

**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
Artificial Intelligence and Machine Learning
B. Sc (AI &ML)
Under Faculty of Management**

To be implemented from 2025-26

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

Bachelor of Science In Artificial Intelligence and Machine
Learning

B.Sc. (Artificial Intelligence and Machine Learning)

I. Preamble

The B.Sc. in Artificial Intelligence (AI) and Machine Learning (ML) program is designed to provide students with a comprehensive understanding of emerging technologies that drive today's digital transformation. As AI and ML 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 instills 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 realworld problem-solving experiences, graduates will be equipped to meet global demands and contribute responsibly to advancements in AI and ML.

II. Vision

Preparing the Students to cope with the rigor of Post Graduate Programmes in global and creating high caliber solution architects for software development in AI and ML, 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 (AI and ML) 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 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 AI and ML 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 AI and ML.
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
Undergraduate 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.
Undergraduate 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 theoretical 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 **40** and **60** Marks respectively. The total marks of IA and UE shall be 100 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
$80 \leq \text{Marks} \leq 100$	O	10
$70 \leq \text{Marks} < 80$	A+	9
$60 \leq \text{Marks} < 70$	A	8
$55 \leq \text{Marks} < 60$	B+	7
$50 \leq \text{Marks} < 55$	B	6
$40 \leq \text{Marks} < 50$	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 60 and IA marks out of 40. The total marks out of 100 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 $x = \text{Max}/10$ (since we have adopted 10 point system). Then GP is calculated by the following formulas

Range of Marks	Formula for the Grade Point
$8x \leq \text{Marks} \leq 10x$	10
$5.5x \leq \text{Marks} < 8x$	Truncate (M/x) +2
$4x \leq \text{Marks} < 5.5x$	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, C_k is the Credit value assigned to a course and GP_k 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, C_k is the Credit value assigned to a course and GP_k 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 ≤ CGPA < 6.00
	5 * CGPA+20	If 6.00 ≤ CGPA < 8.00
	10 * CGPA-20	If 8.00 ≤ CGPA < 9.00
	20 * CGPA-110	If 9.00 ≤ CGPA < 9.50
	40 * CGPA-300	If 9.50 ≤ 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	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
$9.5 \leq \text{CGPA} \leq 10$	O	Outstanding	$80 \leq \text{Marks} \leq 100$
$9.0 \leq \text{CGPA} \leq 9.49$	A+	Excellent	$70 \leq \text{Marks} \leq 80$
$8.0 \leq \text{CGPA} \leq 8.99$	A	Very Good	$60 \leq \text{Marks} \leq 70$
$7.0 \leq \text{CGPA} \leq 7.99$	B+	Good	$55 \leq \text{Marks} \leq 60$
$6.0 \leq \text{CGPA} \leq 6.99$	B	Average	$50 \leq \text{Marks} \leq 55$
$5.0 \leq \text{CGPA} \leq 5.99$	C	Satisfactory	$40 \leq \text{Marks} \leq 50$
CGPA below 5.0	F	Fail	Marks below 40

XII. Course Structure

Semester- I

Bridge Course (Before Semester I): Foundation in Computer Science and Programming Concepts

Objective: To prepare students with essential computer skills, programming fundamentals, and mathematical knowledge required for AI & ML studies.

Topics Covered:

- Introduction to Computers and Operating Systems
- Basics of Algorithms and Flowcharts
- Number Systems and Basic Arithmetic
- Introductory Concepts in Programming (C, Python)
- Problem Solving with Pseudocode

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	Introduction to Artificial Intelligence	Major Core	3	3	1	-	40	60	100
102	C Programming	Major Core	3	3	1	-	40	60	100
103	C Programming Laboratory	Major Core	2	-	-	4	40	60	100*
104	Cyber Security	Minor Core	2	2	-	-	40	60	100
105	Python Programming Laboratory	SEC	2	-	-	4	40	60	100*
106	Environmental Studies	AEC	2	2	-	-	40	60	100
107	English for Communication-I	VEC	2	2	-	-	50	-	50
108	Indian Knowledge System	IKS	2	2	-	-	50	-	50
109	Co-Curricular/Project Work	Co-Curricular/Project Work	2	-	-	4	40	60	100*
Total			20	14	2	12	380	420	800

Semester- II

Bridge Course (Before Semester II) : Advanced Programming and Introduction to Machine Learning

Objective: To introduce advanced programming, object-oriented concepts, networking fundamentals, and machine learning basics.

Topics Covered:

- Basics of Object-Oriented Programming (OOP)
- Introduction to Networking and Internet Protocols
- Data Structures and Algorithms
- Introduction to SQL and Databases
- Fundamentals of Machine Learning

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
201	Applied Machine Learning	Major Core	3	3	1	-	40	60	100
202	Advanced Programming (OOP with C++)	Major Core	3	3	1	-	40	60	100
203	C++ Programming Laboratory	Major Core	2	-	-	4	40	60	100*
204	Networking Fundamentals	Minor Core	2	2	-	-	40	60	100
205	Vocational Training - Full-Stack Development (HTML & CSS Basics)	SEC	2	-	-	4	40	60	100*
206	Basics of Cybersecurity	AEC	2	2	-	-	40	60	100
207	English for Communication-II	VEC	2	2	-	-	50	-	50
208	Soft Skills & Personality Development	VSC	2	2	-	-	50	-	50
209	Co-Curricular/Project Work	Co-Curricular/Project Work	2	-	-	4	40	60	100*
Total			20	14	2	12	380	420	800

Semester-III

Bridge Course (Before Semester III) : Foundations of Machine Learning and Deep Learning

Objective: Introduce foundational concepts of machine learning, data handling, and essential deep learning concepts to prepare students for advanced coursework.

