile applications.
- Identify and analyze vulnerabilities in web applications using industry-standard security testing methodologies and tools.
- Perform security assessment of Android-based mobile applications through static and dynamic analysis techniques.
- Apply secure coding practices and industry standards such as the OWASP Top 10 and OWASP Mobile Top 10 to mitigate application vulnerabilities.
- Develop the ability to prepare security assessment reports and recommend appropriate remediation measures for web and mobile applications.

COURSEOUTCOMES:

After successful completion of this course, students will be able to:

- Explain the architecture, security models, and threat landscape of web and mobile applications.
- Analyze and identify common security vulnerabilities in web applications using standard security testing tools and methodologies.
- Perform static and dynamic security assessment of Android mobile applications and evaluate potential security risks.
- Apply secure development practices and implement appropriate countermeasures based on OWASP security standards.
- Prepare professional vulnerability assessment reports and recommend suitable remediation strategies for improving application security.

SYLLABUS

UNIT I – Web Application Security Fundamentals

Introduction to Web Application Security -Web Application Architecture -HTTP and HTTPS Protocols -Authentication and Authorization -Session Management -Cookies and Web Storage -Same-Origin Policy -Threat Modeling -OWASP Top 10 Overview -Secure Web Application Development Principles **12**

UNIT II – Web Application Vulnerability Assessment

Information Gathering -Web Application Reconnaissance -Burp Suite Fundamentals -Intercepting HTTP Requests and Responses -SQL Injection -Cross-Site Scripting (XSS) -Cross-Site Request Forgery (CSRF) -File Inclusion Vulnerabilities -Command Injection -Directory

Traversal -Secure Input Validation -Web Vulnerability Assessment Methodology. **12**

UNIT III – Mobile Application Security Fundamentals

Mobile Computing Security -Android Operating System Architecture -Android Application Components -Android Permission Model -Android Application Lifecycle -Mobile Threat Landscape -OWASP Mobile Top 10 -Mobile Malware -Secure Mobile Application Design -Mobile Device Security Best Practices - **12**

UNIT IV – Mobile Application Security Testing

Static Application Security Testing (SAST) -Dynamic Application Security Testing (DAST) -Android Debug Bridge (ADB) -APK Structure -Reverse Engineering Fundamentals -Mobile Traffic Analysis -Runtime Analysis -Mobile Vulnerability Assessment -Secure Data Storage -Mobile Authentication Security -Mobile API Security. **12**

UNIT V – Secure Application Development and Incident Response

Secure Coding Practices -Secure Authentication Mechanisms -API Security -Cryptography in Web and Mobile Applications -Logging and Monitoring -Security Testing Life Cycle -Vulnerability Reporting -Risk Assessment -Incident Response for Application Security -Security Compliance -DevSecOps Fundamentals -Future Trends in Web and Mobile Application Security **12**

TEXTBOOKS

1. Andrew Hoffman, Web Application Security: Exploitation and Countermeasures for Modern Web Applications, O'Reilly Media, 2020. UNIT I, II, V
2. Prasad Girotra, Android Security: Attacks, Mitigation and Defenses, CRC Press, 2022. UNIT III, IV, V

REFERENCE BOOKS

1. Dafydd Stuttard and Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, 2nd Edition, Wiley. UNIT I, II
2. OWASP Foundation, OWASP Web Security Testing Guide (WSTG), Latest Version. UNIT III, II, IV
3. OWASP Foundation, OWASP Mobile Application Security Testing Guide (MASTG), Latest Version. UNIT III, II, IV

WEB RESOURCES

1. PortSwigger Web Security Academy: Units I and II
2. Android Developers Security Training Guides: Units III and IV
3. OWASP Foundation Core Projects Dashboard: Covers Units I, III, and V

	INFORMATION SECURITY AND AUDIT	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSEOBJECTIVES:

- To introduce the fundamental concepts and techniques in computer and network security, giving students an overview of information security and auditing,
- To expose students to the latest trend of computer attack and defense.
- To understand policies, systems to protect organizations from unauthorized access
- To understand threats within the organization.
- To analyzeexternal audit through professional agencies.

COURSEOUTCOMES:

- Describe various information security issues and encryption principles.
- Identify IP addresses range owned/used by the organization/systems in target.
- Implemented measures such as policies, systems to protect organizations from unauthorized access/transactions.
- Identify threats within the organization and surrounding the information systems.
- Perform external audit through professional agencies to ensure that organizations security systems.

SYLLABUS

UNIT I: Model for Internetwork Security

Conventional Encryption Principles & Algorithms (DES, AES, RC4, Blowfish) - Block Cipher Modes of Operation, Location of Encryption Devices - Key Distribution - Public key cryptography principles - public key cryptography algorithms (RSA, Diffie-Hellman, ECC) - public Key Distribution. **12**

UNIT II: Approaches of Message Authentication

Secure Hash Functions (SHA-512, MD5) and HMAC - Digital Signatures – Kerberos - X.509 Directory Authentication Service - Email Security: Pretty Good Privacy (PGP) IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management. **12**

UNIT III: Web Security Requirements

Secure Socket Layer (SSL) and Transport Layer Security (TLS) - Secure Electronic Transaction (SET) - Firewalls: Firewall Design principles, Trusted Systems, Intrusion Detection Systems. **12**

UNIT IV: Security Audit

Introduction - Basic Terms Related to Audits - Security audits - The Need for Security Audits in Organization - Organizational Roles and Responsibilities for Security Audit - Auditors responsibility in Security Audits - Types of Security Audits. **12**

