Bharati Vidyapeeth
(Deemed To Be University), Pune
(India)

Accredited 'A++' Grade (2024) By NAAC
Category- I University Status by UGC
'A' Grade University Status by MHRD Govt of India

Bachelor of Science
in
Cyber Security and Digital Forensic
B. Sc (CS & DF)
Under Faculty of Management

To be implemented from 2025-26

Bharati Vidyapeeth (Deemed to be University), Pune
Faculty of Science

Bachelor of Science In Cyber Security and Digital Forensics

B.Sc. (Cyber Security and Digital Forensics)

I. Preamble

The B.Sc. in Cyber Security and Digital Forensics program is designed to provide students with a comprehensive understanding of emerging technologies that drive today's digital transformation. As CS and DF have become indispensable across various industries, the program aims to develop professionals capable of applying these technologies to solve complex problems, innovate, and create intelligent solutions.

This course emphasizes the integration of theoretical foundations with practical skills to prepare students for both research and industry-oriented careers. It focuses on key areas such as supervised and unsupervised learning, neural networks, natural language processing, computer vision, deep learning, big data, cloud computing, and cybersecurity. Students will gain expertise in data-driven decision-making, AI-based project management, and industry-relevant applications.

In addition to technical skills, the program in stills professional ethics, communication, teamwork, and lifelong learning capabilities to foster leadership and adaptability in a rapidly evolving technological landscape. Through rigorous coursework, research projects, internships, and real world problem-solving experiences, graduates will be equipped to meet global demands and contribute responsibly to advancements in CS and DF.

II. Vision

Preparing the Students to cope with the rigor of Post Graduate Programmes in global and creating high calibre solution architects for software development in CS and DF, who will also be sensitive to societal concerns.

Mission

- We aim to drive transformation, technology and innovation through problem solving approach and research development.

- We aim to prepare students with to become productive in the field of Computer Science (CS and DF) and to be lifelong learner.

III. Aims

- To impart quality computer education to enhance logical computing and programming skills.
- To implement innovative techniques and process in leading-learning and evaluation.
- To further creativity and pursuit of excellence in computer applications.

IV. Eligibility

Any candidate passed standard XII (10+2) or equivalent examination from any recognized Board with a minimum of 35% marks or equivalent grade. Mathematics not mandatory.

V. Program Outcomes (POs)

1. Apply mathematics, computer science, and AI knowledge to solve real-world problems.
2. Analyze complex problems and formulate AI-based solutions.
3. Design CS and DF applications considering social, safety, and environmental needs.
4. Conduct research to develop innovative AI models and solutions.
5. Utilize modern AI tools, platforms, and frameworks effectively.
6. Practice ethical responsibilities and understand the societal impact of AI technologies.
7. Communicate effectively in both technical and non-technical contexts.
8. Collaborate and work within multidisciplinary teams to manage AI projects.
9. Engage in lifelong learning to adapt to advancements in CS and DF.
10. Recognize and address societal and environmental issues with sustainable AI innovations.

VI. Program Specific Outcomes (PSOs)

1. Develop and implement AI-driven solutions using machine learning and neural network models.
2. Analyze large datasets and enable data-driven decision-making.
3. Apply AI concepts in emerging technologies like IoT, robotics, and automation.
4. Design and deploy real-world AI systems while collaborating with industry professionals.

VII. Duration of the Programme

The duration of the B. Sc Bachelor's degree Program having six semesters and B. Sc (Honors) Degree Program is of four years spread across Eight Semesters with multiple entry and exit options. Student should complete the 4 years degree programme within 7 years.

a) Following EXIT options are available with the students:

Exit Option	Minimum Credits Requirements	NSQF Level	Bridge course
Under graduate Certificate - After successful completion of First Year	40	5	10 credits bridge course(s) lasting two months including at least 06 credits job specific internship that would help the learner to acquire job ready competencies to enter the workforce.
Under graduate Diploma - After successful completion of Second Year	80	6	
Bachelor's Degree - After successful completion of Third Year	120	7	
Bachelor's Degree with Honors- After successful completion of Fourth Year OR **Bachelor's Degree with Honors (Research) -** After successful completion of Fourth Year	150 152	8	

Note : Student is free to complete some interdisciplinary courses from other institutes provided he/she should earn 50% required credits from home HEI.

Student should complete the core disciplinary courses from home University (HEI) to get exit option for UG certificate/ UG diploma/ Bachelor Degree.

b) Following Entry options are available with the students :

- Student who opt Exit option at the end of 1st / 2nd /3rd year, can reenter the same programme within three years from Exit.

- Student with Bachelors Degree can opt for Bachelor degree with Honors

- Student with Bachelors Degree can opt for Bachelor degree with Honors (Research) if the student secure CGPA >= 7.5

National Skills Qualifications Framework (NSQF) Levels :

Option	NSQF Level	Professional Knowledge	Skill
At the end of first year	5	Knowledge of facts, principles, processes, and basic concepts in computing and AI domains	Knowledge of facts, principles, processes, and basic concepts in computing and AI domains
At the end of Second year	6	Factual and theoretical knowledge in the broader context of object-oriented programming and machine learning	Factual and theoretical knowledge in the broader context of object-oriented programming and machine learning
At the end of Third year	7	Wide-ranging factual and theoretic10al knowledge in machine learning, deep learning, and big data technologies	Wide-ranging factual and theoretical knowledge in machine learning, deep learning, and big data technologies
At the end of Fourth year	8	Comprehensive cognitive and theoretical knowledge with practical skills for creative problem-solving in AI	Comprehensive cognitive and theoretical knowledge with practical skills for creative problem-solving in AI

VIII. Grading System

The Faculty of science, Bharati Vidyapeeth (Deemed to be University) has suggested 10-point grading system for all programmes designed by its various Board of Studies. A grading system is a 10-point system if the maximum grade point is 10. The system is given in Table I below.

Table I: The 10-point Grading System Adapted for Programmes

Range of Percent Marks	[80,100]	[70,79]	[60,69]	[55,59]	[50,54]	[40,49]	[00,39]
Grade Point	10.0	9.0	8.0	7.0	6.0	5.0	0.0
Grade	O	A+	A	B+	B	C	D

Formula to calculate GP is as under:

Set $x = \text{Max}/10$ where Max is the maximum marks assigned for the examination (i.e. 100) Formula to calculate the individual evaluation

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} \leq 8x$	Truncate $(M/x) + 2$
$4x \leq \text{Marks} \leq 5.5x$	Truncate $(M/x) + 1$

IX. Scheme of Examination

Courses having Internal Assessment (IA) and University Examinations (UE) shall be evaluated by the respective constituent units and the University at the term end for **20** and **30** Marks respectively. The total marks of IA and UE shall be 50 Marks and it will be converted into grade points and grades.

For Internal Assessment (IA) the subject teacher may use the following assessment tools:

a) *Class participation*

b) *Class Tests*

c) *Presentations*

d) *Class Assignments*

e) *Case studies*

f) *Practical Assignments*

g) *Mini Projects*

h) *Oral*

X. Standard of Passing

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the student/learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If Student fails in IA, the learner passes in the course provided, he/she obtains a minimum 25% marks in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at UE.

A student who fails at UE in a course has to reappear only at UE as backlog candidate and clear the Head of Passing. Similarly, a student who fails in a course at IA he has to

reappear only at IA as backlog candidate and clear the Head of Passing to secure the GPA required for passing.