Basic Topics Covered:

- Overview of Supervised and Unsupervised Learning
- Introduction to Neural Networks
- Basics of Data Preprocessing and Feature Engineering
- Applied Probability and Statistics Recap

Semester III (Intermediate Level)

Focus: Advanced concepts in machine learning, data structures, deep learning foundations, and software engineering.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
301	Introduction to Machine Learning	Major Core	3	3	1	-	40	60	100
302	Data Structures and Algorithms for AI	Major Core	3	3	1	-	40	60	100
303	Machine Learning Laboratory	Major Core	2	-	-	4	40	60	100*
304	Data Structures and Algorithms Laboratory	Major Core	2	-	-	4	40	60	100*
305	Data Mining	Minor Core	2	2	-	-	40	60	100
306	Operating Systems	SEC	2	2	-	-	40	60	100
307	Communication Skills Development	AEC	2	2	-	-	50	-	50
308	R-Programming	VEC	2	2	-	-	50	-	50
309	Field Project: Machine Learning App	Co-Curricular/Project Work	2	-	-	4	40	60	100*
Total			20	14	2	12	380	420	800

Semester-IV

Bridge Course (Before Semester IV): Essentials of Reinforcement Learning and Computer Vision

Objective: Provide an overview of reinforcement learning, computer vision, and data engineering basics for AI applications.

Basic Topics Covered:

- Introduction to Reinforcement Learning
- Fundamentals of Image Processing and Computer Vision
- Data Engineering Basics (ETL Processes and Big Data Tools)
- 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 Marks
				L	T	P			
401	Neural Networks and Deep Learning	Major Core	3	3	1	-	40	60	100
402	Computer Vision	Major Core	3	3	1	-	40	60	100
403	Deep Learning Laboratory	Major Core	2	-	-	4	40	60	100*
404	Computer Vision Laboratory	Major Core	2	-	-	4	40	60	100*
405	Big Data & Distributed AI	Minor Core	2	2	-	-	40	60	100
406	Software Engineering Principles	SEC	2	2	-	-	40	60	100
407	Professional AI Ethics and Regulations	AEC	2	2	-	-	50	-	50
408	Version Control Systems (Git & GitHub)	VEC	2	2	-	-	50	-	50
409	Field Project: Machine Learning App	Co-Curricular/Project Work	2	-	-	4	40	60	100*
Total			20	14	2	12	380	420	800

Semester-V

Bridge Course (Before Semester V) : Cloud Computing and Distributed AI Foundations

Objective: Strengthen understanding of cloud infrastructure, distributed AI systems, and threat management concepts for AI applications.

Basic Topics Covered:

- Overview of Cloud Computing (AWS, Azure)
- Cloud Security Fundamentals (Encryption, Access Control)
- Basics of Distributed Computing and Load Balancing
- Threat Detection Techniques (AI-based Anomaly Detection)
- Introduction to Data Management Concepts (ETL, Data Pipelines)

Semester V (Higher Level)

Focus: Advanced cloud computing, distributed AI, threat intelligence, and project-based AI development.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
501	Cloud Computing	Major Core	3	3	1	-	40	60	100
502	Reinforcement Learning	Major Core	3	3	-	-	40	60	100
503	Reinforcement Learning Laboratory	Major Core	2	-	-	4	40	60	100*
504	Cloud Laboratory	Major Core	2	-	-	4	40	60	100*
505-A	Data Analysis & Visualization	Major Elective	2	2	-	-	40	60	100
505-B	Data Analysis & Visualization Laboratory	Major Elective	2	-	-	4	40	60	100*
OR									
505-A	Big Data Analytics	Major Elective	2	2	-	-	40	60	100
505-B	Big Data Analytics Laboratory	Major Elective	2	-	-	4	40	60	100*
506	Software Project Management	Minor Core	2	2	-	-	100	-	100
507	Field Project: AI Cloud Application	Co-Curricular /Project Work	2	-	-	4	40	60	100*
Total			20	10	2	16	380	420	800

Semester-VI

Bridge Course (Before Semester VI) : IoT, Security, and AI Governance Fundamentals

Objective: Prepare students for advanced AI governance, IoT security, and risk management strategies.

Basic Topics Covered:

- Introduction to IoT and Security Concepts
- Overview of Risk Management and AI Compliance
- Fundamentals of ETL Processes for AI Integration
- Basics of AI Regulations and Governance Models
- Threat Models and Detection Methods for Large-Scale AI

Semester VI (Higher Level)

Focus: Advance skills in data science, web development, and digital marketing with practical exposure to tools and industry projects.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
601	Data Science	Major Core	3	3	1	-	40	60	100
602	Django	Major Core	3	3	1	-	40	60	100
603	Data Science Laboratory	Major Core	2	-	-	4	40	60	100*
604	Django Laboratory	Major Core	2	-	-	4	40	60	100*
605-A	Go Programming	Major Elective	2	2	-	-	40	60	100
605-B	Go Programming Laboratory	Major Elective	2	-	-	4	40	60	100*
OR									
605-A	Power BI	Major Elective	2	2	-	-	40	60	100
605-B	Power BI Laboratory	Major Elective	2	-	-	4	40	60	100*
606	Object-Oriented Software Engineering	Minor Core	2	2	-	-	100	-	100
607	Industry/Research Internship	Co-Curricular/ Project Work	2	-	-	4	40	60	100*
Total			20	10	2	16	380	420	800

Fourth year of B. Sc Honours Programme with Application Development

Semester-VII

Bridge Course (Before Semester VII): Research Methodology

Objective: Equip students with foundational research methodology, project development, and applied AI knowledge to prepare for specialization in AI applications.

Basic Topics Covered:

- Introduction to Research Methodology and Innovation
- Agile Project Planning Techniques for AI
- Use Cases in AI Applications (Healthcare, Robotics, and Business Intelligence)
- Fundamentals of Explain ability and Interpretability of AI Models
- Introduction to Model Evaluation and Deployment Best Practices

Semester VII (Application Level)

Focus: Develop skills in IoT, Android, GraphQL, big data, and research methodology through practical labs and projects.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
701	Graph QL	Major Core	3	3	1	-	40	60	100
702	Android Programming	Major Core	3	3	1	-	40	60	100
703	Graph QL Laboratory	Major Core	2	-	-	4	40	60	100*
704	Android Programming Laboratory	Major Core	2	-	-	4	40	60	100*
705-A	Hadoop	Major Elective	2	2	-	-	40	60	100
705-B	Hadoop Laboratory	Major Elective	2	-	-	4	40	60	100*
OR									
705-A	Mango DB	Major Elective	2	2	-	-	40	60	100
705-B	Mango DB Laboratory	Major Elective	2	-	-	4	40	60	100*
706	IoT Applications for AI	Minor Core	2	2	-	-	100	-	100
707	Research Methodology and Innovation	Research Methodology	4	-	-	4	100	-	100*
Total			20	10	2	16	380	420	800

Semester-VIII

Bridge Course (Before Semester VIII) : AI Project Integration and Deployment Readiness

Objective: Prepare students for final research projects, real-world AI applications, and industry based deployment scenarios.