UNIT V: Case Studies

Approaches to Audits - Technology based Audits: Vulnerability Scanning and Penetration Testing

- Resistance to Security Audits - Phase in security audit - Security Audit Engagement Costs and other aspects - Budgeting for security audits - Selecting External Security Consultants - Key Success factors for security audits. **12**

TEXT/REFERENCE BOOKS:

1. W. Stalling, ―Cryptography and Network Security Principles and Practices‖, 7th Edition, Pearson of India, 2018. UNIT I, II, III

2. Whitman, ―Principles of Information Security‖, CENGAGE Learning Custom Publishing; 4th ed. Edition, 2011. UNIT III, IV, V

REFERENCE BOOKS:

1. Mark Stamp, ―Information Security‖, Wiley– INDIA, 2006. UNIT I, II, IV
2. Robert Bragg, Mark Rhodes, ―Network Security: The complete reference‖, TMH, 2017. UNIT I,II, III, V

WEB REFERENCES:

1. CryptoSmith Cryptography Visual Learning Tools: Unit I
2. IETF (Internet Engineering Task Force) RFC 4301: IPSec Architecture: Unit II
3. GeeksforGeeks Cryptography and Network Security Tutorial: Units II and III
4. ISACA Information Systems Auditing Standards Library: Units IV and V
5. OWASP Risk Assessment Framework and Pentesting Guidance: Unit V

	WEB TECHNOLOGYLAB	L	T	P	C
		0	0	4	2

(For Students admitted from 2023 onwards)

(Common to B.C.A/B.Sc (CS with CySec))

COURSE OBJECTIVES

- To design and develop static and dynamic web pages.
- To implement client-side and server-side scripting.
- To connect web applications with databases.
- To understand and practice secure web development.

COURSE OUTCOMES

- Design and implement interactive web pages
- Develop server-side web applications
- Integrate databases securely
- Identify and mitigate web vulnerabilities

LIST OF EXPERIMENTS

1. Design a webpage using text formatting, lists, images, and hyperlinks
2. Create HTML tables and forms for data input with CSS
3. Write JavaScript programs for form validation and event handling
4. Write server-side scripts to process form data
5. Develop a simple login system
6. Create and manipulate databases using SQL
7. Connect web application with database
8. Implement CRUD operations using server-side scripting
9. Use prepared statements to prevent SQL Injection
10. Demonstrate SQL Injection and its prevention
11. Implement secure authentication and password hashing

REQUIRED SOFTWARE

- HTML5, CSS3, JavaScript
- PHP, MySQL
- Web Server: Apache / Nginx / XAMPP / WAMP

	CYBER SECURITY PROJECT DEVELOPMENT LAB	L	T	P	C
		0	0	6	2

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

- · To provide an idea of using various Intrusion Detection and Prevention process models in the software industry according to given circumstances.
- · To perform deep-dive security assessments and implement mitigation strategies for DB, Client-Server (web) and network-based threats.
- · Design Secure Architectures: To develop and deploy security solutions, such as Firewalls, IDS, and Zero Trust architectures, to protect critical infrastructure.
- · Perform Threat Hunting and Forensics: Equipped to detect, respond to, and forensically investigate security breaches using real-time monitoring and log analysis tools.
- · Implement Cryptographic Solutions: To program and integrate cryptographic protocols (like RSA, AES, and digital signatures) to ensure data confidentiality and integrity.

COURSE OUTCOMES:

- · Understand the relevance of security in every phase of SDLC.
- · Discuss and analyze how to develop secured software requirement specifications for a given problem.
- · Students will be able to decompose the given project across SDLC phases with applicable vulnerability test cases.
- · Able to understand/apply security patches on latest programming techniques.
- · Ability to develop product-startups implementing software process models in software engineering methods.

LIST OF PROJECT TITLES:

Choose any one case from thefollowing:

1. Web Based Applications with Security dashboard results.
2. Automated Security Testing of Applications like Banking,ElectricityBill,DepartmentalStoreandsoon
3. Penetration Testing on OnlineBooking/TransactionSystem
4. SecurityBasedApplications/Tools
5. Security Tools/Solutions on IoT/Cloudbased/MachineLearning/ArtificialIntelligence
6. BlockChainTechnologies
7. Perform active discovery to identify live hosts, open ports, and operating system fingerprints
8. Analyze real-time network traffic to detect unencrypted passwords and suspicious communication patterns.
9. Conduct automated scans to identify misconfigurations and known security flaws in local systems.

10. Intercept and manipulate HTTP traffic to identify client-side vulnerabilities like XSS and CSRF.
11. Automate the detection and exploitation of SQL injection vulnerabilities in a controlled environment.
12. Develop and test custom rules for an Intrusion Detection System to alert against known attack vectors.
13. Centralize log analysis and monitor for real-time security events using an industry-standard SIEM tool.
14. Generate digital certificates, implement RSA/AES encryption, and verify file integrity using hashing.
15. Audit cloud infrastructure (S3 buckets, IAM roles) for security gaps and scan code for open-source risks.
16. Registry Editing and Viewing using native tools of OS.
17. Email Analysis involving Header check, tracing route.
18. Extracting of files that have been deleted
19. Cryptographic UI tools with different MIME types.