The 10 point Grades and Grade Points according to the following table

Range of Marks (%)	Grade	Grade Point
80≤Marks≤100	O	10
70≤Marks<80	A+	9
60≤Marks<70	A	8
55≤Marks<60	B+	7
50≤Marks<55	B	6
40≤Marks<50	C	5
Marks < 40	D	0

The performance at UE and IA will be combined to obtain GPA (Grade Point Average) for the course. The weights for performance at UE and IA shall be 60% and 40% respectively.

GPA is calculated by adding the UE marks out of 30 and IA marks out of 20. The total marks out of 50 are converted to grade point, which will be the GPA.

Formula to calculate Grade Points (GP)

Suppose that "Max" is the maximum marks assigned for an examination or evaluation, based on which GP will be computed. In order to determine the GP, Set x = Max/10 (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
8x ≤ Marks≤10x	10
5.5x ≤ Marks<8x	Truncate (M/x) +2
4x ≤ Marks<5.5x	Truncate (M/x) +1

Two kinds of performance indicators, namely the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all the courses since his/her enrolment. The CGPA of learner when he /she completes the programme is the final result of the learner.

The SGPA is calculated by the formula

$$SGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

Where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the Semester, including those in which he/she might have failed or those for which he/she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.** The CGPA is calculated by the following formula

$$CGPA = \frac{\sum C_k * GP_k}{\sum C_k}$$

Where, Ck is the Credit value assigned to a course and GPk is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrolment and also during the semester for which CGPA is calculated.

The CGPA shall be calculated up to two decimal place accuracy.

The formula to compute equivalent percentage marks for specified CGPA

% marks (CGPA)	10 * CGPA-10	If $5.00 \leq$ CGPA < 6.00
	5 * CGPA+20	If $6.00 \leq$ CGPA < 8.00
	10 * CGPA-20	If $8.00 \leq$ CGPA < 9.00
	20 * CGPA-110	If $9.00 \leq$ CGPA < 9.50
	40 * CGPA-300	If $9.50 \leq$ CGPA ≤ 10.00

XI. Award of Honours:

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Range of CGPA	Range of CGPA	Range of CGPA
$9.5 \leq CGPA \leq 10$	O	Outstanding	$80 \leq Marks \leq 100$
$9.0 \leq CGPA \leq 9.49$	A+	Excellent	$70 \leq Marks \leq 80$
$8.0 \leq CGPA \leq 8.99$	A	Very Good	$60 \leq Marks \leq 70$
$7.0 \leq CGPA \leq 7.99$	B+	Good	$55 \leq Marks \leq 60$
$6.0 \leq CGPA \leq 6.99$	B	Average	$50 \leq Marks \leq 55$
$5.0 \leq CGPA \leq 5.99$	C	Satisfactory	$40 \leq Marks \leq 50$
CGPA below 5.0	F	Fail	Marks below 40

XII. Course Structure

Semester- I

Bridge Course (Before Semester I): Introduction to Computers and IT Systems

Objective: Equip students with foundational computer science concepts and basic technical skills required for advanced learning in cybersecurity and digital forensics.

Basic Topics Covered:

- Introduction to Computers and IT Systems
- Basics of Programming Logic
- Overview of Cyber Security and Forensics
- Communication Skills and Team Collaboration

Semester I – Basic Concepts (Foundational Level)

Focus: Fundamentals of cybersecurity, digital forensics, and computer programming.

FY Semester I (Basic Level)

Focus: Foundational knowledge in artificial intelligence, programming, mathematics, and communication skills.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
101	Fundamentals of Cyber Security	Major Core	3	3	1	-	40	60	100
102	Introduction to Digital Forensics	Major Core	3	3	1	-	40	60	100
103	Computer Programming in C	Major Core	2	2	-	-	40	60	100
104	Computer Science Fundamentals Lab	Major Core	2	-	-	4	40	60	100*
105	Computer Programming in C Lab	Major Core	2	-	-	4	40	60	100*
106	Networking Fundamentals	Minor Core	2	2	-	-	40	60	100
107	English for Communication-I	AEC	2	2	-	-	50	-	50
108	Indian Knowledge System	VEC	2	2	-	-	50	-	50
109	Co-Curricular/Project Work	Co-Curricular/ Project Work	2	-	-	4	40	60	100*
Total			**20**	**14**	**4**	**12**	**380**	**420**	**800**

Semester- II

Bridge Course (Before Semester II) : Programming Logic and Problem Solving

Objective: Strengthen students' understanding of programming, networking basics, and digital forensics concepts introduced in Semester I.

Basic Topics Covered:

- •   Introduction to Algorithms
- •   Problem Solving with C Programming
- •   Overview of Database Concepts
- •   Introduction to Cyber Laws and Security Policies

FY Semester II (Basic Level)

- •   **Focus:** Core programming concepts, Database fundamentals.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
201	Data Structures and Algorithms	Major Core	3	3	1	-	40	60	100
202	Programming Fundamentals in Python	Major Core	3	3	1	-	40	60	100
203	Cyber Law and Security Policies	Major Core	2	2	-	-	40	60	100
204	Data Structures and Algorithms Lab	Major Core	2	-	-	4	40	60	100[*]
205	Programming Fundamentals in Python Lab	Major Core	2	-	-	4	40	60	100[*]
206	Database Concepts	Minor core	2	2	-	-	40	60	100
207	English for Communication II	AEC	2	2	-	-	50	-	50
208	Indian Constitution and Democracy	VEC	2	2	-	-	50	-	50
209	Co-Curricular/Project Work	Co-Curricular/Project Work	2	-	-	4	100	-	100[*]
Total			**20**	**14**	**2**	**12**	**380**	**420**	**800**

Semester-III

Bridge Course (Before Semester III) :

Objective: Prepare students for advanced concepts in software engineering, operating systems, and cybersecurity.

Basic Topics Covered: Object-Oriented Programming (OOP) Concepts

- Object-Oriented Programming (OOP) Concepts
- Advanced Database Management Techniques
- Cybersecurity Tools and Practices Overview
- Communication and Documentation Skills

Semester III (Intermediate Level)

Focus: Advanced concepts in operating systems, databases, cybersecurity, and software development.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	**T**	**P**			
301	OOP Programming	Major Core	3	3	1	-	40	60	100
302	Cyber Security Fundamentals	Major Core	3	3	1	-	40	60	100
303	Software Engineering Principles	Major Core	2	2	-	-	40	60	100
304	OOP Programming Lab	Major Core	2	-	-	4	40	60	100*
305	Advanced Database Concepts	Minor Core	2	2	-	-	40	60	100
306	Communication Skills Development	AEC	2	2	-	-	50	-	50
307	Introduction to Web Development	VEC	2	2	-	-	50	-	50
308	Field Project: Web Application development	Practical Training	2	-	-	4	40	60	100*
309	Co-Curricular/Project Work	Co-Curricular/ Project Work	2	-	-	4	40	60	100*
Total			**20**	**14**	**2**	**12**	**380**	**420**	**800**

Semester-IV

Bridge Course (Before Semester IV): Basics of Cryptography and Network Security

Objective: Prepare students for advanced concepts in operating systems, cybersecurity protocols, and digital evidence handling.