Basic Topics Covered:

- Advanced Techniques for Project and Thesis Writing
- Integration of AI in Emerging Technologies
- Real-world Case Studies in AI (Healthcare, Business Intelligence, Robotics)
- Overview of AI Security and Compliance Standards

Semester VIII (Application Level)

Focus: Enhance expertise in blockchain, data mining, cybersecurity, and AI applications with hands-on labs and specialized electives.

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total Marks
				L	T	P			
801	Block chain	Major Core	3	3	1	-	40	60	100
802	Data Mining and Data Warehousing	Major Core	3	3	1	-	40	60	100
803	Block chain Laboratory	Major Core	2	-	-	4	40	60	100*
804	Data Mining and Data Warehousing Laboratory	Major Core	2	-	-	4	40	60	100*
805-A	AI for Robotics and Automation	Major Elective	2	2	-	-	40	60	100
805-B	AI for Robotics and Automation Laboratory	Major Elective	2	-	-	4	40	60	100*
OR									
805-A	AI in E-Commerce and Personalization	Major Elective	2	2	-	-	40	60	100
805-B	AI in E-Commerce and Personalization Laboratory	Major Elective	2	-	-	4	40	60	100*
806	AI and Cybersecurity Applications	Minor Core	2	2	-	-	40	60	100
807	Industry Internship	OJT (Internship)	4	-	-	4	100	-	100*
Total			20	10	2	12	380	420	800

Fourth year of B. Sc Honours Programme with Research

Semester VII (Application Level) Research Degree

Focus: Develop advanced skills in Android programming, GraphQL, big data technologies (Hadoop, MongoDB), and research methodology with hands-on labs and projects.

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	Big Data Analytics with Lab	Major Core	4	2	-	4	100	100	200*
703	GraphQL with Lab	Major Core	4	2	-	4	100	100	200*
704	Android Programming 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

Course Number	Course Title	Course Type	Credits	Hours / Week			IA	UE	Total
				L	T	P			
801	Dissertation	Major Core	12	-	-	12	100	300	400*
802	Seminar on Literature Review: Recent Trends in AI and Emerging Technologies	Major Core	2	2	-	-	200	-	200*
803	Research Publication-II	Major Core	2	-	2	-	200	-	200*
Total			16	2	2	12	500	300	800

*These courses/subjects evaluation will carried out as practical or viva examination (No university theory examination is conducted): 103, 105, 109, 203, 205, 209, 303, 304, 309, 403, 404, 409, 503, 504, 505-B, 507, 603, 604, 605-B, 607,

- Fourth Year – Application Development: 703, 704, 705-B, 707, 803, 804, 805-B, 807
- Fourth Year – Research: 702, 703, 704, 705, 801, 802, 803

Abbreviations Expanded

- **SEC** - Skill Enhancement Course
- **VBC** - Value Based Course
- **AEC** - Ability Enhancement Course
- **IKS** - Indian Knowledge System
- **VEC** - Value Education course
- **VSC** - Vocational Skill Course

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
I	101	Introduction to AI	
	Prepared by		
Type	Credits	Evaluation	Marks
Major Core	3	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> 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:			
<p>After completing the course the students shall be able to</p> <p>CO1: Define the scope, goals, and major milestones in AI.</p> <p>CO2: Apply basic problem-solving techniques in AI using search strategies.</p> <p>CO3: Understand concepts of knowledge representation and inference.</p> <p>CO4: Analyze applications of AI in real-world domains.</p>			

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Introduction to AI: Definition, history, characteristics, goals of AI, AI vs Human Intelligence, applications of AI.	5	CO1	Lecture, PPT, Discussion	Remember, Understand	Class Test, Assignment
2	Branches and Approaches of AI: Symbolic AI, sub-symbolic AI, evolutionary computation, expert systems, intelligent agents.	5	CO1	Lecture, Case Examples	Understand	Class Test
3	Problem Solving and Search Techniques: Problem types, problem formulation, uninformed search (BFS, DFS), informed search (Greedy, A*).	5	CO2	Demonstration, Case Studies	Apply	Test, Case Study
4	Knowledge Representation: Propositional and predicate logic,	5	CO3	Blackboard, Examples	Understand, Analyze	Class Assignment

	semantic networks, frames, production rules.					
5	AI Tools and Techniques: Ontologies, rule-based systems, introduction to ML and NLP, inference engines.	5	CO3, CO4	Video, Coding Tools	Analyze	Assignment

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Elaine Rich, Kevin Knight	Artificial Intelligence	2017	McGraw-Hill
2	Stuart Russell, Peter Norvig	Artificial Intelligence: A Modern Approach	2020	Pearson
3	Dan W. Patterson	Introduction to AI and Expert Systems	2009	Pearson

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/106105079
2	https://www.tutorialspoint.com/artificial_intelligence/index.htm
3	https://www.coursera.org/learn/introduction-to-artificial-intelligence

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
I	102	Introduction to C-Programming	
	Prepared by		
Type	Credits	Evaluation	Marks
Major Core	3	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To provide a comprehensive introduction to C programming language. To enable students to write efficient code for problem-solving. To understand control structures, functions, arrays, pointers, and file handling in C. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Understand the syntax and semantics of C programming.</p> <p>CO2: Implement decision-making and iterative structures in code.</p> <p>CO3: Use arrays, strings, and functions effectively.</p> <p>CO4: Demonstrate the use of pointers and file handling for advanced C programming tasks</p>			