	Disaster Risk Reduction & Management	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

- Learn basic terms, core principles, and the complete disaster management cycle (mitigation, preparedness, response, and recovery).
- Study national and international policies, legal frameworks, and guidelines (such as Sendai Framework principles) governing disaster management.
- Develop effective early warning systems, disaster preparedness plans, and community-based risk reduction strategies.
- Build operational capabilities for post-disaster damage assessment, relief coordination, and resilient reconstruction

COURSE OUTCOMES:

At the end of the course, the student shall be able to:

- Explain about concepts of disaster management and types of disasters
- Explain the Vulnerability profile of India & legal framework in India
- Discuss about early warning systems for disaster risk reductions
- Describe the policy and programmers for disaster risk reductions in India CO5: Demonstrate rescue and relief operation in India during disaster

SYLLABUS

UNIT–I : INTRODUCTION TO DISASTER MANAGEMENT: Definitions and concepts of Hazard, Vulnerability, Risk, Resilience, Concept of Disaster Management Cycle – Response, Recovery, Mitigation and Preparedness, Introduction to Various Hazards both Natural and Man-Made Hazards – Earthquakes, Cyclones, Droughts, Floods, Volcanoes, Coastal Hazards, Landslides, Forest Fires, Industrial Accidents, Biological Disasters, etc.., Climate Change, Global Warming. **12**

UNIT–II: DISASTER MANAGEMENT IN INDIA: Hazard and vulnerability profile of India, Disaster Management Act 2005, National Disaster Mitigation and Management Guideline on -National Policy on Disaster Management 2009, NDMA guidelines on Cyclones specifically, besides earthquakes, floods, urban floods, information systems, communication systems etc., Introduction to State Disaster Management Authorities. **12**

UNIT–III: HAZARD ANALYSIS: Estimation of potential causes, characteristics and impact of Hazards. Geological Processes leading to natural hazards, Multi- Hazard Assessment, Short term and Long Term Prediction, Early warning system for different hazards, Risk Analysis for Individuals, communities 59 etc.Role of Remote Sensing & GIS in Disaster Management and its applications, Case Studies. **12**

UNIT–IV: DISASTER RISK REDUCTION (DRR): Assessing Vulnerabilities, Risk Assessment, Preparation of Exposure and Risk Database, Prevention and mitigation strategies

for DRR, Framework of Disaster Risk Reduction. Capacity Building Measures, Community Participation, Contemporary studies and work towards disaster risk reduction, Disaster Risk Reduction Plan. **12**

UNIT-V: RESPONSE AND RECOVERY OPERATIONS: Role of NDRF, Training of personnel, equipment necessary, public awareness creation, Mass Casualty Management, agencies involved in mass casualty management, Qualification and Duties of professionals, Response policy, Case Studies. **12**

TEXT BOOKS:

1. H.K.Guptha, ―Disaster management‖, 2ndEdition, University Press, 2001. UNIT I, II, III
2. R. B. Singh (Ed),―Disaster Management‖, Rawat Publication, New Delhi, 2000. UNIT I, IV, V

REFERENCES:

1. Gupta, M.C., ―Manuals on Natural Disaster management in India‖,National Centre for Disaster Management, IIPA, New Delhi, 2002. UNIT II, III, V
2. Disaster Management Guidelines. GOI-UNDP Disaster Risk Reduction Programme (2005) UNIT II, IV, V

WEB REFERENCES

1. National Disaster Management Authority (NDMA) Official Guidelines: Unit II
2. NIDM (National Institute of Disaster Management) Learning Repository: Units I and
3. Bhuvan - Indian Geo-Platform of ISRO: Unit III
4. UNDRR (United Nations Office for Disaster Risk Reduction) Resource Center: Unit IV National Disaster Response Force (NDRF) Operational Framework: Unit V

	MALWARE ANALYSIS & REVERSE ENGINEERING	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

- The main objectives of this course is
- To equip students with the practical skills needed to safely isolate, dissect, and understand malicious software
- To learn to perform static and dynamic analysis, use debuggers and disassemblers to read assembly code
- To extract indicators of compromise (IOCs), and create threat intelligence reports

COURSE OUTCOME:

- Students gain the practical skills to safely set up isolated analysis labs
- Perform static and dynamic binary analysis
- Bypass anti-evasion mechanisms, and extract actionable threat intelligence
- Deconstruct assembly-level code

SYLLABUS

Unit 1 Malware Fundamentals and Lifecycle

Malware types classification (viruses, worms, trojans, ransomware, APTs); Infection vectors (phishing, drive-by, supply chain); Malware evolution (polymorphic, metamorphic, fileless); Kill chain models (Cyber Kill Chain, MITRE ATT&CK); Indicators of Compromise (IOCs); Malware triage methodologies; Dynamic vs. static vs. behavioral analysis. **12**

Unit 2 Static Analysis Techniques

PE/ELF file format dissection (headers, sections, imports/exports); Packers and crypters detection (UPX, custom); Strings analysis and YARA rules; Hashing and fuzzy hashing (SSDEEP, imphash); Resource extraction (icons, embedded files); Static disassemblers (Ghidra, IDA Free); Control flow graphs and function identification. **12**

Unit 3 Dynamic Analysis and Sandboxing

Safe execution environments (VMware snapshots, Cuckoo Sandbox); API monitoring (APIMonitor, ProcMon); Behavioral analysis (network, filesystem, registry); Dynamic instrumentation (Pin, DynamoRIO); Memory forensics integration; Anti-analysis evasion detection (timing checks, debugger detection, VM artifacts); Sandbox escape techniques. **12**