Basic Topics Covered:

- Basics of Cryptographic Techniques
- Network Security Essentials and Tools Overview
- Hands-on Practice with Network Monitoring Introduction to Digital Evidence Management

Semester IV (Intermediate Level)

- **Focus:** Advanced concepts in operating systems, cybersecurity, and digital evidence handling.
- Optimization Techniques and Advanced Statistics Overview

Semester IV (Intermediate Level)

Focus: Advanced AI topics, AI project development, and big data applications.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
401	Network Security	Major Core	3	3	1	-	40	60	100
402	Cryptography and Security Protocols	Major Core	3	3	1	-	40	60	100
403	Network Security Lab	Major Core	2	-	-	4	40	60	100*
404	Cryptography Lab	Major Core	2	-	-	4	40	60	100*
405	Digital Evidence Handling and Analysis	Minor Core	2	2	-	-	40	60	100
406	Operating Systems and File Systems	AEC	2	2	-	-	40	60	100
407	R-Programming	VEC	2	2	-	-	50	-	50
408	Field Project (Community Engagement)	Practical Training	2	-	-	4	50	-	50
409	Co-Curricular/Project Work	Co-Curricular/Project Work	2	-	-	4	40	60	100*
Total			**20**	**14**	**2**	**16**	**380**	**420**	**800**

Semester V

Bridge Course (Before Semester V) : Cyber Risk Management and Project Tools

Objective: Equip students with practical knowledge of advanced networking, cryptography, and project management strategies.

Basic Topics Covered:

- Advanced Network Configuration and Security
- Project Management Tools and Practices
- Cryptographic Protocol Applications
- Case Studies on Risk Management and Security Breaches

Semester V (Higher Level)

Focus: Advanced security protocols, forensics, and project management.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
501	Advanced Networking	Major Core	3	3	1	-	40	60	100
502	Cryptography and Security Protocols	Major Core	3	3	1	-	40	60	100
503	Cloud Computing Fundamentals	Major Core	2	2	-	-	40	60	100
504	Cryptography & Security Laboratory	Major Core	2	-	-	4	40	60	100*
505	Cloud Computing Fundamentals Laboratory	Major Core	2	-	-	4	40	60	100*
506	Cybersecurity Strategy and Risk Management	Minor Core	2	2	-	-	40	60	100
507	Introduction to Entrepreneurship	AEC	2	2	-	-	50	-	50
508	Professional Ethics and Workplace Skills	VEC	2	2	-	-	50	-	50
509	Community Engagement Project	Co-Curricular/Project Work	2	-	-	4	40	60	100*
Total			**20**	**14**	**2**	**12**	**380**	**420**	**800**

Semester VI

Bridge Course (Before Semester VI) : Incident Response and Vulnerability Management

Objective: Enhance students' understanding of cyber threats, incident response, and vulnerability management through practical exercises and real-world scenarios.
Basic Topics Covered:

- Incident Response and Threat Management
- Vulnerability Assessment Tools (Nessus, OpenVAS)
- Distributed Systems Architecture Overview
- Advanced Cybersecurity Strategy

Semester VI (Higher Level)

Focus: Cyber threats, incident response, vulnerability management, and advanced cybersecurity techniques.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
601	Advanced Cyber Threats and Vulnerability Management	Major Core	3	3	1	-	40	60	100
602	Penetration Testing	Major Core	3	3	1	-	40	60	100
603	Penetration Testing Laboratory	Major Core	2	-	-	4	40	60	100*
604	Advanced Cyber Threats and Vulnerability Management Laboratory	Major Core	2	-	-	4	40	60	100*
605-A	Digital Threat Intelligence	Major Elective	2	2	-	-	40	60	100
605-B	Digital Threat Intelligence Laboratory	Major Elective	2	-	-	4	40	60	100*
OR									
605-A	Blockchain Technology in Security	Major Elective	2	2	-	-	40	60	100
605-B	Blockchain Security Laboratory	Major Elective	2	-	-	4	40	60	100*
606	Introduction to Data Privacy	Minor Core	2	2	-	-	50	-	50
607	Vocational Training: AI & Cybersecurity Deployment	Vocational Training	2	2	-	-	50	-	50
608	Field Project: Security Incident Response	Field Project	2	-	-	4	40	60	100*
Total			**20**	**12**	**2**	**16**	**380**	**420**	**800**

Fourth year of B. Sc Honours Programme with Application Development

Bridge Course (Before Semester VII): Web and Cloud Security Basics

Objective: Prepare students for application-based cybersecurity skills, including web and cloud security, software testing, and industry-standard project practices.
Basic Topics Covered:

- Web Application Security Principles
- Cloud Security Compliance and Governance
- Introduction to Software Quality Assurance
- Research Methodology Essentials for Cybersecurity

Semester VII (Application Level)

Focus: Advanced skills in web security, cloud security, and risk assessment with practical exposure to tools and industry projects.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
701	Web Application Security	Major Core	3	3	1	-	40	60	100
702	Cloud Security and Governance	Major Core	3	3	1	-	40	60	100
703	Web Security Laboratory	Major Core	2	-	-	4	40	60	100*
704	Cloud Security Laboratory	Major Core	2	-	-	4	40	60	100*
705-A	Machine Learning in Security	Major Elective	2	2	-	-	40	60	100
705-B	Security ML Laboratory	Major Elective	2	-	-	4	40	60	100*
OR									
705-A	Security Auditing and Compliance	Major Elective	2	2	-	-	40	60	100
705-B	Auditing Laboratory	Major Elective	2	-	-	4	40	60	100*
706	Distributed systems	Minor core	2	2	-	-	50	-	50
707	Software Testing & Quality Assurance	Vocational training	2	2	-	-	50	-	50
708	Research Methodology and Innovation	Research Methodology	2	2	-	-	40	60	100
Total			**20**	**14**	**2**	**12**	**380**	**420**	**800**

Semester VIII

Bridge Course (Before Semester VIII) : Security Automation and AI Concepts in Cybersecurity

Objective: Equip students with advanced knowledge on security automation, AI-driven security applications, and final capstone project preparation.

Basic Topics Covered:

- Advanced Techniques for Security Automation
- Basic statistics details
- Real-world Case Studies

Semester VIII (Application Level)

Focus: Specialization in secure software development, advanced incident response, research methodology, and practical project-based learning.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	**T**	**P**			
801	Secure Software Development	Major Core	3	3	1	-	40	60	100
802	Advanced Incident Response	Major Core	3	3	1	-	40	60	100
803	Secure Software Development Lab	Major Core	2	-	-	4	40	60	100*
804	Incident Response Lab	Major Core	2	-	-	4	40	60	100*
805-A	Mobile Penetration Testing	Major Elective	2	2	-	-	40	60	100
806-B	Mobile Penetration Testing Lab	Major Elective	2	-	-	4	40	60	100*
OR									
805-A	Data Science	Major Elective	2	2	-	-	40	60	100
805-B	Data Science Lab	Major Elective	2	-	-	4	40	60	100*
806	Mobile Application Security	Minor Core	2	2	-	-	50	-	50
807	Industry Internship	OJT (Internship)	4	-	-	4	150	-	150*
Total			**20**	**10**	**2**	**16**	**440**	**360**	**800**

Fourth year of B. Sc Honours Programme with Research

Semester VII (Application Level) Research Degree

Focus: Specialization in secure software development, advanced incident response, research methodology, and practical project-based learning.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
701	Research Methodology and Innovation	Major Core	4	4	-	-	40	60	100
702	Secure Software Development with Lab	Major Core	4	2	-	4	100	100	200*
703	Cloud Security and Governance with Lab	Major Core	4	2	-	4	100	100	200*
704	Advanced Incident Response with Lab	Major Core	4	2	-	4	100	100	200*
705	Research Publication I	Major Core	2	-	2	-	100	-	100*
Total			**18**	**10**	**2**	**12**	**440**	**360**	**800**