Unit	Content	Hours	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Introduction to C and Operators: Structure of C program, compiling and executing, keywords, identifiers, data types, constants, variables. Operators and expressions: arithmetic, relational, logical, bitwise, assignment, conditional operators, precedence, associativity.	6	CO1	Lecture, Coding Demo, Examples	Remember, Understand	Class Test, Quiz
2	Control Structures: Decision-making (if, if-else, switch), loops (for, while, do-while), use of break, continue, and goto statements.	5	CO2	Problem Solving	Apply	Programming Exercise
3	Functions and Recursion: Function declaration, definition and calling, recursion, scope and storage classes.	5	CO3	Hands-on Coding	Understand, Apply	Mini Project
4	Arrays, Strings and Pointers: 1D and 2D arrays, string handling	6	CO3, CO4	Exercises, Code	Apply, Analyze	Lab Test

	functions, array operations, pointer basics, pointer arithmetic, pointers with arrays and functions.			Practice, Practical Demo		
5	File Handling in C: File operations – opening, reading, writing, closing files; using file pointers.	6	CO4	Practical Demo, Hands-on Practice	Apply, Analyze	Practical Exam

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Yashwant Kanetkar	Let Us C	2018	BPB Publications
2	Brian W. Kernighan, Dennis Ritchie	The C Programming Language	1998	PHI
3	E. Balagurusamy	Programming in ANSI C	2019	McGraw-Hill

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(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
I	103	C Programming Laboratory	
	Prepared by		
Type	Credits	Evaluation	Marks
Major Core	2	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To enable students to practise procedure-oriented programming using the C language. To strengthen students' skills in programming logic development and practical implementation. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Develop basic programming skills using C syntax and compilation techniques.</p> <p>CO2: Implement decision-making and looping constructs to solve real-world problems.</p> <p>CO3: Apply user-defined functions and understand various storage classes.</p> <p>CO4: Manipulate arrays, strings, and pointers efficiently.</p> <p>CO5: Understand dynamic memory allocation and define new data types using structures, enums, and typedef.</p>			

Unit	Content	Sessions (Hours)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Operators and Compilation: Compilation and execution of programs, arithmetic operations, symbolic constants, using gcc options (-o, -c, -D, -l, -I, -g, -E), input/output demonstrations.	5	CO1	Live Demonstration	Understand	Quiz
2	Selection and Iteration Constructs: Implementation of branching, nested branching, and different looping techniques using control structures.	7	CO2	Live Demonstration	Create	Quiz
3	Functions and Storage Classes: Defining and calling functions, recursion, and working with	6	CO3	Live Demonstration	Create	Quiz

	storage classes (register, extern, static).					
4	Arrays and Strings: 1D & 2D arrays (searching, sorting, matrix operations), string manipulation (length, concatenation, substring, case conversion, removal of extra spaces).	7	CO4	Live Demonstration	Create	Quiz
5	Structures and Pointers: Usage of struct, arrays of structures, sorting, pointer basics, pointers as function parameters, dynamic memory allocation, function pointers, array of pointers, ragged arrays.	5	CO5	Live Demonstration	Create	Quiz

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Yashwant Kanetkar	Let Us C	2018	BPB Publications
2	Brian W. Kernighan, Dennis Ritchie	The C Programming Language	1998	PHI
3	E. Balagurusamy	Programming in ANSI C	2019	McGraw-Hill

Online Resources:

No.	Website Address
1	TutorialsPoint – C Programming
2	JavaTpoint – C Programming
3	W3Schools – C Language

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
I	104	Cyber Security	
	Prepared by		
Type	Credits	Evaluation	Marks
Minor Core	2	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To introduce students to the fundamentals of cyber security and cyber ethics. To provide knowledge on threats, vulnerabilities, risk management, and protective technologies. To instil awareness about secure practices and emerging trends in cyber protection. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Understand the core concepts of cyber security, threats, and attacks.</p> <p>CO2: Recognise and classify different types of cybercrimes and preventive methods.</p> <p>CO3: Demonstrate understanding of cryptography, firewalls, and data security practices.</p> <p>CO4: Apply knowledge of cyber ethics and legal frameworks to ensure responsible use of digital resources.</p>			

Unit	Content	Sessions (Hours)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Introduction to Cyber Security: Need for cyber security, security goals (confidentiality, integrity, availability), types of cyber attacks – malware, phishing, DDoS, spoofing.	5	CO1	Lecture, Case Studies	Understand	Quiz, Assignment
2	Cyber Crimes and Prevention: Categories of cybercrimes, identity theft, cyberstalking, cyberbullying, mobile and IoT security threats, digital footprint.	5	CO2	Presentation, Discussion	Remember, Analyse	MCQs, Scenario-based Questions
3	Security Techniques: Cryptography (symmetric and asymmetric), firewalls, intrusion detection systems, anti-virus tools, password security.	5	CO3	Demonstration, Lecture	Apply	Practical Test
4	Cyber Laws and Ethics: Data privacy, IT Act 2000, intellectual property	5	CO4	Seminar, Group Work	Analyse, Apply	Report, Class Presentation

	rights, digital signatures, ethical hacking and responsible behaviour in cyberspace.					
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Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Nina Godbole & Sunit Belapure	<i>Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives</i>	2011	Wiley India
2	William Stallings	<i>Cryptography and Network Security</i>	2020	Pearson
3	Chuck Easttom	<i>Computer Security Fundamentals</i>	2019	Pearson

Online Resources:

No.	Website Address
1	https://www.cybrary.it
2	https://www.geeksforgeeks.org/cyber-security-basics
3	https://www.coursera.org/learn/intro-cyber-security

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
I	105	Python Programming Laboratory	
	Prepared by		
Type	Credits	Evaluation	Marks
SEC	2	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To provide hands-on experience in programming using Python. To enable students to implement problem-solving techniques using core Python features. To develop logical thinking and basic algorithmic skills for real-world applications. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Understand Python syntax, data types, variables, and I/O operations.</p> <p>CO2: Apply decision-making and loop control structures to develop interactive programs.</p> <p>CO3: Implement user-defined functions and use built-in modules.</p> <p>CO4: Work with Python data structures such as lists, tuples, sets, and dictionaries.</p> <p>CO5: Handle file operations, exceptions, and basic Python libraries for data processing.</p>			