Unit 4 Reverse Engineering

Core Concepts Assembly language essentials (x86/x64, ARM); Disassembly and decompilation; Calling conventions (stdcall, fastcall, thiscall); Function prologue/epilogue patterns; Data flow vs. control flow analysis; Symbolic execution fundamentals; Binary patching and code caves; Obfuscation reversal (control flow flattening, opaque predicates). **12**

Unit 5 Advanced Malware Techniques

Rootkit analysis (SSDT hooking, DKOM); Kernel-mode malware; Anti-forensics (timestomping, log wiping); C2 communication protocols (HTTP, DNS tunneling, custom); Ransomware (crypto APIs, payment portals); APT persistence mechanisms; Firmware/BIOS

malware; Mobile malware (APK analysis, Frida scripting). **12**

TEXT BOOKS

1. Sikorski, M. and Honig, A., Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software, 1st ed., No Starch Press, 2012. UNIT I to IV
2. Andriesse, D., Practical Binary Analysis: Build Your Own Linux Tools for Binary Instrumentation, Analysis, and Disassembly, 1st ed., No Starch Press, 2018. UNIT II, IV, V

REFERENCE BOOKS

1. Michael Hale Ligh et al.,,The Art of Memory Forensics: Detecting Malware and Threats in Windows, Linux, and Mac Memory, 1st ed., John Wiley & Sons, 2014. UNIT III, V

WEB REFERENCES:

1. MITRE ATT&CK Framework Dashboard: Unit I
2. YARA Rules Official Documentation Guide: Unit II
3. CAPE Sandbox Project (Cuckoo Alternative Community Platform): Unit III
4. OpenSecurityTraining2: Architecture & Reverse Engineering Tracks: Unit IV
5. Frida Dynamic Instrumentation Toolkit Guide: Unit V

	SECURITY ARCHITECTURE AND DESIGNS	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

The main objectives of this course are

- This course introduces the basic concepts of Security and its needs, architecture and models
- To gain knowledge about security, information, components, issues, analysis, architecture, various models, security types and its applications.

COURSE OUTCOME

- Become proficient in concepts like Security components, balancing and Access
- To understand the basics of security needs in business, threats etc., and ability to Understand Ethical and Professional issues concepts.
- Become proficient in security technologies like IDS, cryptography.
- Understand the concepts of Access control, physical security and personnel

SYLLABUS

UNIT I: Securing Information

Introduction: Information Security, Critical Characteristics of Information, Components of an Information System, Securing the Components, Balancing Security and Access- CIA **12**

UNIT II: Security Analysis and Security Models

Need for security, Business needs, Threats, Attacks, Legal, Ethical and Professional Issues. Basic Security Models: Bell- LaPadula model- Biba model- Clark- Wilson model- Non-Interference model. **12**

UNIT III: Logical Design

Blueprint for security, Information Security policy, NIST Models, VISA International security Models, Design of Security Architecture, planning for continuity. COBiT (Control Objectives of Information and Related Technology- The information security management maturity model. **12**

UNIT IV: Physical Design

Security Technology, IDS, Cryptography, Access Control Devices, Physical Security, Security and Personnel. **12**

UNIT V: Architecture Types and Case Studies

Architecture: Types- Low- level, Mid-level and High-level Architecture, Case study- Business cases for Security. **12**

TEXT BOOKS:

1. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, 7th Edition, Cengage Learning, 2022. Unit I, II, III, IV.
2. William Stallings and Lawrie Brown, Computer Security: Principles and Practice, 5th Edition, Pearson Education, 2024. Unit I, II,IV, V.

REFERENCE BOOKS:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, and Jonathan Margulies, Security in Computing, 6th Edition, Prentice Hall, 2023. UNIT I, II, IV

2. W. Krag Brotby, Information Security Governance: A Practical Development and Implementation Approach, 1st Edition, John Wiley & Sons, 2009. Unit III and V.

WEB RESOURCES:

1. GeeksforGeeks Information Security Models Tutorial: Unit II
2. CISSP Certification Domain 3 Guide via Cybrary: Units I and II
3. ISACA COBIT Framework Resource Center: Unit III
4. NIST Computer Security Resource Center (CSRC): Unit III
5. OWASP Automated Access Control Verification Guidance: Unit IV

	SOFT COMPUTING	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

The main objectives of this course are

- To summarize the basics of problem solving using computational thinking.
- To organize and process data using computers.
- To apply software development procedures.

COURSE OUTCOME

- Summarize the basics of computers and data and solve problems using different elements of computational thinking and logic.
- Analyze problems and represent solutions using algorithms and activity diagrams.
- Organize and process data using different data structures.
- Apply software testing procedures.
- Illustrate the importance of the foundations of concurrency and information security.

UNIT I: Computational Thinking

Computers and Computational Thinking– From Abacus to Machine– The first Software– What makes it a Modern Computer?– The first Modern Computer– Moore‘s Law– Information and Data: Converting Information into Data– Data Capacity– Data Types and Data Encoding– Data Compression. **12**

UNIT II: Logic

Boolean Logic– Applications of propositional logic– Solving Problems: Problem Definition– Logical Reasoning– Decomposition– Abstraction– Class Diagrams and Use Case Diagrams. **12**

UNIT III: Fuzzy Logic

Non-Monotonic reasoning- Fuzzy Logic- Fuzzy rules- Fuzzy inference- Temporal Logic- Temporal reasoning- Neural Networks- Neuro Fuzzy Inferences. **12**

UNIT IV: Computational Intelligence and its Application

Natural Language Processing- Morphological analysis- syntax analysis- Semantic analysis- All NLP applications- Language models- Information Retrieval- Information Extraction- Machine Translation- Machine Learning. **12**

UNIT V: Concurrent Activity

Parallelism– Scheduling– Sorting Networks– Measuring Concurrency‘s Effect– Information Security: What is Security? – Foundations– Common Forms of Cyber Crime– Securing Data– Securing Techniques– Strategies. **12**

TEXT BOOKS

1. David D. Riley, Kenny A. Hunt, ―Computational Thinking for the Modern Problem Solver‖, CRC Press, 2014, ISBN: 9781466587793 UNIT I, II, V
2. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th Edition, Pearson, 2020. Unit III and IV.