Semester VIII (Application Level) Research Degree

Focus: Simple application-based subjects that cover security automation, IoT, AI, and advanced practical implementations without repetition of previous topics.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
801	Dissertation	Major Core	12	-	-	12	100	300	801*
802	Seminar on Emerging Trends in Cybersecurity & Forensics	Major Core	2	2	-	-	200	-	802*
803	Research Publication-II	Major Core	2	-	2	-	200	-	803*
Total			**16**	**2**	**2**	**12**	**500**	**300**	

*These courses/subjects evaluation will be carried out as practical or viva examination (No university theory examination is conducted): 104, 105, 109, 204, 205, 209, 304, 308, 309, 403, 404, 409, 504, 505, 509, 507, 603, 604, 605-B, 608,
Fourth Year – Application Development: 703, 704, 705-B, 803, 804, 805-B, 807
Fourth Year – Research: 702,703,704, 705, 801, 802, 803

Abbreviations Expanded

➢ **AEC** - Ability Enhancement Course

➢ **VEC** - Value Education course

Semester	Course Code	Course Title	
I	101	Fundamentals of Cyber Security	
	Prepared by		
Type	**Credits**	**Evaluation**	**Marks**
Major Core	3	UE:IE	60:40

Course Objectives:

- To introduce the foundational concepts, history, and goals of Artificial Intelligence.
- To familiarize students with various problem-solving methods and AI techniques.
- To provide insights into knowledge representation, search strategies, and AI applications.

Course Outcomes:

After completing the course the students shall be able to
CO1: Describe cybersecurity principles and CIA triad.
CO2: Explain threat types and vulnerabilities.
CO3: Apply basic security policies and encryption.
CO4: Analyze the effectiveness of firewalls and access controls.

Unit	Content (Detailed)	Sessions (Hours)	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	**Cyber Security Foundations**– Definition and need for cybersecurity– Principles of security: Confidentiality, Integrity, Availability (CIA)– Types of security: Network, System, Application– Key security concepts: Assets, Threats, Vulnerabilities, Risks	6	CO1	Lecture, PPTs, Real-life Examples	Understand	Class Test, Assignment
2	**Cyber Threats and Attacks**– Common threats: Malware, Phishing, Ransomware, DoS/DDoS, MITM– Attack surfaces, vectors, and actors– Social engineering attacks and case studies	6	CO2	Case Studies, Demonstrations	Understand, Apply	Quiz, Assignment
3	**Cryptography and Secure Communication**– Importance of cryptography in cybersecurity– Symmetric vs Asymmetric Encryption (AES, RSA)– Hashing techniques: MD5, SHA– Digital	6	CO3	Videos, Hands-on Demos	Apply	Class Test, Viva

	Signatures and secure transmission					
4	**Security Mechanisms and Access Controls**– Authentication methods: Passwords, OTP, Biometrics– Network security tools: Firewalls, IDS/IPS– Access Control Models: DAC, MAC, RBAC	6	CO4	Multimedia, Demos, Visual Aids	Analyze	Group Presentation
5	**Policies, Compliance & Future Trends**– Security Policies, Guidelines, and Audits– Incident response fundamentals– Cybersecurity standards (e.g., ISO 27001)– Future trends: Zero Trust, AI in Security– Careers and certifications in cybersecurity	6	CO1, CO4	Case Study, Industry Talk, Exploration	Apply, Analyze, Evaluate	Report Review, Reflective Essay

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	William Stallings	Network Security Essentials	2016	Pearson Education
2	Chuck Easttom	Cybersecurity Essentials	2019	Jones & Bartlett
3	Charles P. Pfleeger	Security in Computing	2015	Pearson Education

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/106105031
2	https://www.tutorialspoint.com/cyber_security/index.htm
3	https://www.ibm.com/security/cybersecurity-threats

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
I	**102**	**Introduction to Digital Forensics**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Major Core	3	UE:IE	60:40

Course Objectives:

- Understand digital forensics process and investigation lifecycle.
- Learn basics of evidence collection and analysis.
- Explore tools and laws related to digital forensics.

Course Outcomes:

After completing the course the students shall be able to
CO1: Understand forensics principles and lifecycle.
CO2: Identify types of digital evidence.
CO3: Use basic forensic tools for analysis.
CO4: Discuss legal issues in digital forensics

Unit	Content (Detailed)	Sessions (Hours)	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	**Introduction to Digital Forensics**– Definition, importance, and objectives of digital forensics– Phases: Identification, Preservation, Analysis, Presentation– Types: Computer, Network, Mobile Forensics– Current trends: Cloud, Anti-forensics, Career opportunities	6	CO1	Lecture, PPT, Group Task	Remember, Understand, Analyze	Class Test, Quiz, Poster
2	**Evidence Handling and Acquisition**– Types of evidence: Volatile vs Non-Volatile– Evidence acquisition techniques: Imaging and Cloning– Chain of custody and handling protocols– Basics of file systems: FAT, NTFS	6	CO2	Case Study, Examples	Understand, Apply	Assignment

3	**Forensic Tools and Techniques**– Introduction to tools: FTK, Autopsy, EnCase, Wireshark– Disk and memory analysis– Email, log, and registry forensics– Open-source vs commercial tools	6	CO3	Demonstration, Lab Videos	Apply, Analyze	Practical Demo, Viva
4	**Legal, Ethical, and Investigative Framework**– Cybercrime laws: IPC, IT Act, international frameworks– Ethical responsibilities in forensics– Forensic report writing and presentation– Documentation and timeline analysis	6	CO4	Discussion, Case Study, Process Walkthrough	Analyze, Evaluate	Presentation, Report Draft
5	**End-to-End Investigation & Evidence Admissibility**– Conducting a forensic investigation– Report validation and courtroom standards– Evidence admissibility in court– Final case preparation and closure	6	CO3, CO4	Role Play, Mock Investigation	Apply, Evaluate	Final Report, Viva

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Nelson, Phillips, Steuart	Guide to Computer Forensics and Investigations	2018	Cengage Learning
2	Marjie T. Britz	Computer Forensics and Cyber Crime	2014	Pearson Education
3	John Sammons	The Basics of Digital Forensics	2020	Syngress (Elsevier)

Online Resources:

No.	Website Address
1	https://www.tutorialspoint.com/cprogramming
2	https://www.javatpoint.com/c-programming-language-tutorial
3	https://www.w3schools.in/c

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
I	**103**	**Introduction to Digital Forensics**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Major Core	2	UE:IE	60:40

Course Objectives:

- Understand digital forensics process and investigation lifecycle.
- Learn basics of evidence collection and analysis.
- Explore tools and laws related to digital forensics.

Course Outcomes:

After completing the course the students shall be able to
CO1: Understand forensics principles and lifecycle.
CO2: Identify types of digital evidence.
CO3: Use basic forensic tools for analysis.
CO4: Discuss legal issues in digital forensics.