Unit	Content	Sessions (Hours)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Python Basics: Installation, writing simple scripts, variables, operators, input/output, comments.	4	CO1	Live Coding, Demo	Understand	Practical Quiz
2	Control Flow: if, if-else, nested conditions, loops (for, while), break, continue, pass.	5	CO2	Code Along, Lab Practice	Apply	Lab Assignment
3	Functions and Modules: Defining functions, default arguments, recursion, import, built-in modules (math, random, etc.).	5	CO3	Exercises, Demonstration	Create	Code Evaluation
4	Data Structures: Lists, tuples, dictionaries, sets – creation, manipulation, iteration, nested structures.	6	CO4	Interactive Practice	Apply	Lab Tasks
5	Files and Exceptions: Reading/writing files, file modes, with	4	CO5	Case Examples	Analyse	Practical Test

	statement, exception handling using try, except, finally.					
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Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Reema Thareja	<i>Python Programming Using Problem Solving Approach</i>	2021	Oxford University Press
2	Dr. R. Nageswara Rao	<i>Core Python Programming</i>	2018	Dreamtech Press
3	Mark Lutz	<i>Learning Python</i>	2020	O'Reilly Media

Online Resources:

No.	Website Address
1	https://www.w3schools.com/python
2	https://www.geeksforgeeks.org/python-programming-language
3	https://www.programiz.com/python-programming

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
I	106	Environmental Studies	
	Prepared by		
Type	Credits	Evaluation	Marks
AEC	2	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To create awareness about environmental issues and sustainable development. To understand the interrelationship between environment and society. To promote environmental ethics and responsible citizenship. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Understand environmental concepts, ecosystems, and biodiversity.</p> <p>CO2: Identify causes and impacts of pollution and global environmental problems.</p> <p>CO3: Evaluate conservation strategies and sustainable practices.</p> <p>CO4: Demonstrate awareness of environmental legislation and civic responsibilities.</p>			

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Introduction to Environment: Components of environment, biotic-abiotic interaction, ecosystems, biodiversity	5	CO1	Lecture, PPT	Understand	Quiz
2	Natural Resources: Water, forest, energy – conservation, management, sustainable use	5	CO1, CO3	Group Discussion	Apply	Assignment
3	Environmental Pollution: Air, water, soil, noise, global warming, climate change	6	CO2	Multimedia Content, Seminar	Analyze	Test
4	Social Issues and Environmental Law: Waste management, Environmental Protection Act, SDGs, EIA	5	CO3, CO4	Case Studies, Discussion	Evaluate	Presentation

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Erach Bharucha	Textbook of Environmental Studies	2013	University Grants Commission
2	Anubha Kaushik, C. Kaushik	Perspectives in Environmental Studies	2018	New Age International
3	Rajagopalan R.	Environmental Studies: From Crisis to Cure	2016	Oxford University Press

Online Resources:

No.	Website Address
1	https://nptel.ac.in/courses/122102006
2	https://www.environmentalsciencedegree.org/resources/
3	https://www.epa.gov/students

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-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:			
<ul style="list-style-type: none"> To develop effective written and spoken communication skills. To enhance vocabulary, grammar, and comprehension skills. To build confidence in expressing ideas in academic and social settings. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Use English grammar correctly in writing and speaking.</p> <p>CO2: Develop reading comprehension and listening skills.</p> <p>CO3: Write formal and informal texts effectively.</p> <p>CO4: Engage in effective verbal communication with clarity and coherence.</p>			

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Grammar Essentials: Parts of speech, tenses, subject-verb agreement	4	CO1	Practice Exercises	Remember, Apply	Quiz
2	Vocabulary Building and Reading Comprehension: Synonyms, antonyms, cloze test	4	CO2	Reading Sessions	Understand	Reading Test
3	Writing Skills: Paragraph writing, email drafting, note-making	5	CO3	Guided Writing	Apply	Written Assignment
4	Spoken English: Pronunciation, role-play, formal speaking	5	CO4	Group Discussion	Evaluate	Oral Presentation

Reference Books:

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

Online Resources:

Sr. No.	Website Address
1	https://learnenglish.britishcouncil.org
2	https://www.englishclub.com
3	https://www.cambridgeenglish.org/learning-english

MOOCs:

Sr. No.	Platform
1	NPTEL / Swayam
2	FutureLearn
3	Coursera

Programme: BSc(AI and ML)-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:			
<ul style="list-style-type: none"> To familiarise students with the foundational aspects of Indian knowledge traditions. To understand contributions of ancient Indian thinkers in science, mathematics, and philosophy. To promote respect for Indian culture and heritage through interdisciplinary learning. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Recognise key concepts and values of Indian knowledge systems.</p> <p>CO2: Appreciate the scientific and philosophical traditions of India.</p> <p>CO3: Analyse interdisciplinary relevance of Indian contributions in modern context.</p> <p>CO4: Develop sensitivity towards cultural and intellectual heritage of India.</p>			

Unit	Content	Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	Overview of Indian Knowledge System: Vedas, Upanishads, and classical literature	4	CO1	Lecture, Discussion	Remember, Understand	Quiz
2	Ancient Indian Sciences: Ayurveda, astronomy, mathematics (Baudhāyana, Āryabhaṭa)	5	CO2	Storytelling, Video Modules	Understand, Apply	Test
3	Philosophical Traditions: Six systems of Indian philosophy, Buddhist and Jain thought	5	CO2, CO3	Seminar, Reflection	Analyse	Assignment
4	Contemporary Relevance: Application of IKS in environment, education, technology	4	CO3, CO4	Case Studies, Presentation	Evaluate	Oral Presentation

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Kapil Kapoor	Texts and Traditions in Indian Knowledge Systems	2020	D. K. Printworld
2	Subhash Kak	The Nature of Indian Knowledge	2018	PHISPC
3	Michel Danino	The Indian Mind: Essays on Indian Civilisation	2016	D. K. Printworld

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 / Swayam
2	IGNOU IKS Portal
3	eGyanKosh

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
II	201	Applied Machine Learning	
	Prepared by		
Type	Credits	Evaluation	Marks
Major Core	3	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To introduce the core concepts of supervised and unsupervised learning. To develop practical understanding of ML algorithms through real-world datasets. To enable students to apply ML techniques for classification, regression, and clustering. To encourage ethical and interpretable use of machine learning systems. 			
Course Outcomes:			
<p>After completing the course the students shall be able to:</p> <p>CO1: Understand the fundamentals of machine learning and data preprocessing.</p> <p>CO2: Implement supervised learning algorithms such as linear regression and decision trees.</p> <p>CO3: Apply unsupervised learning techniques like k-means and hierarchical clustering.</p> <p>CO4: Evaluate model performance using accuracy, precision, recall, and confusion matrices.</p> <p>CO5: Apply ML techniques to practical problems using Python libraries like scikit-learn</p>			