REFERENCE BOOKS:

1. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, 7th Edition, Cengage Learning, 2022. Unit V.
2. Kenneth H. Rosen, Discrete Mathematics and Its Applications, 8th Edition, McGraw-Hill Education, 2018. Unit II.

WEB RESOURCES:

1. GeeksforGeeks Data Encoding and Compression Tutorials: Unit I
2. Visual Paradigm UML Class Diagram Guide: Unit II
3. Tutorialspoint Fuzzy Logic Systems Reference Guide: Unit III
4. Stanford NLP Group Coursera Lecture Series: Unit IV
5. GeeksforGeeks Parallel Computing & Concurrency Architecture: Unit V

	DEEP LEARNING	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)
(Common to B.Sc (CS with DS)/B.Sc (CS with CySec))

COURSE OBJECTIVES

- To introduce students to the basic concepts and techniques of Deep Learning.
- To understand the theoretical foundations, algorithms, and methodologies of Neural Networks.
- To design and develop applications using specific Deep Learning models.
- To provide practical knowledge in handling and analysing real-world applications.
- To understand the different models used in Deep Learning.

COURSE OUTCOMES

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

- Recognize the characteristics of Deep Learning models that are useful in solving real-world problems.
- Understand different methodologies for creating applications using Deep Neural Networks.
- Identify and apply appropriate Deep Learning algorithms for analysing data for a variety of problems.
- Implement different Deep Learning algorithms.
- Design test procedures to assess the efficacy of the developed model.

SYLLABUS

UNIT I — DEEP LEARNING INTRODUCTION

The Neural Network – Limits of Traditional Computing – Machine Learning – Introduction to Neurons – Feed-Forward Neural Networks – Types of Neurons – Softmax Output Layers. **12**

UNIT II — DEEP LEARNING MODELS

Introduction to Deep Learning Models with Keras – Creating a Keras Model – Understanding Data – Specifying a Model – Compiling and Fitting a Model – Classification Models. **12**

UNIT III — CONVOLUTIONAL NEURAL NETWORK

Convolutional Neural Networks – Feature Selection – Max Pooling – Filters and Feature Maps – Convolution Layer – Applications. **12**

UNIT IV — RECURRENT NEURAL NETWORK

Recurrent Neural Networks – Memory Cells – Sequence Analysis – Word2Vec – Long Short-Term Memory (LSTM) – Memory-Augmented Neural Networks. **12**

UNIT V — REINFORCEMENT LEARNING

Introduction to Reinforcement Learning – Introduction to Markov Decision Process. **12**

TOTAL:60 Hrs

TEXT BOOK

1. Seth Weidman, Deep Learning from Scratch: Building with Python from First Principles, Greyscale Indian Edition, September 2019.

REFERENCES

1. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, Adaptive Computation and Machine Learning Series, MIT Press, 2017.

WEB RESOURCES:

1. TensorFlow and Keras Documentation: Official TensorFlow Keras Guide
2. PyTorch Tutorials: Official PyTorch Tutorials
3. DeepLearning.AI: Deep Learning Specialization and Learning Resources
4. DeepLearning.AI Resource Centre: Guides, AI Notes and Course Materials

	GRAPH THEORY	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

Course Objectives

The course aims to:

1. Introduce the fundamental concepts of Graph Theory, graph representations and graph structures with applications in computer networks and cyber security.
2. Develop skills in analyzing paths, connectivity, trees and network structures for understanding communication and security relationships.
3. Introduce graph algorithms for analysing network reachability, attack paths, critical nodes and security vulnerabilities.
4. Explain graph colouring, matching and related concepts with applications in security resource allocation, conflict analysis and network protection.
5. Develop an understanding of attack graphs, dependency graphs, trust graphs and graph-based models for cyber threat and security analysis.

Course Outcomes

After successful completion of the course, students will be able to:

CO1: Explain fundamental concepts of graphs, graph representations and graph structures and model computer and cyber security networks using graphs.

CO2: Analyze paths, trees and connectivity to determine network reachability, critical components and security relationships.

CO3: Apply graph traversal, shortest-path, spanning-tree and flow algorithms to cyber security and network analysis problems.

CO4: Apply graph colouring, matching, vertex cover and related techniques to security resource allocation and conflict analysis.

CO5: Construct and analyse attack graphs, dependency graphs, trust graphs and other graph-based models for cyber threat and security analytics.

SYLLABUS

UNIT I :-Fundamentals of Graphs and Cyber Security Networks(12 Hours)

Introduction to Graph Theory – Applications of Graphs in Computer Science and Cyber Security – Basic Terminology – Vertices and Edges – Degree of a Vertex – Simple Graphs – Multigraphs – Directed and Undirected Graphs – Weighted Graphs – Graph Representations – Adjacency Matrix – Adjacency List – Incidence Matrix – Subgraphs – Graph Isomorphism – Graph Modelling of Computer Networks, Users, Devices and Security Relationships.