Unit	Content	Sessions (Hrs)	Cos	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Digital Forensics**: Definition, importance, scope, and objectives of digital forensics. Key phases of the forensic process (identification, preservation, analysis, presentation). Classification of	9	CO1	Lecture, PPT, Discussion	Remember, Understand	Class Test, Quiz

	forensics: Computer forensics, Network forensics, Mobile device forensics.					
2	**Evidence Identification and Acquisition**: Types of digital evidence – volatile and non-volatile. Rules of evidence handling. Chain of custody. Data acquisition techniques (disk imaging, cloning). File system forensics (FAT, NTFS basics).	9	CO2	Case Study, Live Examples	Understand, Apply	Assignment, Practical Sheet
3	**Forensics Tools and Techniques**: Introduction to common tools – FTK, Autopsy, EnCase, Wireshark. Steps to perform preliminary analysis using tools. Disk and memory analysis basics. Email, log, and registry forensics overview.	8	CO3	Demonstration, Lab Videos	Apply, Analyze	Practical Demo, Viva
4	**Legal and Ethical Aspects**: Introduction to cybercrime and IPC/IT Act sections. International laws and frameworks. Ethical responsibilities of forensic investigators. Report writing and presentation of evidence in court.	8	CO4	Discussion, Case Study	Analyze, Evaluate	Presentation, Case-based Q&A

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Nelson, Phillips, Steuart	Guide to Computer Forensics and Investigations	2018	Cengage Learning
2	Marjie T. Britz	Computer Forensics and Cyber Crime	2014	Pearson Education
3	John Sammons	The Basics of Digital Forensics	2020	Syngress (Elsevier)

Online Resources:

No.	Website Address

1	https://nptel.ac.in/courses/106105205
2	https://www.tutorialspoint.com/digital_forensics/index.htm
3	https://opensecuritytraining.info

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
I	**104**	**Computer Science Fundamentals Laboratory**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Minor Core	2	UE:IE	60:40

Course Objectives:

- To provide hands-on experience in basic computer operations, system software, and command-line interfaces.
- To enhance practical knowledge of file systems, memory management, and utilities in operating systems.
- To build foundational skills in using tools relevant to cybersecurity and digital forensics.
- To develop technical confidence in performing basic troubleshooting and system diagnostics.

Course Outcomes:

After completing the course the students shall be able to
CO1: Demonstrate proficiency in using operating system commands and file structures.
CO2: Use utilities for system configuration, storage, and task management.
CO3: Explore basic security tools and network commands.
CO4: Apply system-level understanding to identify simple performance issues or errors.

Unit	Practical Content	Sessions (Hrs)	COs	Teaching Methodology	Cognition Level	Evaluation Tools
1	Introduction to computer hardware and software components. Operating system installation (Windows/Linux).	4	CO1	Demonstration	Understand	Viva
2	File and directory commands in Windows/Linux: navigation, creation, deletion, permissions, redirection.	4	CO1	Hands-on	Apply	Practical Exam
3	Disk and memory	4	CO2	Practice-based	Apply	Observation

	management: Task Manager, top, free, df, du, chkdsk, diskpart.					
4	Basic shell scripting (Linux): creating and executing scripts, variables, conditional statements.	4	CO2	Mini Project	Apply	Viva, Execution
5	Basic network configuration and diagnostics: ipconfig, ping, tracert, netstat, nslookup.	4	CO3	Case Study, Demos	Understand, Analyze	Test
6	Use of simple cybersecurity tools (e.g., antivirus, system audit tools, hashing utilities like md5sum).	4	CO3, CO4	Simulation	Apply, Analyze	Record Book Review

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Anita Goel	Computer Fundamentals	2016	Pearson Education
2	Norton Peter	Introduction to Computers	2017	McGraw Hill
3	D. S. Yadav	Foundations of Information Technology	2020	New Age International

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/106103199
2	https://www.geeksforgeeks.org/basics-of-computers/
3	https://www.tutorialspoint.com/computer_fundamentals/computer_overview.htm

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
I	**105**	**Computer Programming in C Lab**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Major Core	2	UE:IE	60:40

Course Objectives:

- To provide practical experience in writing and executing C programs.
- To strengthen students' problem-solving ability using structured programming techniques.
- To implement decision making, loops, functions, arrays, strings, and file-handling concepts.
- To develop logical skills required for software development and debugging.

Course Outcomes:

After completing the course the students shall be able to

CO1: Write, compile, and debug basic C programs.
CO2: Implement control flow mechanisms such as loops and conditional structures.
CO3: Use arrays, functions, and string operations to solve real-life problems.
CO4: Apply file handling operations for data storage and retrieval.

Unit	Practical Content	Sessions (Hrs)	COs	Teaching Methodology	Cognition Level	Evaluation Tools
1	Simple C programs using variables, data types, and operators	4	CO1	Hands-on Practice	Remember, Apply	Viva
2	Programs using if, if-else, nested-if, switch-case statements	4	CO2	Lab Demonstration	Apply	Test
3	Looping constructs: while, do-while, for loops	4	CO2	Blackboard, Demos	Apply, Analyze	Practical Sheet
4	Functions: user-defined, recursive, call by value/reference	4	CO3	Code Walkthrough	Apply	Record Book Check
5	Arrays (1D, 2D) and their operations	4	CO3	Structured Practice	Apply, Analyze	Viva
6	String operations using library and custom functions	4	CO3	Group Activity	Understand, Apply	Execution
7	File handling: read/write files using fprintf, fscanf, fgetc, fputc	4	CO4	Simulation	Apply, Analyze	Mini Project

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	E. Balagurusamy	Programming in ANSI C	2019	McGraw Hill Education
2	Yashavant Kanetkar	Let Us C	2020	BPB Publications
3	Reema Thareja	Programming in C	2018	Oxford University Press

Online Resources:

No.	Website Address
1	https://www.geeksforgeeks.org/c-programming-language/
2	https://www.tutorialspoint.com/cprogramming/index.htm
3	https://nptel.ac.in/courses/106104128

MOOCs:

No.	Platform
1	NPTEL – Basics of Computers by IIT Kharagpur
2	Coursera – Introduction to Computers by IBM
3	edX – Computer Science Essentials for Software Development

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	**Course Code**	**Course Title**	
I	**106**	**Networking Fundamentals**	
	Prepared by		
Type	**Credits**	**Evaluation**	**Marks**
Minor core	2	UE:IE	60:40

Course Objectives:

- To introduce the basic concepts and models of computer networks.
- To explain data transmission mechanisms and network protocols.
- To provide foundational knowledge of network devices, IP addressing, and routing.
- To familiarize students with LAN, WAN, and basic troubleshooting techniques.

Course Outcomes:

After completing the course the students shall be able to:
CO1: Understand key networking concepts, models and transmission media.
CO2: Identify and explain network devices and their functions.
CO3: Apply knowledge of IP addressing and subnetting.
CO4: Describe network types, architectures and basic troubleshooting methods.

Unit	Content	Sessions (Hrs)	COs	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Networking**: Need of computer networks, components of a network, types (LAN, MAN, WAN), network topologies (bus, star, ring, mesh), OSI and TCP/IP models.	5	CO1	Lecture, Diagrams	Remember, Understand	Class Test
2	**Transmission Media and Devices**: Guided vs. unguided media, twisted pair, coaxial cable, fiber optics, wireless transmission. Devices: Hub, Switch, Router, Bridge, Repeater, Gateway.	5	CO2	Demonstration, Visual Aids	Understand	Quiz
3	**IP Addressing and Routing**: IPv4 structure, classes, private/public IP, subnetting, default gateway, DNS, DHCP, static vs. dynamic routing.	5	CO3	Board Explanation, Examples	Apply	Assignment
4	**Network Types and Troubleshooting**: Client-server vs. peer-to-peer, WLAN, PAN, basic commands: ping, tracert,	5	CO4	Case Study, Simulation	Analyze	Viva, Presentation

	ipconfig, netstat. Common errors and resolutions.					