Unit	Content (Detailed)	Sessions (Hours)	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Introduction to Machine Learning – Definition and significance of ML– Types of ML: Supervised, Unsupervised, Semi-supervised, Reinforcement Learning– Applications of ML in various domains (healthcare, finance, cybersecurity, etc.)– ML development tools (Python, scikit-learn, Jupyter Notebook)– Ethical implications: bias, fairness, transparency, privacy	6	CO1	Lecture, Group Discussion, Real-world Examples	Understand	Quiz
2	Data Preprocessing for Machine Learning – Importance of data preprocessing– Handling	6	CO1, CO5	Case-based Practice, Group Tasks	Apply	Assignment

	missing data and noise– Data cleaning and transformation– Feature scaling: normalization and standardization– Feature engineering: encoding, binning, feature extraction and selection– Data splitting: training and testing sets					
3	Supervised Learning Algorithms – Introduction to supervised learning: characteristics and workflow– Linear Regression : model representation, cost function, gradient descent– Decision Trees : splitting criteria (Gini, entropy), overfitting, pruning– k-Nearest Neighbors (k-NN) : distance metrics, choosing 'k', bias-variance tradeoff– Evaluation metrics: accuracy, precision, recall, F1-score	8	CO2	Coding Demo, Lab Exercises	Apply, Analyze	Practical Test
4	Unsupervised Learning Algorithms – Overview of unsupervised learning– K-means Clustering : initialization, distance metrics, convergence– Hierarchical Clustering : agglomerative vs divisive, dendrograms, linkage methods– Cluster validation methods– Applications: customer segmentation, anomaly detection	6	CO3	Hands-on Practice, Visual Tools	Analyze	Lab Task
5	Integration and Mini-Project – Review of ML	4	CO4, CO5	Project-based Learning,	Apply, Analyze	Mini Project Report &

	pipeline: problem formulation to deployment– Combining preprocessing and models into a workflow– Case study: choose dataset and apply ML model (classification or clustering)– Model tuning and interpretation– Ethics review in applied context			Peer Review		Viva
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Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Aurélien Géron	<i>Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow</i>	2022	O'Reilly Media
2	Tom Mitchell	<i>Machine Learning</i>	1997	McGraw-Hill
3	Ethem Alpaydin	<i>Introduction to Machine Learning</i>	2020	MIT Press

Online Resources:

No.	Website Address
1	https://scikit-learn.org/stable/
2	https://www.geeksforgeeks.org/machine-learning/
3	https://www.kaggle.com/learn/intro-to-machine-learning

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera (Andrew Ng's ML course)

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
II	202	Advanced Programming(OOPs with C++)	
	Prepared by		
Type	Credits	Evaluation	Marks
Major Core	3	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To understand the principles and features of Object-Oriented Programming (OOP). To implement classes, objects, inheritance, and polymorphism in C++. To apply concepts such as operator overloading, templates, and exception handling. To handle file operations and use Standard Template Library (STL) in C++. To develop small-scale applications using advanced programming techniques. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Understand the principles of object-oriented programming and the syntax of C++.</p> <p>CO2: Implement classes, constructors, destructors, and operator overloading in C++.</p> <p>CO3: Apply inheritance and polymorphism to create reusable and flexible code.</p> <p>CO4: Use templates, exception handling, and file operations for advanced programming tasks.</p> <p>CO5: Develop and demonstrate real-world applications using OOP concepts in a mini project.</p>			

Unit	Content (Detailed)	Sessions (Hours)	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Object-Oriented Programming Concepts – Introduction to OOP: Need and benefits of OOP– Principles: Encapsulation, Abstraction, Inheritance, Polymorphism– Difference between procedural and OOP– Structure of C++ program, compiling and execution– Classes and Objects: Declaration, definition, access specifiers	6	CO1	Lecture, Coding Demo	Understand	Quiz
2	Constructors, Destructors, and Operator Overloading – Constructors: default, parameterized, copy constructors– Destructor	6	CO2	Hands-on Coding, Demonstrations	Apply	Assignment

	and its role– Constructor overloading– Operator Overloading: unary and binary operators, friend functions– Rules and restrictions in operator overloading					
3	Inheritance and Polymorphism – Inheritance: single, multiple, multilevel, hierarchical, hybrid– Access specifiers and constructor behavior in inheritance– Function Overriding– Virtual functions and dynamic binding– Abstract classes and pure virtual functions	6	CO3	Code Examples, Visual Diagrams	Apply, Analyze	Class Test
4	File Handling and Templates – File stream classes and operations (open, read, write, close)– Modes of file opening– Text vs binary files– Templates: Function and Class templates– Introduction to STL (Standard Template Library)	6	CO4	Practical Demo, Real-Life Examples	Apply	Lab Task
5	Exception Handling and Project Work – Exception handling: try, catch, throw– Handling multiple exceptions, user-defined exceptions– Nested try blocks– Mini Project: Implementation of a real-world problem using OOP concepts (e.g., Student Management, Banking System)– Project documentation and Viva	6	CO5	Project-Based Learning, Peer Discussion	Analyze, Create	Mini Project Presentation & Viva

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	E. Balagurusamy	Object-Oriented Programming with C++	2018	McGraw Hill
2	Ashok N. Kamthane	Programming in C++	2012	Pearson
3	Herbert Schildt	The Complete Reference C++	2015	McGraw Hill

Online Resources:

No.	Website Address
1	https://www.geeksforgeeks.org/c-plus-plus
2	https://www.tutorialspoint.com/cplusplus
3	https://www.programiz.com/cpp-programming

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera (Andrew Ng's ML course)

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
II	203	C++ Programming Laboratory	
	Prepared by		
Type	Credits	Evaluation	Marks
Major Core	2	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To provide hands-on experience with C++ programming and object-oriented principles. To develop logic and coding proficiency by solving structured programming problems. To enable students to build and debug programs that demonstrate real-time applications. To enhance understanding of templates, file handling, and exception mechanisms. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Understand the syntax, structure, and core features of C++.</p> <p>CO2: Design modular programs with classes and objects.</p> <p>CO3: Apply principles of inheritance and polymorphism.</p> <p>CO4: Implement advanced concepts such as file handling, exception handling, and template usage.</p>			

Sr. No.	Title of Practical	COs	Teaching Methodology	Cognition Level	Evaluation Tools
1	Write a program to demonstrate basic I/O operations, variables, data types, and control statements.	CO1	Lab Demo, Code Debug	Understand	Quiz, Execution
2	Implement a program using various decision-making statements (if, switch) and loops (for, while).	CO1	Hands-on Coding	Apply	Observation Sheet
3	Write a program using functions (with and without return types, parameters, recursion).	CO1	Problem Solving	Apply	Viva, Execution
4	Create a class with private and public members. Use objects to access the members and perform operations.	CO2	Code Lab	Apply	File Submission
5	Demonstrate the use of constructors and destructors in C++ programs.	CO2	Demonstration	Understand	Quiz, Execution
6	Implement single and multilevel inheritance with appropriate base and derived class functionalities.	CO2	Guided Lab Practice	Analyze	Lab Report
7	Demonstrate function overloading and operator overloading.	CO2	Concept-based Coding	Analyze	Practical Exam

8	Implement a program using file handling (ifstream, ofstream) for reading and writing files.	CO3	File I/O Coding	Apply	Assignment Check
9	Write a program using exception handling (try, catch, throw). Demonstrate division by zero or invalid input.	CO3	Use-case Scenario	Apply	Code Review
10	Develop a program using templates (function and class templates) to handle multiple data types.	CO3	Template-Based Task	Create	Practical Test
11	Create an array of objects and perform sorting based on a member variable.	CO4	Lab Mini Project	Analyze	Code + Viva

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	E. Balagurusamy	Object Oriented Programming with C++	2020	McGraw-Hill
2	Bjarne Stroustrup	The C++ Programming Language	2013	Addison-Wesley
3	Herbert Schildt	C++: The Complete Reference	2017	McGraw-Hill

Online Resources:

No.	Website Address
1	https://www.geeksforgeeks.org/c-plus-plus
2	https://cplusplus.com
3	https://www.tutorialspoint.com/cplusplus

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera (Andrew Ng's ML course)

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
II	204	Networking Fundamentals	
	Prepared by		
Type	Credits	Evaluation	Marks
Minor Core	2	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To introduce students to the fundamental concepts of computer networks and communication systems. To understand various types of networks, network topologies, and models like OSI and TCP/IP. To explore IP addressing schemes, protocols, and network security basics. To provide foundational knowledge for advanced networking and cybersecurity studies. 			
Course Outcomes:			
<p>After completing the course the students shall be able to:</p> <p>CO1: Understand the basic terminology, architecture, and applications of computer networks.</p> <p>CO2: Explain and differentiate between OSI and TCP/IP reference models and their layers.</p> <p>CO3: Apply knowledge of IP addressing, subnetting, and routing concepts in networking.</p> <p>CO4: Describe various network devices, communication modes, and common protocols.</p>			

Unit	Content	Hours	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Introduction to Computer Networks: Definition, characteristics, benefits; types of networks (LAN, MAN, WAN, PAN); network topologies (bus, star, ring); applications of networks in real-world scenarios (banking, e-commerce, education).	4	CO1	Lecture, Real-Life Examples	Understand	Quiz
2	Network Models: OSI reference model – 7 layers, functions and services of each layer; TCP/IP model – comparison with OSI; protocol stack, encapsulation and decapsulation process.	5	CO2	Diagram Explanation, Flowcharts	Understand	Assignment
3	IP Addressing & Subnetting: Types of IP addresses (IPv4, IPv6); classes of IPv4, subnetting, CIDR notation; private vs	5	CO3	Problem-solving, Numericals	Apply	Class Test

	public IP; DNS and DHCP concepts.					
4	Networking Devices and Media: Roles of router, switch, hub, repeater, bridge, modem; types of transmission media – guided (twisted pair, coaxial, fiber-optic) and unguided (radio, microwave, infrared); basic data transmission concepts (bandwidth, throughput).	4	CO1, CO4	Demonstration, Video Walkthroughs	Understand	Quiz

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Behrouz A. Forouzan	Data Communications and Networking	2017	McGraw-Hill
2	Andrew S. Tanenbaum	Computer Networks	2021	Pearson Education
3	William Stallings	Data and Computer Communications	2020	Pearson

Online Resources:

No.	Website Address
1	https://www.geeksforgeeks.org/computer-network-tutorial
2	https://www.tutorialspoint.com/data_communication_computer_network
3	https://networkencyclopedia.com

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
II	205	Vocational Training – Full-Stack Development (HTML & CSS Basics)	
	Prepared by		
Type	Credits	Evaluation	Marks
SEC	2	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To introduce students to the fundamentals of web development using HTML and CSS. To enable students to build static, structured, and responsive web pages. To train learners in organizing content and applying styles for visual enhancement. To prepare students for advanced web technologies and frontend frameworks. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Develop semantic and well-structured web pages using HTML5.</p> <p>CO2: Apply CSS styling to enhance web layout and appearance.</p> <p>CO3: Design responsive pages using Flexbox and media queries.</p> <p>CO4: Integrate forms, links, multimedia, and layouts for user interaction.</p>			

Sr. No.	Title of Practical	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Create a basic HTML page with headings, paragraphs, line breaks, and text formatting.	CO1	Code demonstration	Understand	Lab File
2	Use lists (ordered and unordered), links (internal, external), and anchor tags.	CO1	Hands-on session	Apply	Viva, Execution
3	Create HTML tables and nested tables with different attributes.	CO1	Practice session	Apply	Assignment
4	Build a registration form using form elements (input, textarea, radio, checkbox, button).	CO4	Form Design	Apply	Lab Exercise
5	Embed images, audio, and video files in a webpage using HTML5 tags.	CO4	Multimedia demo	Apply	Observation Sheet
6	Apply CSS to style text (color, font, alignment), margins, padding, borders.	CO2	CSS Styling Lab	Apply	File Review
7	Design a web page layout using division tags and background properties in CSS.	CO2	Visual layout building	Create	Practical Exam
8	Use CSS box model to control spacing and layout of elements.	CO2	Property-based coding	Apply	Viva

9	Create a responsive navigation bar using Flexbox.	CO3	Guided coding task	Create	Lab Evaluation
10	Implement media queries to make an HTML page mobile responsive.	CO3	Responsive design demo	Create	Mini Project

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Jon Duckett	HTML and CSS: Design and Build Websites	/4	Wiley
2	Elisabeth Freeman	Head First HTML and CSS	2012	O'Reilly Media
3	Thomas Powell	HTML & CSS: The Complete Reference	2017	McGraw-Hill

Online Resources:

No.	Website Address
1	https://developer.mozilla.org/en-US/docs/Web/HTML
2	https://www.w3schools.com
3	https://www.geeksforgeeks.org/html-tutorial

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
II	206	Basics of Cybersecurity	
	Prepared by		
Type	Credits	Evaluation	Marks
ACE	2	UE:IE	60:40
Course Objectives:			
<ul style="list-style-type: none"> To provide an introduction to the principles of cybersecurity. To identify various types of cyber threats and vulnerabilities. To understand techniques for securing digital data and systems. To promote ethical practices and awareness of cyber laws 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Identify common types of cyber threats and attacks.</p> <p>CO2: Explain defense mechanisms like firewalls, encryption, and antivirus.</p> <p>CO3: Understand ethical, legal, and privacy aspects in cyberspace.</p> <p>CO4: Practice safe and responsible behavior while using digital devices.</p>			

Unit	Content	Hours	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Introduction to Cybersecurity: Importance of cybersecurity, assets and vulnerabilities, confidentiality, integrity, and availability (CIA Triad).	4	CO1	Concept discussion, videos	Understand	Quiz
2	Cyber Threats and Attacks: Malware (virus, worms, ransomware), phishing, DoS, brute-force, insider threats; real-world case studies.	5	CO1, CO2	Scenario analysis, case study	Analyze	Assignment
3	Security Measures: Firewalls, antivirus, authentication, encryption basics, best practices in personal security.	5	CO2, CO4	Demonstration, hands-on	Apply	Practical Task
4	Ethics and Cyber Law: Ethical hacking, data privacy, IT Act 2000, cybercrimes, cyber ethics, digital hygiene.	4	CO3, CO4	Group discussion, debates	Understand	Written Exam

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	William Stallings	Network Security Essentials	2020	Pearson
2	Chuck Easttom	Computer Security Fundamentals	2021	Pearson Education
3	Nina Godbole & Sunit Belapure	Cyber Security: Understanding Cyber Crimes	2011	Wiley India

Online Resources:

No.	Website Address
1	https://www.geeksforgeeks.org/cyber-security
2	https://www.cybrary.it
3	https://www.ibm.com/security/learn

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-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
VEC	2	IE	50
Course Objectives:			
<ul style="list-style-type: none"> To enhance proficiency in written and oral communication for academic and workplace contexts. To strengthen vocabulary, grammar, and composition skills. To improve listening and speaking skills for group discussions and interviews. 			
Course Outcomes:			
<p>After completing the course the students shall be able to</p> <p>CO1: Improve use of vocabulary and grammar in spoken and written communication.</p> <p>CO2: Draft formal letters, emails, resumes, and reports.</p> <p>CO3: Express ideas clearly through presentations, interviews, and discussion.</p>			

Unit	Content	Hours	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Grammar and Vocabulary: Sentence construction, parts of speech, subject-verb agreement, tenses, synonyms, antonyms.	4	CO1	Worksheets, quizzes	Remember	Grammar Test
2	Written Communication: Resume writing, formal email, job applications, notice, report writing.	4	CO2	Peer editing, writing drills	Apply	Assignment
3	Oral Communication: Group discussion, mock interviews, presentation skills, non-verbal communication.	4	CO3	Role play, mock practice	Apply	Oral Presentation
4	Listening and Reading Comprehension: Audio exercises,	3	CO1, CO3	Listening Labs, Reading	Understand	Comprehension Test

	passage reading, note-taking, interpreting instructions.			Sessions		
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Reference Books:

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

Online Resources:

No.	Website Address
1	https://learnenglish.britishcouncil.org
2	https://www.englishclub.com
3	https://www.grammar-monster.com

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera

Programme: BSc(AI and ML)-CBCS–Syllabus w.e.f.-Year 2025–2026			
Semester	Course Code	Course Title	
II	208	Soft Skills & Personality Development	
	Prepared by		
Type	Credits	Evaluation	Marks
VSC	2	IE	50
Course Objectives:			
<ul style="list-style-type: none"> 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:			
<p>After completing the course the students shall be able to</p> <p>CO1: Demonstrate improved interpersonal communication and teamwork.</p> <p>CO2: Practice leadership, time, and stress management strategies.</p> <p>CO3: Exhibit a confident and professional personality.</p>			

Unit	Content	Hours	COs	Teaching Methodology	Cognitive Level	Evaluation Tools
1	Communication and Teamwork: Verbal and non-verbal cues, listening skills, team roles.	4	CO1	Activities, group discussions	Apply	Peer Evaluation
2	Leadership and Time Management: Leadership styles, conflict resolution, time planning.	4	CO2	Group tasks, role plays	Apply	Reflective Journal
3	Personality Development: Self-awareness, confidence building, grooming, attitude shaping.	4	CO3	Individual presentations	Create	Self-Assessment Sheet
4	Professional Etiquette and Goal Setting: Workplace behavior, email etiquette, SMART goals, motivation techniques.	3	CO1, CO3	Video Examples, Guided Activities	Understand, Apply	Presentation and Report

Reference Books:

Sr. No.	Author(s)	Title	Year	Publisher
1	Barun Mitra	Personality Development and Soft Skills	2011	Oxford University Press
2	K. Alex	Soft Skills – Know Yourself & Know the World	2016	S. Chand
3	Gajendra Singh Chauhan	Soft Skills and Personality Development	2018	Cengage Learning

Online Resources:

No.	Website Address
1	https://www.skillsyouneed.com
2	https://www.mindtools.com
3	https://www.coursera.org/browse/personal-development

MOOCs:

No.	Platform
1	NPTEL / Swayam
2	edX
3	Coursera