UNIT II :- Paths, Trees and Network Connectivity (12 Hours)

Walks – Trails – Paths – Cycles – Connected and Disconnected Graphs – Euler Graphs – Hamiltonian Graphs – Trees – Properties of Trees – Rooted Trees – Spanning Trees – Minimum Spanning Trees – Cut Vertices – Bridges – Vertex Connectivity – Edge Connectivity – Network Reachability – Applications to Network Segmentation and Resilient Cyber Security Architecture.

UNIT III :-Graph Algorithms for Security Analysis (12 Hours)

Graph Traversal Algorithms – Breadth First Search – Depth First Search – Shortest Path Problems – Dijkstra's Algorithm – Bellman-Ford Algorithm – All-Pairs Shortest Path – Floyd-Warshall Algorithm – Minimum Spanning Tree Algorithms – Prim's Algorithm – Kruskal's Algorithm – Network Flow Concepts – Maximum Flow – Minimum Cut – Applications to Attack-Path Analysis, Network Reachability and Security Control Placement.

UNIT IV :- Graph Colouring, Matching and Security Applications(12 Hours)

Graph Colouring – Vertex Colouring – Chromatic Number – Edge Colouring – Bipartite Graphs – Applications of Graph Colouring – Matching – Maximum Matching – Perfect Matching – Vertex Cover – Independent Sets – Applications of Matching and Colouring to Security Resource Assignment, Access Relationships, Communication Networks and Conflict-Free Security Planning.

UNIT V :- Graph Models and Analytics for Cyber Security (12 Hours)

Graph Centrality – Degree Centrality – Closeness Centrality – Betweenness Centrality – Graph Similarity – Graph Clustering – Dependency Graphs – Trust Graphs – Attack Graphs – Attack Trees and their Graph Representation – Malware Propagation Graphs – User and Entity Relationship Graphs – Graph-Based Anomaly Detection – Graph-Based Cyber Threat Analysis – Introduction to Graph Analytics.

Text Books

1. Douglas B. West, **Introduction to Graph Theory**, Pearson Education, Second Edition, 2001.
2. Kenneth H. Rosen, **Discrete Mathematics and Its Applications**, McGraw-Hill Education, Seventh Edition, 2012.

References

1. Reinhard Diestel, **Graph Theory**, Springer, Fifth Edition, 2017.
2. J. A. Bondy and U. S. R. Murty, **Graph Theory**, Springer, 2008.
3. Frank Harary, **Graph Theory**, Addison-Wesley Publishing Company, 1969.
4. Jonathan L. Gross and Jay Yellen, **Graph Theory and Its Applications**, CRC Press, Third Edition, 2018.

Web Resources

1. **NPTEL – Graph Theory** – Graph fundamentals, paths, trees, connectivity, matching, graph algorithms and network flow.
2. **NetworkX Documentation** – Graph construction, traversal, shortest paths, connectivity, spanning trees, flow and graph analysis.
3. **Gephi** – Graph visualization, network analysis and graph-based data exploration.
4. **Neo4j Graph Academy** – Graph data modelling, graph databases and relationship analysis.

	MINI PROJECT	L	T	P	C
		0	0	6	6

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES:

- To provide insights into the process of software development.
- To enable students analytical and practical exposure by giving hands-on experience with learned knowledge through different courses.
- To make the students to get the industrial exposure.
- To implement the knowledge, technology, innovational ideas for solving the industrial problems.
- To understand methodologies and professional way of documentation and communication.

COURSE OUTCOMES:

- · Able to apply and develop modules using latest technologies.
- · Able to apply and develop latest technologies.
- · Exercise teamwork in developing and integrating into a single project.
- · Analyze the system for its productivity and feasibility.
- · Exercise teamwork in developing and integrating into a single project.
- · Prepare report on the application of emerging technologies in the selected industry.

A Possible set of applications may be the following:

1. Automation of Departmental Store, E-Seva, Banking, Hospital Industry etc.,
2. Web applications using PHP/MVC
3. Web applications using Angular/NodeJS/ReactJS
4. Web applications using Java/ Frameworks like Hibernate, Struts or Spring
5. Web applications using MVC,C# and.NET Programming
6. Machine Learning/Deep Learning using Python
7. Android using Java or Kotlin
8. Cryptography using C# or JAVA or GO or PHP, etc.,
9. Data Analytics using Python, R, etc.,
10. Digital Image Processing using Java or Python, MATLAB, etc.,

	CYBER THREATS AND MODELING	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

COURSE OBJECTIVE:

- The learner understands the basic concepts of cyber security
- Threats and modeling.
- Learn about email threats, web threats and cyber threat management.

COURSE OUTCOMES:

- To gain the knowledge of the cyber threats like email threats, web threats and how to
- Modeling.
- To learn the fundamentals like Worms, Virus, and Spam's, Ad ware, Spy ware, Trojans and covert channels.
- Understand the concept of cyber security threat management.
- Gain experience of security elements and threat analysis.
- To understand the concepts of Security Requirements Specifications.