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Behrouz A. Forouzan	Data Communications and Networking	2017	McGraw Hill Education
2	Andrew S. Tanenbaum	Computer Networks	2013	Pearson Education
3	James F. Kurose	Computer Networking: A Top-Down Approach	2021	Pearson Education

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/106105081
2	https://www.geeksforgeeks.org/computer-network-tutorials/
3	https://www.tutorialspoint.com/computer_fundamentals/computer_networking.htm

MOOCs:

No.	Platform
1	NPTEL – Computer Networks by IIT Kharagpur
2	Coursera – The Bits and Bytes of Computer Networking
3	edX – Networking Essentials by Cisco

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
I	**107**	**English for Communication – I**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
VEC	2	IE	50

Course Objectives:

- To develop basic communication skills in English for academic and professional contexts.
- To improve vocabulary, grammar, and sentence construction for written and spoken communication.
- To introduce students to functional English through real-life situations.

To prepare students for effective participation in interviews, discussions, and presentations

Course Outcomes:

After completing the course the students shall be able to

CO1: Demonstrate improved grammar and sentence structure in written communication.
CO2: Use correct pronunciation, vocabulary, and tone in oral communication.
CO3: Compose formal and informal communication such as emails, applications, and reports.
CO4: Participate effectively in group discussions, role plays, and interviews.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Fundamentals of Communication**: Meaning and types of communication; barriers; effective communication process; body language.	5	CO1	Lecture, Discussion	Understand	Class Test
2	**Grammar and Usage**: Tenses, voice, reported speech, articles, prepositions, subject-verb agreement, vocabulary building.	6	CO1	Worksheet, Blackboard	Apply	Grammar Test
3	**Written Communication**: Formal vs. informal writing; email etiquette; application writing; resume preparation; paragraph writing.	5	CO3	Writing Practice	Apply	Assignment
4	**Oral Communication Skills**: Self-introduction, mock interviews, group discussions, debate, role play, pronunciation drills.	6	CO2, CO4	Language Lab, Activity-based	Apply, Analyze	Oral Test, Viva

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Meenakshi Raman, Sangeeta Sharma	Technical Communication	2015	Oxford University Press
2	Raymond Murphy	English Grammar in Use	2019	Cambridge University Press
3	Sanjay Kumar, Pushp Lata	Communication Skills	2018	Oxford University Press

Online Resources:

Sr. No.	Website Address
1	https://nptel.ac.in/courses/109104031 (English Communication)
2	https://www.englishgrammar.org
3	https://learnenglish.britishcouncil.org

MOOCs:

Sr. No.	Platform
1	NPTEL – Soft Skills / English Communication
2	Coursera – Improve Your English Communication Skills (Georgia Tech)
3	Swayam – English Language for Communication

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
I	**108**	**Indian Knowledge System**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
IKS	2	IE	50

Course Objectives:

- To introduce students to the holistic and scientific heritage of Indian civilization.
- To provide awareness about Indian knowledge traditions in science, technology, arts, education, and environment.
- To instill values from Indian philosophical systems and cultural practices.
- To promote understanding of India's contribution to global knowledge and sustainable development.

Course Outcomes:

After completing the course the students shall be able to
CO1: Explain the core values and philosophical foundations of Indian knowledge systems.
CO2: Identify contributions of ancient India in the fields of science, technology, and mathematics.
CO3: Appreciate Indian systems of education, medicine, and environmental sustainability.
CO4: Demonstrate cultural sensitivity and values rooted in Indian traditions.

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Indian Knowledge Systems (IKS):** Definition, nature and structure of IKS; Six Darshanas (schools of philosophy); concept of Dharma, Artha, Kama, Moksha.	5	CO1	Lecture, Storytelling	Understand	Class Test
2	**Science and Technology in Ancient India:** Vedic mathematics, metallurgy, astronomy (Aryabhatta, Bhaskaracharya), architecture (temples, Vastu), Ayurveda and Siddha systems.	6	CO2	PPT, Visual Aids	Understand, Analyze	Assignment
3	**Indian Education and Literature:** Ancient education system (Gurukula, Nalanda, Takshashila); literature (Vedas, Upanishads, epics	5	CO3	Reading & Discussion	Understand	Presentation

	like Ramayana and Mahabharata).					
4	**Environmental and Ethical Perspectives in IKS:** Indian traditions on sustainability, Panchabhutas, festivals and ecology, Swachh Bharat philosophy, Yoga, and holistic living.	6	CO4	Multimedia, Activities	Analyze, Evaluate	Role Play, Reflection

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Kapil Kapoor	Text and Interpretation: The Indian Tradition	2005	DK Printworld
2	Subhash Kak	The Indian Mind: Essentials of Indian Philosophy	2016	D.K. Printworld
3	Michel Danino	Indian Knowledge Systems	2021	PHI Learning

Online Resources:

No.	Website Address
1	https://iks.iitgn.ac.in
2	https://nptel.ac.in/courses/121106014
3	https://ccrtindia.gov.in

MOOCs:

No.	Platform
1	NPTEL – Indian Knowledge Systems (by IIT Kharagpur)
2	Swayam – Indian Culture and Heritage
3	AICTE IKS Cell – IKS Online Courses

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
II	**201**	**Data Structures and Algorithms**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Major Core	3	UE:IE	60:40

Course Objectives:

- To understand fundamental concepts of data structures and their applications.
- To study algorithmic techniques for problem-solving and optimization.
- To apply appropriate data structures for efficient data storage and manipulation.
- To analyze algorithm performance and space-time complexity.

Course Outcomes:

After completing the course the students shall be able to
CO1: Describe linear and non-linear data structures and their characteristics.
CO2: Apply stacks, queues, and linked lists in various real-life applications.
CO3: Analyze and implement tree and graph algorithms.
CO4: Evaluate algorithm efficiency using time and space complexity.

Unit	Content (Detailed)	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Data Structures and Algorithms**– Data types, arrays, pointers– Recursion and recursive algorithms– Algorithm complexity (Big-O, Big-Ω, Big-Θ)– Classification of data structures	6	CO1	Lecture, Problem Solving	Remember, Understand	Class Test
2	**Linear Data Structures**– Arrays, stacks (operations, applications)– Queues: linear, circular, dequeue– Linked lists: singly, doubly, circular	6	CO2	Demonstration, Examples	Understand, Apply	Assignment
3	**Non-linear Data Structures**– Trees: Binary Tree, BST, Heap– Tree Traversals: Preorder, Inorder, Postorder– Graphs: Representations,	6	CO3	Diagrams, Flowcharts	Apply, Analyze	Quiz

	Traversals (BFS, DFS)					
4	**Searching and Sorting Techniques**– Linear and Binary Search– Sorting Algorithms: Bubble, Selection, Insertion, Merge, Quick Sort– Complexity analysis of algorithms	6	CO4	Code Tracing, Board Work	Analyze, Evaluate	Viva, Test
5	**Hashing, Indexing and Applications**– Hashing: Functions and Collision Handling (Chaining, Open Addressing)– Indexing Methods and Performance– Applications in Compilers, Databases, AI, Cybersecurity– Overview of STL (C++) or Collections (Python)	6	CO3, CO4	Visualization, Real-World Mapping	Apply, Analyze	Assignment, Test

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Ellis Horowitz, Sartaj Sahni	Fundamentals of Data Structures	2008	Universities Press
2	Seymour Lipschutz	Data Structures	2014	McGraw Hill Education
3	Mark Allen Weiss	Data Structures and Algorithm Analysis	2013	Pearson Education

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/106102064
2	https://www.geeksforgeeks.org/data-structures/
3	https://www.tutorialspoint.com/data_structures_algorithms/index.htm

MOOCs:

No.	Platform
1	NPTEL
2	Coursera
3	edX

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
II	**202**	**Programming Fundamentals in Python**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Major Core	3	UE:IE	60:40

Course Objectives:

- To introduce the Python programming language and its core features.
- To develop problem-solving skills using Python constructs.
- To familiarize students with object-oriented concepts in Python.
- To apply Python programming in simple real-world applications.