UNIT I INTRODUCTION

Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cybercrimes. Network Threats: Active/ Passive – Interference – Interception –Impersonation – Worms–Virus – Spam's – Ad ware - Spy ware – Trojans and covert channels –Backdoors – Bots – IP Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats -Threats to Server security. **12**

UNIT II SECURITY THREAT MANAGEMENT

Risk Assessment - Forensic Analysis - Security threat correlation –Threat awareness – Vulnerability sources and assessment- Vulnerability assessment tools –Threat identification - Threat Analysis -Threat Modeling - Model for Information Security Planning. **12**

UNIT III SECURITY ELEMENTS

Authorization and Authentication - types, policies and techniques – Security certification – Security monitoring and Auditing - Security Requirements Specifications – Security Policies and Procedures –Firewalls – IDS - Log Files - Honey Pots. **12**

UNIT IV SECURITY MODELS

Access control, Trusted Computing and multilevel security - Security models - Trusted Systems- Software security issues- Physical and infrastructure security- Human factors – Security awareness -Training - Email and Internet use policies. **12**

UNIT V CASE STUDY

Carbank: The Great Bank Robbery - Cyber Security Updates Onboard - Monitoring of Log Files and Alerts – Security analysis of industrial control Systems. **12**

Total: 60 Hours

TEXT BOOKS

1. William Stallings and Lawrie Brown, " Computer Security: Principles and Practice, Prentice Hall", 2008. UNIT I, III, IV, V
2. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security, 7th Edition, Cengage Learning, 2022. UNIT II, III, IV

REFERENCE BOOKS:

1. Frank Swiderski and Window Snyder, Threat Modeling, 1st Edition, Microsoft Press, 2004. Unit II.
2. Jocelyn O. Padallan, Cyber Security, 1st Edition, Arcler Press, 2019. Unit I, II, V.

WEB RESOURCES

1. GeeksforGeeks Cyber Attacks & Network Security Tutorial: Unit I.
2. OWASP Threat Modeling Cheat Sheet: Unit II
3. NIST Computer Security Resource Center (CSRC): Units III and IV
4. SANS Institute Reading Room Case Studies: Unit V

	OPERATIONS RESEARCH	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)

Course Objectives

The course aims to:

1. Introduce the fundamental principles of Operations Research, mathematical modelling and optimization with applications in cyber security and computing.
2. Develop skills in formulating optimization problems for security resource allocation, vulnerability management and cyber security planning.
3. Introduce decision-making and game-theoretic models for analysing interactions between attackers and defenders.
4. Explain network, scheduling and resource optimization techniques for cyber security operations and incident response.
5. Develop competency in applying computational optimization techniques and Python-based OR tools to cyber security problems.

Course Outcomes

After successful completion of the course, students will be able to:

CO1: Formulate mathematical optimization models for cyber security resource allocation, security planning and risk management.

CO2: Apply network and resource optimization techniques to analyse security infrastructure, network protection and security-control placement.

CO3: Apply Decision Theory and Game Theory to analyse attacker-defender interactions and cyber security investment decisions.

CO4: Apply scheduling, prioritization and project management techniques to vulnerability remediation, incident response and cyber security operations.

CO5: Apply simulation, heuristic optimization and Python-based OR tools to solve cyber security risk and decision-analysis problems.

SYLLABUS

UNIT I :- Mathematical Modelling and Optimization for Cyber Security(12 Hours)

Introduction to Operations Research – Role of Operations Research in Cyber Security – Decision-Making and Optimization – Steps in Operations Research Model Development – Problem Identification

– Decision Variables – Parameters – Constraints – Objective Functions – Mathematical Modelling – Types of Optimization Problems – Single and Multi-Objective Optimization – Linear and Non-Linear Optimization – Formulation of Cyber Security Optimization Problems – Security Cost and Risk Models.

UNIT II :- Network and Resource Optimization(12 Hours)

Network Optimization – Network Models – Shortest Path Problems – Minimum Spanning Tree – Maximum Flow and Minimum Cut – Network Capacity and Bottleneck Analysis – Resource Allocation Models – Security Resource Allocation – Firewall and Security Service Placement – Security Monitoring Resource Allocation – Optimal Deployment of Security Controls – Optimization of Network Protection Strategies.

UNIT III :- Decision Theory and Game-Theoretic Models for Cyber Security(12 hours)

Decision-Making under Certainty, Risk and Uncertainty – Payoff and Loss Functions – Expected Value – Decision Trees – Utility Concepts – Introduction to Game Theory – Strategic Decision-Making – Two-Person Zero-Sum Games – Pure and Mixed Strategies – Saddle Point – Dominance Principle – Attacker-Defender Models – Security Investment Decisions – Cyber Attack and Defence Strategy Analysis.

UNIT IV :-Scheduling, Prioritization and Cyber Security Operations (12 hours)

Scheduling Concepts – Resource-Constrained Scheduling – Job Sequencing – Task Prioritization – Incident Response Scheduling – Vulnerability Remediation Scheduling – Patch Prioritization – Security Testing and Assessment Planning – Project Scheduling – PERT and CPM Concepts – Critical Path Analysis – Time-Cost Considerations – Applications to Cyber Security Operations and Security Project Management.

UNIT V :- Risk Optimization, Simulation and Computational Methods(12 hours)

Cyber Security Risk Modelling – Risk-Based Optimization – Cost-Risk Trade-off – Security Control Selection – Multi-Criteria Decision Making – Introduction to Heuristic and Metaheuristic Optimization – Genetic Algorithm Concepts – Particle Swarm Optimization Concepts – Simulation and Monte Carlo Methods – Optimization under Uncertainty – Computational OR using Python – Applications to Cyber Risk and Security Decision Analytics.

Text Books

1. Hamdy A. Taha, **Operations Research: An Introduction**, Pearson/Prentice Hall.
2. Frederick S. Hillier and Gerald J. Lieberman, **Introduction to Operations Research**, McGraw-Hill.

References

1. Kanti Swarup, P. K. Gupta and Man Mohan, **Operations Research**, Sultan Chand & Sons.
2. J. K. Sharma, **Operations Research: Theory and Applications**, Trinity Press.
3. R. Panneerselvam, **Operations Research**, PHI Learning.
4. Ravindran, Phillips and Solberg, **Operations Research: Principles and Practice**, John Wiley and Sons.

Web Resources

1. **NPTEL – Operations Research** – Mathematical modelling, optimization, network models, decision analysis and computational OR.
2. **Google OR-Tools** – Linear programming, integer programming, constraint optimization and routing.
3. **SciPy Optimization** – Numerical optimization and optimization algorithms using Python.
4. **PuLP Documentation** – Linear and integer programming using Python.
5. **NetworkX Documentation** – Network optimization, shortest path, spanning tree and flow algorithms.

	QUANTUM COMPUTING	L	T	P	C
		3	1	0	4

(For Students admitted from 2023 onwards)
Common for B.Sc. (CS with Data Science) / B.Sc. (CS with Cyber security)

COURSE OBJECTIVES

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and its relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

COURSE OUTCOMES:

- Explain the fundamental concepts of quantum computing, including complex numbers, linear algebra, quantum mechanics, qubits, superposition, matrices and operators.
- Apply quantum gates and multi-qubit operations to design and develop basic quantum circuits and understand the principles of quantum error correction.
- Analyze fundamental quantum algorithms such as Deutsch's, Deutsch–Jozsa, Grover's and Quantum Fourier Transform algorithms and evaluate their advantages over classical approaches.
- Explain and analyze the principles of classical and quantum information theory, including Shannon's and Schumacher's noiseless channel coding theorems and information transmission through noisy quantum channels.
- Apply the principles of quantum cryptography to understand Shor's factoring algorithm, Quantum Key Distribution, BB84 and Ekert protocols, and assess their significance for secure communication.

SYLLABUS

UNIT I: Quantum Computing Basic Concepts - Complex Numbers - Linear Algebra - Postulates of Quantum Mechanics - Matrices and Operators - Global Perspectives - Quantum Bits - Representations of Qubits – Superposition **12**

UNIT II: Quantum Gates and Circuits - Universal Logic Gates - Basic Single Qubit Gates - Multiple Qubit Gates - Circuit Development - Quantum Error Correction **12**

UNIT III: Quantum Algorithms - Quantum Parallelism - Deutsch's Algorithm - Deutsch-Jozsa Algorithm - Quantum Fourier Transform and Its Applications - Quantum Search Algorithms - Grover's Algorithm **12**

UNIT IV: Quantum Information Theory - Data Compression - Shannon's Noiseless Channel Coding Theorem - Schumacher's Quantum Noiseless Channel Coding Theorem - Classical Information over Noisy Quantum Channels **12**

UNIT V: Quantum Cryptography - Classical Cryptography Basic Concepts - Private Key Cryptography - Shor's Factoring Algorithm - Quantum Key Distribution - BB84 - Ekert Protocol **12**

TEXT BOOKS:

1. **Parag K. Lala**, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education, 2020.
   Units Covered: Unit I – Quantum Computing Basic Concepts; Unit II – Quantum Gates and Circuits; Unit III – Quantum Algorithms; Unit V – Quantum Cryptography.
2. **Michael A. Nielsen and Isaac L. Chuang**, Quantum Computation and Quantum Information, Cambridge University Press, 2010.
   Units Covered: Unit I – Quantum Computing Basic Concepts; Unit II – Quantum Gates and Circuits; Unit III – Quantum Algorithms; Unit IV – Quantum Information Theory; Unit V – Quantum Cryptography.

REFERENCE BOOKS:

1. **Chris Bernhardt**, Quantum Computing for Everyone, The MIT Press, 2020. **Units Covered:** Unit , II , III.
2. **N. David Mermin**, Quantum Computer Science: An Introduction, Cambridge University Press, 2007. **Units Covered:** Unit I, II, III,IV,V

WEB RESOURCES:

1. **Microsoft Quantum Learning** – Quantum computing fundamentals, qubits, quantum gates, circuits, algorithms and programming.
   Microsoft Quantum Learning
2. **IBM Quantum Learning** – Quantum computing concepts, quantum circuits, algorithms and hands-on learning resources.
   IBM Quantum Learning
3. **Qiskit Documentation** – Practical resources for developing and executing quantum circuits and algorithms.
   Qiskit Documentation

	PROJECT	L	T	P	C
		0	0	21	12

(For Students admitted from 2023 onwards)

COURSE OBJECTIVES

- To understand the software engineering methodologies for project development.
- To gain knowledge on recent technologies.
- To develop software products in various domains.
- To improve their communication and presentation skill.
- To get training for testing the software products.

COURSE OUTCOME

- Analyze and design software in an efficient manner.
- Understand the features of current technologies.
- Implement the applications in various domains.
- Create Test Plan and apply various testing methods.
- Able to communicate and present the software product.

INSTRUCTIONS

1. Students have to do projects in an Industry/Research Organization/In-house.
2. Students must attend the review meeting as per the guidelines.
3. The software products will be developed and tested in various domains using current technologies.
4. After completion of the project, students should submit Project Completion Certificate.
5. The document related to the Project should be prepared as per the guidelines and should be submitted on time.

Students may have to publish the papers based on their project work before submission of the Project Document.