Course Outcomes:

After completing the course the students shall be able to
CO1: Understand Python syntax, variables, operators, and control structures.
CO2: Apply lists, tuples, sets, and dictionaries for data management.
CO3: Use functions and modules to structure Python programs effectively.
CO4: Implement object-oriented programming concepts and basic file handling in Python.

Unit	Content (Detailed)	Sessions (Hours)	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	**Introduction to Python**– Features, installation, IDEs– Basic syntax, variables, data types– Input/output, operators, expressions	6	CO1	Lecture, Live Coding	Understand	Class Test
2	**Control Structures and Collections**– Control flow: if, elif, else, while, for, break, continue, pass– Data collections: lists, tuples, sets, dictionaries – operations and use cases	6	CO2	Hands-on Exercises	Apply	Coding Assignment
3	**Functions, Modules and Packages**– Defining and calling functions, arguments, recursion– Built-in functions– Modules: importing, user-defined– Creating and using	6	CO3	Lab Practice	Apply, Analyze	Practical Test

	packages					
4	**Object-Oriented Programming in Python**– Classes and objects, constructors, self– Inheritance, encapsulation, polymorphism– Method overriding	6	CO4	Examples, Projects	Apply, Create	Viva, Mini Project
5	**File Handling, Exceptions and Applications**– File handling: open, read, write (text & binary), file methods– Exception handling: try-except-finally– Python Applications: mini-projects (calculator, file parser)– Intro to libraries: math, random, datetime	6	CO2, CO3, CO4	Practice Examples, Projects, Code Reviews	Analyze, Evaluate	Practical Test, Project Submission

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Reema Thareja	Python Programming using Problem Solving Approach	2019	Oxford University Press
2	E. Balagurusamy	Problem Solving and Python Programming	2018	McGraw Hill Education
3	Mark Lutz	Learning Python	2013	O'Reilly Media

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/106106145
2	https://www.w3schools.com/python/
3	https://www.geeksforgeeks.org/python-programming-language/

MOOCs:

No.	Platform
1	NPTEL – Python for Everybody by IIT Madras
2	Coursera – Python for Everybody (University of Michigan)

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
II	**203**	**Cyber Law and Security Policies**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Major Core	2	UE:IE	60:40

Course Objectives:

- To provide an overview of cyber laws and regulations applicable in digital environments.
- To introduce legal frameworks, policies, and standards governing cybersecurity.
- To understand data protection, privacy rights, and intellectual property in cyberspace.
- To familiarize students with cybercrime types, investigation procedures, and compliance

Course Outcomes:

After completing the course the students shall be able to

CO1: Describe the legal aspects of cyberspace and IT Act provisions.
CO2: Explain different types of cybercrimes and applicable legal frameworks.
CO3: Interpret laws related to data protection, privacy, and digital evidence.
CO4: Analyze cybersecurity policies, standards, and ethical issues in digital forensics.

Sr. No.	Title of Practical	COs		Teaching Methodology	Cognition Level	Evaluation Tools
1	**Introduction to Cyber Law**: Overview of IT Act 2000 and 2008 amendments, objectives, jurisdiction in cyberspace, legal recognition of electronic documents and signatures.	5	CO1	Lecture, Law Texts	Remember, Understand
2	**Cybercrimes and Offences**: Hacking, identity theft, cyber terrorism, child pornography, financial frauds, cyberbullying; legal remedies and punishments under IT Act and IPC.	5	CO2	Case Studies, Court Examples	Understand, Apply
3	**Data Privacy and Protection**: Introduction to GDPR, Data Protection Bill (India), rights of data subjects, lawful data processing, liabilities.	5	CO3	Discussion, News Analysis	Apply, Analyze
4	**Security Policies and Ethics**: Types of security policies	5	CO4	Policy Analysis,	Analyze, Evaluate

	(organizational, access control, password policy), ISO 27001 standards, cyber ethics, role of CERT-In.			Demo	

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Pavan Duggal	Cyber Law: An Indian Perspective	2021	Saakshar Law Publications
2	Vivek Sood	Cyber Law Simplified	2015	McGraw Hill Education
3	Karnika Seth	Computers, Internet and New Technology Laws	2013	LexisNexis

Online Resources:

No.	Website Address
1	https://www.meity.gov.in/content/information-technology-act
2	https://nptel.ac.in/courses/106105231 (Cyber Security and Law)
3	https://www.indiacode.nic.in

MOOCs:

No.	Platform
1	NPTEL – Cyber Security and Laws (IIT Kharagpur)
2	Swayam – Cyber Law and Ethics
3	Coursera – Internet History, Technology, and Security

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
II	**204**	**Data Structures and Algorithms Lab**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Minor Core	2	UE:IE	60:40

Course Objectives:

- To provide hands-on implementation of data structures and algorithmic concepts using a programming language (C/C++/Python).
- To reinforce theoretical understanding of stacks, queues, linked lists, trees, and sorting/searching techniques.
- To improve debugging and problem-solving skills with optimized data structure use.
- To introduce students to algorithm performance testing and analysis through practicals

Course Outcomes:

After completing the course the students shall be able to

CO1: Implement and manipulate linear data structures such as arrays, stacks, and queues.
CO2: Apply linked lists for dynamic data operations.
CO3: Implement non-linear data structures including trees and graphs.
CO4: Apply and compare sorting and searching algorithms with performance evaluation.

Unit	Practical Content	Sessions (Hrs)	COs	Teaching Methodology	Cognition Level	Evaluation Tools
1	Programs on arrays and dynamic memory allocation.	4	CO1	Hands-on Coding	Apply	Practical Test
2	Stack implementation using arrays and linked lists – push, pop, infix to postfix conversion.	4	CO1	Demo + Lab Practice	Apply	Viva
3	Queue and circular queue implementation using arrays and linked lists.	4	CO1	Code Simulation	Apply	Record Book
4	Singly, doubly, and circular linked list – insertion, deletion, traversal.	4	CO2	Instructor-guided Practice	Apply, Analyze	Execution
5	Tree creation, traversal (preorder, inorder, postorder), and BST operations.	4	CO3	Dry Run + Program	Analyze	Lab Assessment
6	Graph representation, BFS and DFS traversal algorithms.	4	CO3	Visualization + Execution	Apply, Analyze	Viva
7	Sorting algorithms – Bubble, Selection, Insertion, Merge, Quick Sort.	4	CO4	Comparative Coding	Analyze, Evaluate	Test

| 8 | Searching – Linear and Binary; time complexity comparison. | 4 | CO4 | Case-based Lab | Apply, Evaluate | Assignment |

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	E. Balagurusamy	Data Structures Through C	2019	McGraw Hill Education
2	Reema Thareja	Data Structures Using C	2017	Oxford University Press
3	Seymour Lipschutz	Schaum's Outline: Data Structures	2014	McGraw Hill Education

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/106102064
2	https://www.geeksforgeeks.org/data-structures/
3	https://www.programiz.com/dsa

MOOCs:

No.	Platform
1	NPTEL – Data Structures and Algorithms by IIT Madras
2	Coursera – Algorithms, Part I (Princeton University)
3	edX – Data Structures and Software Design (PennX)

Programme: BSc(CS and DF)–CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
II	**205**	**Programming Fundamentals in Python Lab**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Major Core	2	UE:IE	60:40

Course Objectives:

- To provide hands-on experience in writing Python programs using core programming constructs.
- To develop skills in implementing control structures, data types, functions, and file operations.
- To introduce basic object-oriented programming in Python.
- To enhance students' debugging and testing capabilities in Python environments.

Course Outcomes:

After completing the course the students shall be able to

CO1: Develop simple Python programs using variables, operators, and control flow.
CO2: Apply data structures such as lists, tuples, and dictionaries to solve problems.
CO3: Use user-defined functions and modularize code.
CO4: Implement OOP concepts and file handling in Python programs

Sr. No.	Title of Practical	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Write programs to demonstrate variables, input/output, operators, and expressions.	4	CO1	Lab Demonstration	Understand, Apply
2	Implement decision-making and looping: if, if-else, for, while, nested loops.	4	CO1	Guided Coding	Apply
3	Programs using lists, tuples, sets, and dictionaries – creation, access, and manipulation.	4	CO2	Hands-on Lab	Apply
4	Define and invoke functions – default arguments, recursion, return values.	4	CO3	Practice + Debugging	Apply
5	Modules and packages – importing, custom modules, built-in libraries (math, random).	4	CO3	Code Demos	Apply
6	Classes and objects, constructors, inheritance – basic OOP in Python.	4	CO4	Mini Project	Analyze
7	File handling – open, read, write, append, file modes, with statement.	4	CO4	File-Based Programming	Apply

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Reema Thareja	Python Programming: Using Problem Solving Approach	2019	Oxford University Press
2	Yashavant Kanetkar	Let Us Python	2020	BPB Publications
3	Dr. R. Nageswara Rao	Core Python Programming	2018	Dreamtech Press

Online Resources:

No.	Website Address
1	https://www.geeksforgeeks.org/python-programming-language/
2	https://www.w3schools.com/python/
3	https://nptel.ac.in/courses/106106145

MOOCs:

No.	Platform
1	NPTEL – Programming, Data Structures and Algorithms in Python
2	Coursera – Python for Everybody (University of Michigan)
3	edX – Introduction to Python Programming (Microsoft)

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
II	**206**	**Database Concepts**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
Minor Core	2	UE:IE	60:40

Course Objectives:

- To understand database concepts, architecture, and models.
- To design entity-relationship models.
- To implement relational databases using SQL.

Course Outcomes:

After completing the course the students shall be able to
CO1: Explain database systems, architecture, and models.
CO2: Design ER models and convert them into relational schemas.
CO3: Apply normalization techniques and perform relational algebra operations.
CO4: Implement SQL queries for data definition and manipulation.

Unit	Content	Hours	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Introduction to DBMS, components, architecture, schemas, data independence	5	CO1	Lecture, PPT	Understand	Class Test
2	ER Modeling: Entity, attributes, keys, ER diagrams, relational mapping	5	CO2	Diagrams, Case Study	Apply	Assignment
3	Relational Algebra and Normalization: FDs, 1NF to BCNF	5	CO3	Problem Solving	Analyze	Quiz
4	SQL: DDL, DML, joins, nested queries, transactions, views	5	CO4	Lab Sessions	Apply	Practical Test

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Abraham Silberschatz	Database System Concepts	2020	McGraw-Hill
2	Ramez Elmasri	Fundamentals of Database Systems	2017	Pearson
3	S. K. Singh	Database Systems: Concepts, Design and Applications	2011	Pearson

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/106105175
2	https://www.geeksforgeeks.org/dbms/
3	https://www.tutorialspoint.com/dbms/index.htm

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
II	**207**	**English for Communication – II**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
AEC	2	IE	50

Course Objectives:

- To enhance academic and workplace communication.
- To improve vocabulary, grammar, and expression.
- To build confidence in formal speaking and writing.
- To foster effective participation in discussions and presentations.

Course Outcomes:

After completing the course the students shall be able to
CO1: Demonstrate correctness in grammar and vocabulary.
CO2: Speak fluently and effectively in academic/professional settings.
CO3: Draft formal written documents.
CO4: Participate in group activities confidently.

Unit	Content	Hours	Cos	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Reading skills: comprehension, summarizing, skimming	5	CO1	Reading Practice	Understand	Worksheet
2	Writing: emails, letters, reports, resume	6	CO3	Writing Activities	Apply	Assignment
3	Speaking: group discussions, interviews, presentations	5	CO2, CO4	Role-play, Mock Practice	Apply	Viva
4	Grammar and Vocabulary: tenses, connectors, phrasal verbs	6	CO1	Grammar Exercises	Apply	Test

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Meenakshi Raman, Sangeeta Sharma	Technical Communication	2015	Oxford
2	Raymond Murphy	English Grammar in Use	2019	Cambridge
3	Sanjay Kumar, Pushp Lata	Communication Skills	2018	Oxford

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/109104031
2	https://www.englishgrammar.org
3	https://learnenglish.britishcouncil.org

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(CS and DF)-CBCS–Syllabus w.e.f.-Year 2025–2026		
Semester	**Course Code**	**Course Title**
II	**208**	**Indian Constitution and Democracy**
	Prepared by	
Type	**Credits**	**Evaluation**	**Marks**
VEC	2	IE	50

Course Objectives:

- To develop interpersonal, leadership, and communication skills for professional success.
- To inculcate time management, goal setting, and emotional intelligence.
- To promote confidence, self-awareness, and team dynamics.

Course Outcomes:

After completing the course the students shall be able to
CO1: Describe the preamble and constitutional vision.
CO2: Understand fundamental rights and duties.
CO3: Explain the structure and functioning of Indian democracy.
CO4: Recognize the role of citizens in democratic society.

Unit	Content	Hours	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	History and making of Constitution, preamble, key features	5	CO1	Lecture, Videos	Understand	Class Test
2	Rights and Duties: fundamental rights, directive principles	6	CO2	Case Study	Analyze	Assignment
3	Governance: Legislature, Executive, Judiciary, elections	5	CO3	Group Discussion	Understand	Presentation
4	Democracy and Citizenship: participation, civic values	6	CO4	Activity-based	Apply, Evaluate	Role Play

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	M. Laxmikanth	Indian Polity	2021	McGraw-Hill
2	D. D. Basu	Introduction to the Constitution of India	2018	LexisNexis
3	Subhash Kashyap	Our Constitution	2020	NBT India

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/109104074
2	https://www.constitutionofindia.net
3	https://www.indiacode.nic.in

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera