



Karmaveer Bhaurao Patil University, Satara

**Syllabi for
B.Sc. III (Artificial Intelligence)**

**Under
Faculty of Science and Technology
(As per NEP 2020)**

With effect from Academic Year 2026-2027

Syllabi for Bachelor of Science (B.Sc.) Part – III Artificial Intelligence

PREAMBLE:

This syllabus is framed to give knowledge with an understanding of Artificial Intelligence to undergraduate students in the B.Sc. degree programme.

The Bachelor of Science (B.Sc.-III) in Artificial Intelligence course is designed to provide students with a strong foundation in the principles, theories and applications of Artificial Intelligence enabling them to meet in the intelligent digital era. Aligned with the National Education Policy (NEP) 2020, the program emphasizes multidisciplinary learning, skill development, critical thinking, innovation and experiential education.

The curriculum integrates fundamental concepts of Artificial Intelligence with emerging intelligent technologies, preparing students to analyse complex problems, design intelligent solutions and develop AI-based systems using modern tools, programming languages and machine learning frameworks. It encompasses core areas such as programming, mathematics for AI, data structures and algorithms, machine learning, deep learning, natural language processing, computer vision, data science, cloud computing, AI ethics, software engineering along with practical laboratory work, internships, projects, research-oriented learning.

GENERAL OBJECTIVES OF THE PROGRAMME:

1. To provide students with a strong foundation in the core principles and theories of Artificial Intelligence and machine learning.
2. To foster a scientific and analytical mindset, encouraging curiosity, critical thinking, innovation in solving complex problems.
3. To develop practical skills in programming, algorithm design, data handling, implementation of AI models and systems.
4. To help students understand key AI concepts, terminologies, techniques, their interrelationships across different domains.
5. To raise students awareness of ethical, social, environmental implications of artificial intelligence and its applications.
6. To equip students with interdisciplinary knowledge in computer science, mathematics, data science, cognitive science to enable a holistic understanding of intelligent systems.
7. To empower students to apply AI knowledge and tools to address real-world challenges in sectors like healthcare, education, agriculture, business, sustainability.

GENERAL OUTCOME OF THE PROGRAMME:

After completing the B.Sc. program, graduates will...

1. Understand the fundamental concepts of Artificial Intelligence, programming, algorithms, data handling, intelligent systems, apply them to solve real-world problems.
2. Pursue higher education, research, career opportunities in Artificial Intelligence, machine learning, data science, computer science related fields.
3. Secure employment in government organizations, public sector undertakings, software companies, IT industries, AI-based organizations and other technology sectors.
4. Demonstrate professional ethics, effective communication, teamwork, leadership, problem-solving skills required in academic and professional environments.
5. Adapt to emerging AI technologies through continuous learning and develop innovative, responsible, sustainable AI-based solutions that contribute to society.

PROGRAMME SPECIFIC OBJECTIVES:

1. Develop a strong foundation in Artificial Intelligence, Machine Learning, Data Science, programming, and related computational sciences
2. Apply analytical thinking, critical reasoning, and problem-solving skills to design and develop AI-based solutions for real-world and interdisciplinary applications.
3. Acquire practical skills in programming, data analysis, algorithm development, and the implementation of AI models and intelligent systems.
4. Prepare for higher education, research, and advanced studies in Artificial Intelligence, Data Science, Robotics, and related fields in India and abroad.
5. Qualify for competitive examinations and technical roles in government organizations, public sector undertakings, and AI-driven industries.
6. Develop entrepreneurial skills to create AI-based products, services, and innovative technology solutions while meeting industry requirements.
7. Demonstrate professional ethics, effective communication, teamwork, leadership, and social responsibility in the development and deployment of Artificial Intelligence technologies.

PROGRAMME SPECIFIC OUTCOMES:

After completing the B.Sc. (Artificial Intelligence) program, students will:

1. Be able to explain, describe, discuss fundamental and advanced concepts in artificial intelligence, machine learning, data science.
2. Design, develop, implement AI models, algorithms, intelligent systems to solve real-world problems.
3. Critically analyze data, models, outcomes to improve decision-making and system performance.
4. Apply AI techniques to build innovative solutions across domains such as healthcare, agriculture, business, education, environmental sustainability.
5. Utilize their technical skills to become self-reliant, by securing employment in AI driven industries, starting their own tech-based ventures, or freelancing in the digital economy.
6. Design and manage AI-based projects with a focus on scalability, performance, ethical responsibility.
7. Gain industry-relevant skills and exposure through internships, workshops, live projects in collaboration with AI and tech companies.
8. Enhance research competencies through academic research, innovation challenges, capstone projects.
9. Critically assess the societal and ethical implications of AI applications and contribute responsibly to the development of sustainable and inclusive technologies.

1. TITLE: Artificial Intelligence

2. YEAR OF IMPLEMENTATION: FROM 2026-2027

3. DURATION: 01 year

4. PATTERN: Semester examination

5. MEDIUM OF INSTRUCTION: English

6. STRUCTURE OF COURSE:

AS PER NEP-2020 (2.0)

Semester (Level)	Courses			OE	VSC/ SEC	AEC/ VEC/ IKS	OJT/ FP/ CEP/ CC/ RP	Total Credits	Degree/ Cum. Cr. MEME
	Course I	Course II	Course III						
	Major Mandatory	Major Elective	--						
Sem V (5.5)	Major IX (2) Major X (2) Major XI (2) Major P V (2)	Major XII (Elect.) (2) Major P VI (Elect.) (2)	-	-	VSC III (2) (P) Major specific)	AEC III (2) (English)	OJT (4) CEP (2)	22	UG Degree: 132
Sem VI (5.5)	Major XIII (2) Major XIV (2) Major XV (2) Major P VII (2)	Major XVI (Elect.) (2) Major P VIII (Elect.) (2)	-	-	VSC IV (2) (P) Major specific) SEC III (2) (P)	AEC III (2) (English)	FP (2) CC (2)	22	
Credits	16	08	-	-	06	04	10	44	
Total	48	24	12	08	14	16	10	132	Exit Option

Abbreviations: DSC: Discipline Specific Course; DSE: Discipline Specific Elective; CCE: Continuous Comprehensive Examination; AEC: Ability Enhancement Course; VSC: Vocational Skill Course; SEC: Skill Enhancement Course; OJT: On Job Training; FP: Field Project;

7. COURSE TITLE

FIFTH SEMESTER

SEMESTER V				
Sr. No.	Components	Course Code	Course	Credits
1	Major IX	BAIT 351	Data Structures and algorithms using Python.	02
2	Major X	BAIT 352	Fundamental of Deep Learning	02
3	Major XI	BAIT 353	Mongo DB	02
4	Major Elective XII	BAIT 354	Computer Network	02
		BAIT 355	Quantum Computing	
5	Major Practical V	BAIP 356	Practical V	02
6	Major Elective Practical VI	BAIP 357	Practical VI	02
7	VSC	BAIPVSC III	Applied GitHub Techniques	02
8	AEC	BAITAEC III	English	02
9	OJT	BAIPOJT I	On Job Training	04
10	CEP	BAIPCEP I	Community Engagement Programme	02
Total				22

SIXTH SEMESTER

SEMESTER VI				
Sr. No.	Components	Course Code	Course	Credits
1	Major XIII	BAIT 361	Advances In Deep Learning.	02
2	Major XIV	BAIT 362	Django Framework.	02
3	Major XV	BAIT 363	Software Testing.	02
4	Major Elective XVI	BAIT 364	Digital Cyber Security	02
		BAIT 365	UI/UX Design	
5	Major Practical VII	BAIP 366	Practical VII	02
6	Major Practical VIII	BAIP 367	Practical VIII	02
7	VSC	BAIPVSC IV	Data Visualization Using Power BI	02
8	SEC	BAIPSEC III	Fundamentals of Jenkins	02
9	AEC	BAITAEC IV	English	02
10	FP	BAITFP I	Field Project	02
11	CC	BAITCC I	Co-curricular Course in Artificial Intelligence	02
Total				22
EXIT OPTION: Award of UG Degree in Major with 132 credits OR Continue with Major & Minor.				

**8. EVALUATION STRUCTURE:
SEMESTER V (5.5)**

Vertical	Course Category	Course Code	Internal Evaluation	ESE	Total Marks	Credits
DSC	T	BAIT 351	20	30	50	02
	T	BAIT 352	20	30	50	02
	T	BAIT 353	20	30	50	02
	P	BAIP 356	20	30	50	02
DSE (1 Theory Papers Out of 2)	T	BAIT 354	20	30	50	02
	T	BAIT 355	20	30	50	02
	P	BAIP 357	20	30	50	02
AEC	T	AEC III	20	30	50	02
VSC	P	BAIPVSC III	20	30	50	02
CEP	P	BAIPCEP I	20	30	50	02
OJT	P	BAIPOJT I	40	60	100	04
Total					550	22

Semester VI (5.0)

Vertical	Course Category	Course Code	Internal Evaluation	ESE	Total Marks	Credits
DSC	T	BAIT 361	20	30	50	02
	T	BAIT 362	20	30	50	02
	T	BAIT 363	20	30	50	02
	P	BAIP 366	20	30	50	02
DSE (1 Theory Papers Out of 2)	T	BAIT 364	20	30	50	02
	T	BAIT 365	20	30	50	02
	P	BAIP 367	20	30	50	02
AEC	T	AEC IV	20	30	50	02
VSC	P	BAIPVSC IV	20	30	50	02
SEC	P	BAIPSEC III	20	30	50	02
CC	T	BAIPCC I	20	30	50	02
FP	P	BAIPFP I	20	30	50	02
Total					550	22

Abbreviations: DSC: Discipline Specific Course; DSE: Discipline Specific Elective; CCE: Continuous Comprehensive Examination; AEC: Ability Enhancement Course; VSC: Vocational Skill Course; SEC: Skill Enhancement Course; OJT: On Job Training; FP: Field Project; CEP: Community Engagement Program; CC: Co-curricular Course; T: Theory; P: Practical

INTERNAL EVALUATION STRUCTURE

- Internal evaluation of theory papers shall carry a weightage of 40%.
- **Activity:** For the internal evaluation of theory papers following activities will be adopted for CCE I & CCE II: class test/ open book test/ online course/ Industrial review/ Industrial visit/ e learning video creation/ assignment/ seminar/ case study/ field work/ project.
- CCE III shall consist of multiple-choice questions.
- Each CCE will carry 10 marks for 2-credit theory papers and 20 marks for 4-credit theory papers, the best two scores will be considered for final score.
- Internal evaluation of practical papers shall carry a weightage of 40%.
- For practical examinations, internal evaluation will be based on student performance, attendance, journal records, viva voce.

Abbreviations: CCE: Continuous Comprehensive Examination;
ESE: End Semester Examination.

9. OTHER FEATURES:

A) LIBRARY:

The Institute and Departmental libraries are well-equipped with a wide range of reference books, textbooks, academic journals, periodicals related to Artificial Intelligence, Computer Science and Data Science.

B) EQUIPMENT:

i. DIGITAL INFRASTRUCTURE:

1. High-performance computers with AI-capable GPUs - 120
2. Interactive Panels - 4
3. High-speed internet

ii. LABORATORY EQUIPMENT & TOOLS:

1. AI & Data Science Workstations with pre-installed software (Python, Tensor Flow, etc.)
2. Raspberry Pi, Arduino kits, robotics kits for hands-on learning.
3. Virtual labs.
4. IOT development boards and sensors.

SEMESTER-V



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Faculty of Science and Technology

Yashwantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester - V

Type : Major

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Data Structures and Algorithms Using Python(BAIT351)

Course Objectives: Student Should be able to...

- 1) Understand and implement basic data structures and algorithms in Python.
- 2) Analyze and apply algorithmic techniques such as recursion, divide-and-conquer, dynamic programming.
- 3) Develop and evaluate Python programs for sorting, searching, graph algorithms.
- 4) Understand and apply data structures like heaps, priority queues, tries, disjoint sets.

Course Outcomes: Student will be able to...

- 1) Implement data structures such as arrays, stacks, queues, trees, graphs.
- 2) Apply sorting and searching techniques using Python.
- 3) Solve problems using recursion, divide-and-conquer, dynamic programming.
- 4) Demonstrate proficiency in file handling and data input/output in Python.

Module	Title and Contents	Hrs
Module -1:	Introduction and Basic Data Structures 1.1 Introduction to Arrays 1.2 Operations on arrays. 1.3 Linked Lists and types. 1.4 Singly Linked Lists. 1.5 Doubly Linked Lists. 1.6 Circular Linked Lists. 1.7 Python implementation of arrays and linked lists.	08
Module -2:	Stacks, Queues, Recursion 2.1 Concept of Stack - Definitions, Operations, Applications. 2.2 Implementation of Queue - Definitions, Operations. 2.3 Applications of Queue. 2.4 Introduction to Recursion. 2.5 Recursion examples and algorithm. 2.6 Recursive algorithms.	07
Module -3:	Trees and Graphs 3.1 Binary Trees and Traversals. 3.2 Binary Search Tree. 3.3 Operations on tree- Insertion, Deletion, Search. 3.4 Graph Traversals. 3.5 BFS (Breadth-First Search) 3.6 DFS (Depth-First Search)	07

Module -4:	Sorting, Searching, Algorithm Design 4.1 Introduction of Sorting. 4.2 Bubble Sort. 4.3 Merge Sort. 4.4 Quick Sort. 4.5 Searching: Linear, Binary Search. 4.6 Algorithmic techniques: Divide-and-Conquer.	08
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Reference Books: -

- 1) Agarwal, B. Hands-On Data Structures and Algorithms with Python. Birmingham: Packt Publishing, 2022.
- 2) Saha, S. Data Structures and Algorithms Using Python. Cambridge: Cambridge University Press, 2022.
- 3) The Self-Taught Computer Scientist: The Beginner's Guide to Data Structures and Algorithms. Independently Published, 2021.
- 4) Bhargava, Aditya. Grokking Algorithms: An Illustrated Guide for Programmers and Other Curious People. Shelter Island, NY: Manning Publications, 2016.
- 5) Miller, B. N., & Ranum, D. L. Problem Solving with Algorithms and Data Structures Using Python. Franklin, Beedle & Associates, 2011.

Evaluation Pattern:	
Total Marks: 50	
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (Best of 2 from CCE I, II & III Selected for final Score)	End Semester Examination (30 Marks): • Question -1: Solve the following questions (5 questions of 2 Marks) • Question -2: Attempt any two out of three questions (3 questions of 10 marks) • Question -3: Attempt any four out of Six questions (6 questions of 05 marks) (50 Marks converted to 30 marks)



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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences
(Artificial Intelligence)

Programme: B.Sc.

Semester - V

Type : Major

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Fundamentals of Deep Learning (BAIT 352)

Course Objectives: Student Should be able to...

- 1) Understand the basic concepts of deep learning and its applications in various fields.
- 2) Learn different types of neural networks and their roles in solving complex problems.
- 3) Gain hands-on experience with deep learning frameworks (e.g., TensorFlow, PyTorch) to build and evaluate models.
- 4) Learn how to evaluate deep learning models.

Course Outcomes: Student will be able to...

- 1) Understand and apply deep learning algorithms to solve real-world problems.
- 2) Build, train, evaluate deep learning models using TensorFlow and PyTorch.
- 3) Optimize deep learning models through regularization and hyper parameter tuning.
- 4) Implement advanced architectures.

Module	Title and Contents	Hrs
Module -1:	Introduction to Deep Learning 1.1 Artificial Intelligence (AI), Machine Learning (ML) & Deep Learning (DL) 1.2 Applications of Deep Learning 1.3 Biological Neuron vs Artificial Neuron 1.4 Perceptron and Multi-Layer Perceptron (MLP) 1.5 Artificial Neural Network (ANN) 1.6 Advantages and Limitations of Deep Learning	08
Module -2:	Fundamentals of Neural Networks 2.1 Architecture of ANN 2.2 Weights and Biases 2.3 Forward Propagation & Backpropagation 2.4 Activation Functions (Sigmoid, Tanh, ReLU, Softmax) 2.5 Loss Function, Cost Function & Learning Rate 2.6 Epochs, Batch Size, Parameters & Hyperparameters	07
Module -3:	Training Deep Neural Networks 3.1 Gradient Descent (Batch, SGD, Mini-Batch) 3.2 Optimizers (SGD, RMSProp, Adam) 3.3 Data Preprocessing & Feature Scaling 3.4 Weight Initialization & Batch Normalization 3.5 Overfitting and Underfitting	07

Module -4:	Unit 4: Convolutional Neural Networks (CNN) 4.1 Introduction to CNN 4.2 Convolution, Filters & Feature Maps 4.3 Padding and Stride 4.4 Pooling Layer & Flatten Layer 4.5 CNN Architecture 4.6 Applications of CNN	08
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Reference Books: -

- 1) Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep Learning. 2nd ed. Cambridge: MIT Press, 2023.
- 2) LeCun, Yann, and Ishan Misra. Modern Deep Learning: Foundations and Advances. 1st ed. New York: Oxford University Press, 2023.
- 3) Nielsen, Michael. Neural Networks and Deep Learning: A Textbook. 1st ed. San Francisco: Determination Press, 2022.
- 4) Schmidhuber, Jürgen. Deep Learning in Neural Networks: An Overview. 1st ed. Berlin: Springer, 2022.
- 5) Goodfellow, Ian, and Dumitru Erhan. Representation Learning: A Review and New Perspectives. 1st ed. London: Academic Press, 2022.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):

- CCE - I : 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(Best of 2 from CCE I, II & III Selected for final Score)

End Semester Examination (30 Marks):

- Question -1: Solve the following questions (5 questions of 2 Marks)
- Question -2: Attempt any two out of three questions (3 questions of 10 marks)
- Question -3: Attempt any four out of Six questions (6 questions of 05 marks)
(50 Marks converted to 30 marks)



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**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester - V

Type : Major

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: MongoDB (BAIT 353)

Course Objectives: Student Should be able to...

- 1) Introduce students to MongoDB as a powerful NoSQL database and explain its key features and applications.
- 2) Help students install, configure, operate MongoDB using CLI and GUI tools (MongoDB Compass).
- 3) Train students on CRUD (Create, Read, Update, Delete) operations and query processing in MongoDB.
- 4) Enable students to perform indexing and querying for efficient data retrieval.

Course Outcomes: Student will be able to...

- 1) Perform CRUD operations (insert, read, delete) efficiently using MongoDB commands.
- 2) Apply advanced querying techniques and indexing to optimize database performance.
- 3) Integrate MongoDB with Python applications using PyMongo and perform data backup and restore.
- 4) Utilize cloud-based MongoDB services (MongoDB Atlas) and develop simple real-world projects.

Module	Title and Contents	Hrs
Module -1:	Introduction to MongoDB 1.1 What is MongoDB? Features of MongoDB. 1.2 Advantages of NoSQL databases 1.3 Differences between SQL and NoSQL 1.4 Basic Terms: Database, Collection, Document Applications of MongoDB.	08
Module -2:	Setting up and Basic Operations 2.1 Installation of MongoDB and MongoDB Compass 2.2 Starting and stopping MongoDB server 2.3 Creating a Database and Collection 2.4 Inserting Documents (insertOne, insertMany) 2.5 Reading Documents (find, findOne) 2.6 Deleting Documents (deleteOne, deleteMany)	07
Module -3:	Querying and Indexing 3.1 Querying Documents (Query Conditions) 3.2 Query Operators (\$eq, \$gt, \$lt, \$gte, \$lte) 3.3 Logical Operators (\$and, \$or, \$not) 3.4 Sorting and Updating Documents (sort(), limit(), skip()) 3.5 Introduction to Indexing (createIndex(), getIndexes(), dropIndex()) 3.6 Query Optimization (Using explain() for Query Performance)	07

Module -4: Introduction to MongoDB with Python	4.1 Basics (aggregate() method) 4.2 Introduction to MongoDB with Python (PyMongo) 4.3 Connecting MongoDB with a Python program 4.4 Backup and Restore (mongodump, mongorestore) 4.5 Overview of MongoDB Atlas (Cloud MongoDB) 4.6 Simple Real-world Applications of MongoDB	08
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Reference Books: -

- 1) Guzman, M., and L. Lopez. Learning MongoDB 6.x: Learn the Fundamentals of MongoDB Database Management System. 1st ed. Birmingham: Packt Publishing, 2023.
- 2) Rahman, M. S. MongoDB: Basics to Advanced – A Beginner's Guide to NoSQL Database. New York: Apress, 2023.
- 3) Nakashima, T., and M. Kim. MongoDB for Dummies. 2nd ed. Hoboken: Wiley, 2018.
- 4) Banks, Kyle, and Peter Bakkum. MongoDB in Action: Covers MongoDB Version 3.0. 2nd ed. Shelter Island, NY: Manning Publications, 2016.
- 5) Hows, David, Eelco Plugge, Peter Membrey, and Tim Hawkins. The Definitive Guide to MongoDB: A Complete Guide to Dealing with Big Data Using MongoDB. 3rd ed. New York: Apress, 2015.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):	End Semester Examination (30 Marks):
• CCE - I : 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (Best of 2 from CCE I, II & III Selected for final Score)	• Question -1: Solve the following questions (5 questions of 2 Marks) • Question -2: Attempt any two out of three questions (3 questions of 10 marks) • Question -3: Attempt any four out of Six questions (6 questions of 05 marks) (50 Marks converted to 30 marks)



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**Board of Studies in Computational Sciences
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Programme: B.Sc.

Semester - V

Type : Major Elective

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Computer Network (BAIT 354)

Course Objectives: Student Should be able to...

- 1) Overview of Computer Networks.
- 2) Analyze and apply Network Devices, Network Topologies.
- 3) Develop and evaluate Network Security and Mobile Network.
- 4) Understanding of the differences between Wi-Fi and Bluetooth.

Course Outcomes: Student will be able to...

- 1) Implement data structures such as Wi-Fi, Bluetooth, Zigbee, LTE.
- 2) Apply HTTP, HTTPS Protocol.
- 3) Solve problems using Viruses, worms, Trojans, ransomware, rootkits.
- 4) Understand computer network architecture.

Module	Title and Contents	Hrs
Module -1:	Introduction to Computer Networks 1.1 Overview of computer networks and their importance 1.2 Types of networks: LAN, MAN, WAN, PAN. 1.3 Difference between network and internet. 1.4 Network topologies: Star, Ring, Bus, Mesh, Hybrid. Network devices 1.5 Network Devices: Hub, Switch, Router, Modem, Repeater, Bridge, Gateway, Access Point and Firewall.	08
Module -2:	Layer and protocols 2.1 Transmission media: Copper cables, fiber optics, wireless communication, Ethernet. 2.2 Bandwidth, data rate, channel capacity. 2.3 Network Layer – IP addressing: IPv4, IPv6, Subnetting. 2.4 Basic principles of application protocols: Email protocols: SMTP, POP3, IMAP. 2.5 Web protocols: HTTP, HTTPS, FTP, SMTP, POP3,	07
Module -3:	Wireless Networks and Mobile Networks 3.1 Introduction to Wireless Networks 3.2 Wireless communication technologies: Wi-Fi, Bluetooth, ZigBee, LTE 3.3 Wireless Network Devices 3.4 Mobile Networks: 2G, 3G, 4G and 5G 3.5 Difference between Wi Fi and Bluetooth. 3.6 Wireless Network Security	07

Module -4:	Network Security 4.1 Introduction to Network Security 4.2 Network Threats and Attacks 4.3 Importance of network security in the modern digital world. 4.4 Types of malware: Viruses, worms, Trojans, ransomware, rootkits 4.5 Antivirus and anti-malware techniques	08
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Reference Books: -

- 1)Kurose, J.F., Ross, K.W. Computer Networking: A Top-Down Approach. 8th ed. Boston: Pearson, 2024.
- 2)Meyers, M. CompTIA Network+ Certification All-in-One Exam Guide. 7th ed. New York: McGraw-Hill, 2024.
- 3)Donahue, G.A. Network Warrior. 2nd ed. Sebastopol: O'Reilly Media, 2024.
- 4)Forouzan, B.A. Data Communications and Networking. 5th ed. New York: McGraw-Hill Education, 2013.
- 5) Tanenbaum, A. S., & Wetherall, D. J. Computer Networks. 5th ed., Pearson, 2011.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):

- CCE - I : 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(Best of 2 from CCE I, II & III Selected for final Score)

End Semester Examination (30 Marks):

- Question -1: Solve the following questions
(5 questions of 2 Marks)
- Question -2: Attempt any two out of three questions
(3 questions of 10 marks)
- Question -3: Attempt any four out of Six questions
(6 questions of 05 marks)
(50 Marks converted to 30 marks)



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**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester - V

Type : Major Elective

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Quantum Computing (BAIT 355)

Course Objectives: Student Should be able to...

- 1) Understand the fundamental concepts and principles of Quantum Computing.
- 2) Analyze the basic concepts of Qubits, Quantum Gates and Quantum Circuits.
- 3) Develop an understanding of Quantum Algorithms and Quantum Programming.
- 4) Explore the applications, advantages and limitations of Quantum Computing.

Course Outcomes: Student will be able to...

- 1) Understand the fundamental concepts of Quantum Computing and Qubits.
- 2) Apply basic Quantum Gates and Quantum Circuits to solve simple problems.
- 3) Explain and implement basic Quantum Algorithms such as Deutsch-Jozsa and Grover's Algorithm.
- 4) Understand the applications of Quantum Computing in areas such as Cryptography, Artificial Intelligence and Optimization.

Module	Title and Contents	Hrs
Module -1:	Introduction to Quantum Computing 1.1 Introduction to Quantum Computing and Classical computing 1.2 Introduction to Moore's Law and Need for Quantum Computers. 1.3 Basic concepts: Bits, Qubits, Superposition, Entanglement. 1.4 Quantum states and measurements 1.5 Real-world applications of Quantum Computing.	08
Module -2:	Quantum Mechanics Essentials for Computing 2.1 Quantum bits (qubits) and Bloch Sphere, Postulates of Quantum Mechanics 2.2 Important Operators (Identity, Pauli matrices). 2.3 Linear algebra basics: vectors, matrices, complex numbers 2.4 Quantum gates and operations (Pauli gates, Hadamard gate, etc.), multi-qubit systems and tensor products.	07
Module -3:	Quantum Circuits and Algorithms 3.1 Building basic quantum circuits, Quantum circuit diagrams, 3.2 Universal Quantum Gates (CNOT + Single Qubit Gates) 3.3 Concept of Quantum Parallelism. 3.4 Introduction to key algorithms: Deutsch-Jozsa Algorithm, Grover's Search Algorithm, Introduction to Shor's Algorithm.	07
Module -4:	Quantum Machine Learning 4.1 Basics of Quantum Machine Learning (QML) 4.2 Quantum data encoding, Quantum classifiers, Variational Quantum Classifier (VQC). 4.3 Basics of Quantum cryptography, Quantum-secure communication, Quantum Random Number Generation 4.4 Applications: Pattern recognition, Optimization Tools: PennyLane, Qiskit Machine Learning.	08

Reference Books: -

- 1) Hidary, Jack D. Quantum Computing: An Applied Approach. 2nd ed. Cham: Springer, 2021.
- 2) Rieffel, Eleanor G., and Wolfgang H. Polak. Quantum Computing: A Gentle Introduction. Cambridge, MA: MIT Press, 2011.
- 3) Nielsen, Michael A., and Isaac L. Chuang. Quantum Computation and Quantum Information. 10th Anniversary ed. Cambridge: Cambridge University Press, 2010.
- 4) McMahon, David. Quantum Computing Explained. Hoboken, NJ: Wiley-Interscience, 2007.
- 5) Yanofsky, N. S., & Mannucci, M. A. Quantum Computing for Computer Scientists. Cambridge University Press, 2008.

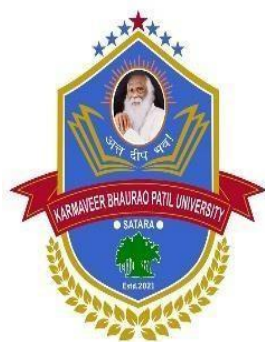
Evaluation Pattern:**Total Marks: 50****Internal Continuous Evaluation (20 Marks):**

- CCE - I : 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(Best of 2 from CCE I, II & III Selected for final Score)

End Semester Examination (30 Marks):

- Question -1: Solve the following questions
(5 questions of 2 Marks)
- Question -2: Attempt any two out of three questions
(3 questions of 10 marks)
- Question -3: Attempt any four out of Six questions
(6 questions of 05 marks)
(50 Marks converted to 30 marks)



Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences
(Artificial Intelligence)

Programme: B.Sc.

Semester – V

Type : Major Practical

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical V(BAIP 356)
Practical Batch: 12 Student/ Batch

Course Objectives: Student Should be able to...

- 1) Understand fundamental data structures like arrays, linked lists, stacks, queues, trees, graphs.
- 2) Explore algorithmic techniques such as recursion, divide-and-conquer, dynamic programming, greedy methods.
- 3) Evaluate, optimize, deploy deep learning models using appropriate performance metrics and best practices.
- 4) To train students on CRUD (Create, Read, Update, Delete) operations and query processing in MongoDB.

Course Outcomes: Student will be able to...

- 1) Implement and manipulate data structures such as arrays, stacks, queues, linked lists in Python.
- 2) Apply sorting and searching techniques to solve computational problems efficiently.
- 3) Develop and evaluate deep learning solutions for real-world applications using modern deep learning frameworks.
- 4) Apply advanced querying techniques and indexing to optimize database performance.

Practical	List of Experiments (Any 15)	Hrs
BAIT 356	1. Array Operations: Implement insertion, deletion, traversal, slicing on arrays in Python. 2. Singly Linked List: Write a program to create a singly linked list and perform insertion, deletion, traversal. 3. Doubly Linked List: Implement a doubly linked list with insertion, deletion, traversal operations. 4. Circular Linked List: Create a circular linked list and perform basic operations like insertion and traversal. 5. Stack Implementation: Write a Python program to implement a stack using lists. 6. Queue Implementation: Create a program to implement a simple queue and a circular queue using lists. 7. Parentheses Matching: Use a stack to check for balanced parentheses in a given string. 8. Postfix Expression Evaluation: Evaluate a postfix expression using stacks. 9. Binary Tree Traversals: Implement inorder, preorder, postorder traversals of a binary tree. 10. Binary Search Tree: Write a program to perform insertion, deletion, search operations on a binary search tree. 11. Implement a Simple Perceptron 12. Implement Activation Functions 13. Create a Simple Artificial Neural Network (ANN) 14. Implement Forward Propagation 15. Implement Gradient Descent	60

	16. Train an ANN Using Different Optimizers 17. Perform Data Preprocessing and Feature Scaling 18. Demonstrate Overfitting and Underfitting. 19. Create a Simple Convolutional Neural Network (CNN) 20. Image Classification Using CNN	
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Reference Books: -

- 1) Chollet, François. Deep Learning with Python. 2nd ed. Shelter Island, NY: Manning Publications, 2022.
- 2) The Self-Taught Computer Scientist: The Beginner's Guide to Data Structures and Algorithms. Independently Published, 2021.
- 3) Chollet, François. Deep Learning with Python. 2nd ed. Shelter Island, NY: Manning Publications, 2021.
- 4) Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep Learning. 1st ed. Cambridge, MA: MIT Press, 2016.
- 5) Miller, B. N., & Ranum, D. L. Problem Solving with Algorithms and Data Structures Using Python. Franklin, Beedle & Associates, 2011

Evaluation Pattern:	
Total Marks: 50	
Internal Evaluation (20 Marks): • Journal : 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks	Practical Exam Paper (30 Marks): • Section I: Attempt any TWO questions (10 marks each) • Section II: Attempt any TWO questions (05 marks each)



Karmaveer Bhaurao Patil University, Satara

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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester – V

Type : Major Practical

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical Lab E-1 (BAIP 357)
Practical Batch: 12 Student/ Batch

Course Objectives: Student Should be able to...

- 1) Train students on CRUD (Create, Read, Update, Delete) operations and query processing in MongoDB.
- 2) Enable students to perform indexing and querying for efficient data retrieval.
- 3) Overview of Computer Networks, Metropoloion Area Network.
- 4) Analyze and apply Network Devices, Network Topologies.

Course Outcomes: Student will be able to...

- 1) Integrate MongoDB with Python applications using PMongo and perform data backup and restore.
- 2) Utilize cloud-based MongoDB services (MongoDB Atlas) and develop simple real-world projects.
- 3) Implement Local Area Network.
- 4) Understanding of Internet vs. Network.

Practical	List of Experiments (Any 15)	Hrs
BAIT 357 E-1	1. Install MongoDB and MongoDB Compass on your computer. 2. Start the MongoDB server and create your first database. 3. Create a collection named 'students' inside your database. 4. Insert 3 sample student documents into the 'students' collection. 5. Insert multiple employee records into a collection called 'employees'. 6. Retrieve all documents from the 'employees' collection. 7. Update the salary of one employee using updateOne(). 8. Delete a document where the employee's name is 'John' using deleteOne(). 9. Find all employees whose salary is greater than 30,000 using \$gt. 10. Sort the employees in ascending order of their names. 11. Study of Network Devices in Detail. 12. Create a basic network topology using Cisco Packet Tracer. 13. Study different types of Computer Networks: LAN, MAN, WAN and PAN. 14. Configure two or more computers with IP addresses in Cisco Packet Tracer and test connectivity. 15. Study of Wi- Fi, Bluetooth. 16. Study of Study different network topologies: Bus, Star, Ring, Mesh and Hybrid. 17. Configure a router in Cisco Packet Tracer for communication between two different networks. 18. Study of LTE Network. 19. Study of Transmission Media – Copper Cables, Fiber Optics, Wireless Communication 20. Study of Applications and Challenges of Wireless Networks	60

Reference Books: -

- 1) Harrison, Michael. MongoDB 4.x Cookbook: Over 80 Practical Recipes for Scalable Data

Management. 2nd ed. Birmingham: Packt Publishing, 2022.

- 2) Chodorow, Kristina. MongoDB: The Definitive Guide: Powerful and Scalable Data Storage. 3rd ed. Sebastopol, CA: O'Reilly Media, 2021.
- 3) Nakashima, T., and M. Kim. MongoDB for Dummies. 2nd ed. Hoboken, NJ: Wiley, 2021.
- 4) Tanenbaum, Andrew S., and David J. Wetherall. Computer Networks. 6th ed. Boston: Pearson, 2021.
- 5) Stallings, William. Data and Computer Communications. 11th ed. Boston: Pearson, 2021.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal : 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Attempt any TWO questions (10 marks each)
- Section II: Attempt any TWO questions (05 marks each)



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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences
(Artificial Intelligence)

Programme: B.Sc.

Semester – V

Type : Major Practical

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical Lab E-II (BAIP 357)
Practical Batch: 12 Student/ Batch

Course Objectives: Student Should be able to...

- 1) Understand fundamental data structures like arrays, linked lists, stacks, queues, trees, graphs.
- 2) Explore algorithmic techniques such as recursion, divide-and-conquer, dynamic programming, greedy methods.
- 3) To introduce students to MongoDB as a powerful NoSQL database and explain its key features.
- 4) Explore quantum algorithms such as Grover's and Shor's algorithm and their computational advantages over classical methods.

Course Outcomes: Student will be able to...

- 1) Implement and manipulate data structures such as arrays, stacks, queues, linked lists in Python.
- 2) Apply sorting and searching techniques to solve computational problems efficiently.
- 3) Perform CRUD operations (insert, read, delete) efficiently using MongoDB commands.
- 4) Understand and implement basic quantum concepts such as qubits, superposition, entanglement using frameworks like Qiskit.

Practical	List of Experiments (Any 15)	Hrs
BAIT 357 E-II	1. Install MongoDB and MongoDB Compass on your computer. 2. Start the MongoDB server and create your first database. 3. Create a collection named 'students' inside your database. 4. Insert 3 sample student documents into the 'students' collection. 5. Insert multiple employee records into a collection called 'employees'. 6. Retrieve all documents from the 'employees' collection. 7. Update the salary of one employee using updateOne(). 8. Delete a document where the employee's name is 'John' using deleteOne(). 9. Find all employees whose salary is greater than 30,000 using \$gt. 10. Sort the employees in ascending order of their names. 11. Install Python, Jupyter Notebook and Qiskit. 12. Create a basic quantum circuit using Qiskit. 13. Create a simple classical logic gate simulator (AND, OR, NOT). 14. Write Python code to simulate a bit flip (classical bit). 15. Represent a qubit on the Bloch Sphere (plot using Qiskit). 16. Create quantum circuits using multiple basic gates. 17. Matrix representation of Identity and Pauli operators (small program). 18. Build a two-qubit system and show tensor product results. 19. Solve vector and complex number exercises with Python (NumPy). 20. Create custom 2x2 matrices and perform matrix operations.	60

Reference Books: -

- 1) Chollet, François. Deep Learning with Python. 2nd ed. Shelter Island, NY: Manning Publications, 2022.
- 2) The Self-Taught Computer Scientist: The Beginner's Guide to Data Structures and Algorithms. Independently Published, 2021.
- 3) Chodorow, Kristina. MongoDB: The Definitive Guide: Powerful and Scalable Data Storage. 3rd ed. Sebastopol, CA: O'Reilly Media, 2021.
- 4) Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep Learning. 1st ed. Cambridge, MA: MIT Press, 2016.
- 5) Nielsen, Michael A., and Isaac L. Chuang. Quantum Computation and Quantum Information. 10th Anniversary ed. Cambridge: Cambridge University Press, 2010.

Evaluation Pattern:**Total Marks: 50****Internal Evaluation (20 Marks):**

- Journal : 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Attempt any TWO questions (10 marks each)
- Section II: Attempt any TWO questions (05 marks each)



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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester - V

Type : VSC

Marks: 50

Credits : 2

From: A. Y. 2026-27

**Name of the Course and Code: Practical Based on: Applied GitHub Techniques
(BAIPVSC III)**

Practical Batch: 12 Student/ Batch

Course Objectives: Student Should be able to...

- 1) Understand the basics of Git and GitHub for version control and collaboration.
- 2) Use GitHub repositories, branches, pull requests for team collaboration.
- 3) Apply Git commands to manage and track source code changes effectively.
- 4) Develop professional version control practices for software project management.

Course Outcomes: Student will be able to...

- 1) Implement version control by cloning, committing, pushing changes to GitHub repositories.
- 2) Collaborate in teams by creating and reviewing pull requests on GitHub.
- 3) Create and manage GitHub repositories, including forking, branching, merging code.
- 4) Automate project workflows using GitHub Actions for CI/CD pipelines and automated testing.
- 5) Practice GitHub's best collaborative workflows, such as GitFlow or feature branching.

Practical	List of Experiments (Any 15)	Hrs.
BCSPVSC III	1. Install Git and Configure User Details. 2. Initialize a Git Repository(Create a new folder and initialize a Git repository using git init) 3. Create, Add, Commit a File 4. Check the Status of Files in Git(Modify the file and use git status) 5. View Commit History : Use git log to see commit history and git show to check commit details. 6. Undo Changes Before Committing: Use git checkout and git reset to revert changes. 7. Create and Switch Branches: Create a new branch using git branch and switch between branches. 8. Merge two branches and resolve conflicts if they occur. 9. Add files to .gitignore and check ignored files. 10. Use git stash to temporarily save changes and restore them later. 11. Create a repository on GitHub and set it up locally. 12. Link a local repository with GitHub and push changes (git push). 13. Clone an Existing GitHub Repository. 14. Fork a public repository, star it, explore the changes. 15. Make changes in a forked repo, create a pull request, merge it. 16. Use GitHub for Speed. 17. Open Source Contribution Workflow. 18. Create branch workflow. 19. Use Secrets Management in GitHub. 20. Use a Strong README	60

Reference Books: -

- 1) Shih, A. Learning GitHub: Master GitHub for Managing Repositories, Collaboration, and Version Control. 1st ed. Birmingham: Packt Publishing, 2022.
- 2) GitHub. GitHub Documentation: GitHub Guides and GitHub Learning Lab. GitHub, 2021.
- 3) Miller, J. M. GitHub Projects for Developers: Manage, Collaborate, and Ship Your Code. 1st ed. Sebastopol, CA: O'Reilly Media, 2021.
- 4) Hansen, R. GitHub Essentials: Master GitHub's Key Features to Improve Your Workflow. 1st ed. Birmingham: Packt Publishing, 2020.
- 5) Loeliger, J., & McCullough, M. Version Control with Git: Powerful Tools and Techniques for Collaborative Software Development. 3rd ed., O'Reilly Media, 2012.

Evaluation Pattern:**Total Marks: 50****Internal Evaluation (20 Marks):**

- Journal : 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Attempt any TWO questions (10 marks each)
- Section II: Attempt any TWO questions (05 marks each)



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Yashvantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester - V

Type: OJT

Marks: 100

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: BAIP OJT-I

Course Objective: Student Should be able to...

- 1) Practical Exposure: Bridge skill gaps by providing hands-on work experience in real-world environments.
- 2) Industry Alignment: Foster cooperation with local industries, MSMEs, craft centers to match market demands.
- 3) Experiential Learning: Shift focus from rote memorization to active, experience based learning and problem-solving.
- 4) Career Readiness: Equip students with 21st-century skills, professional ethics, an understanding of workplace dynamics.

Course Outcomes: Upon completion of the OJT, students will be able to...

- 1) Demonstrate proficiency in domain-specific technical tasks and job roles mapped with National Occupational Standards (NOS).
- 2) Exhibit improved communication, teamwork, leadership, adaptability in professional settings.
- 3) Apply analytical abilities to resolve practical operational challenges on-site.
- 4) Display higher self-reliance and readiness for entrepreneurship or immediate workforce entry.

Module	Title and Content	Hrs.
	Internship Guidelines for Students 1) Documentation: Annexures – I to IX (compulsory). 2) Safety: Students must follow ethical, safety, confidentiality rules by company/organization and institutional norms during the OJT. 3) Complete allotted tasks, maintain a daily logbook. 4) Attendance: Minimum 75% required. 5) Discipline: Respectful and ethical behavior during On-the-job training is mandatory. 6) Prepare and submit project report and presentation.	120

Evaluation Pattern:

Total Marks: 100

Internal Evaluation (40 Marks):

- Appendix VII: Supervisor Evaluation Of Intern : 20 Marks
- Attendance Diary/Logbook : 20 Marks

End Semester Examination (60 Marks):

- Viva Voce / Presentation : 20 Marks
- Depth of knowledge and skills acquired: 20 Marks
- Report: 20 Marks



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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester – V

Type: CEP

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: BAIP CEP-I

Course Objectives: Student Should be able to...

1. To promote a respect for rural culture, lifestyle, wisdom among students.
2. To learn about the present status of agricultural and development initiatives.
3. Identify and address the root causes of distress and poverty among vulnerable households.
4. Improve learning outcomes by applying classroom knowledge to real-world situations

Course Outcomes: Student will be able to...

1. After completing this course, students will be able to
2. Gain an understanding of rural life, Indian culture, social realities.
3. Develop empathy and bonds of mutuality with the local community.
4. Appreciate the significant contributions of local communities to Indian society and economy.

Module	Title and Content	Hrs.
	Community Engagement Programme (CEP) The Community Engagement Programme (CEP) is an integral part of the undergraduate curriculum under NEP 2020. It aims to connect students with society by involving them in activities that promote civic responsibility, scientific temper, sustainable development. This program encourages experiential learning by exposing students to community challenges and enabling them to contribute positively using their academic knowledge and innovative ideas. Rules and Regulations 1) Attendance: Minimum 75% required in all modules. 2) Discipline: Respectful and ethical behavior in the community is mandatory. 3) Documentation: Field diary and report must be handwritten or typed by the student only. 4) Safety: Students must follow safety guidelines and institutional norms during field visits. 5) Consent: No photos or videos of community members without prior permission. 6) The fieldwork conference is part of the timetable and is mandatory. Faculty should hold a fieldwork conference FOREIGHTNIGHTLY for all students. Guidelines for Implementation: 1) The Community Engagement Project should be different from the regular programmes of NSS/NCC/Green Club /F.P., etc.	

	2) Department shall designate a faculty coordinator for programme. 3) The programme should be implemented during the semester as per the academic calendar. 4) Collaborations with NGOs, local bodies, government departments are encouraged for meaningful engagement. 5) Students should work in groups (5–10 members) for field visits and activities. 6) A field diary should be maintained by each student and verified by the faculty. 7) Final assessment should be done jointly by the internal coordinator and an external evaluator based on set criteria. Department should maintain documentary evidence such as photos, attendance, reports for audit.	
Evaluation Pattern:		
Total Marks: 50		
• Report : 10 Marks • Journal/Viva : 10 • Marks Presentation : 10 Marks • Day To Day Performance :20Marks • Total : 50 Marks		

SEMESTER-VI



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**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester - VI

Type : Major

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Advances in Deep Learning (BAIT 361)

Course Objectives: Student Should be able to...

- 1) Understand the basic concepts of deep learning and its applications in various fields.
- 2) Learn different types of neural networks and their roles in solving complex problems.
- 3) Gain hands-on experience with deep learning frameworks (e.g., TensorFlow, PyTorch) to build and evaluate models.
- 4) Learn how to evaluate deep learning models.

Course Outcomes: Student will be able to...

- 1) Understand and apply deep learning algorithms to solve real-world problems.
- 2) Build, train, evaluate deep learning models using TensorFlow and PyTorch.
- 3) Optimize deep learning models through regularization and hyperparameter tuning.
- 4) Implement advanced architectures in Deep Learning.

Module	Title and Contents	Hrs
Module -1:	Recurrent Neural Networks (RNN) 1.1 Sequential Data & Need for RNN 1.2 RNN Architecture & Recurrent Neurons 1.3 Forward Propagation in RNN 1.4 Backpropagation Through Time (BPTT) 1.5 Vanishing Gradient Problem 1.6 Applications of RNN	08
Module -2:	Advanced RNN (LSTM & GRU) 2.1 Limitations of Basic RNN 2.2 LSTM Architecture (Cell State & Hidden State) 2.3 LSTM Gates (Forget, Input & Output) 2.4 GRU Architecture 2.5 Comparison of RNN, LSTM & GRU 2.6 Applications of LSTM & GRU	07
Module -3:	Attention Mechanism 3.1 Limitations of RNN & LSTM 3.2 Need for Attention Mechanism 3.3 Attention Mechanism & Types of Attention 3.4 Self-Attention (Query, Key & Value) 3.5 Scaled Dot-Product Attention 3.6 Multi-Head Attention & Applications	07

Module -4:	Transformer Networks 4.1 Introduction to Transformer & Transformer vs RNN/LSTM 4.2 Encoder and Decoder Architecture 4.3 Positional Encoding 4.4 Feed Forward Network (FFN) 4.5 Transformer Training Process	08
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Reference Books: -

- 1) Goodfellow, Ian, Yoshua Bengio, and Aaron Courville. Deep Learning. 2nd ed. Cambridge, MA: MIT Press, 2023.
- 2) Prince, Simon J. D. Understanding Deep Learning. 1st ed. Cambridge, MA: MIT Press, 2023.
- 3) Nielsen, Michael. Neural Networks and Deep Learning: A Textbook. 1st ed. San Francisco: Determination Press, 2022.
- 4) Schmidhuber, Jürgen. Deep Learning in Neural Networks: An Overview. 1st ed. Berlin: Springer, 2022.
- 5) Agarwal, B. Hands-On Data Structures and Algorithms with Python. 2nd ed., Packt Publishing, 2022.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):

- CCE - I : 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(Best of 2 from CCE I, II & III Selected for final Score)

End Semester Examination (30 Marks):

- Question -1: Solve the following questions (5 questions of 2 Marks)
- Question -2: Attempt any two out of three questions (3 questions of 10 marks)
- Question -3: Attempt any four out of Six questions (6 questions of 05 marks)
(50 Marks converted to 30 marks)



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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences
(Artificial Intelligence)

Programme: B.Sc.

Semester – VI

Type : Major

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Django Framework (BAIT 362)

Course Objectives: Student Should be able to...

- 1) Understand Django's Architecture.
- 2) Learn about Templates, Models.
- 3) Learn about Django views & Django Forms.
- 4) Implement authentication and security features.

Course Outcomes: Student will be able to...

- 1) Work on Django models.
- 2) Learn how to work on Views and templates.
- 3) Learn how to design Django forms.
- 4) Build secure web applications.

Module	Title and Contents	Hrs
Module -1:	Introduction to Django 1.1 Definition, Overview of Django and its advantages 1.2 Django's architecture (MTV - Model, Template, View) 1.3 Django project vs app structure Setting Up a Django Project 1.4 Creating a new Django project using Django-admin start project 1.5 Understanding project settings (settings.py) 1.6 Running the development server (python manage.py run server) 1.7 Understanding URLs and routing (urls.py)	08
Module -2:	Django Models 2.1 Introduction to Django ORM (Object-Relational Mapping) 2.2 Creating models (Defining fields and their types) 2.3 Model migrations (Creating and applying migrations using make migrations and migrate). 2.4 Basic queries with Django ORM (CRUD operations) 2.5 Model relationships (One-to-one, one-to-many, many-to-many)	07
Module -3:	Django Views and Templates 3.1 Understanding views in Django (Function-based views and class-based views) 3.2 Returning HTTP responses (HTTP Response, render, redirect) 3.3 URL routing and view function mapping. 3.4 Introduction to Django templates (Template inheritance, template tags, filters) 3.5 Passing data to templates from views	07

Module -4:	Django Forms 4.1 Introduction to Django forms (using forms. Form and forms. Model Form) 4.2 Handling form submissions (GET and POST methods). 4.3 Validating form data 4.4 Displaying and processing form errors 4.5 Working with model forms	08
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Reference Books: -

- 1) Vincent, William S. Django for Professionals: Production Websites with Python and Django. 2nd ed. Boston: WelcomeToCode, 2023.
- 2) López, W. Django for Beginners: Build Websites with Python and Django. 1st ed. New York: Packt Publishing, 2022.
- 3) Holovaty, Adrian, and Jacob Kaplan-Moss. The Django Book. 2nd ed. San Francisco: Django Software Foundation, 2021.
- 4) Nielsen, W. Django 3 By Example: Build Powerful and Reliable Web Applications from Scratch. 2nd ed. Birmingham: Packt Publishing, 2021.
- 5) Greenfeld, Daniel, and Audrey Roy. Two Scoops of Django 3.x: Best Practices for the Django Web Framework. 3rd ed. United States: Two Scoops Press, 2021.

Evaluation Pattern:

Total Marks: 50

Internal Continuous Evaluation (20 Marks):

- CCE - I : 10 Marks: Activity
- CCE - II: 10 Marks: Activity
- CCE - III: 10 Marks: MCQ Test

(Best of 2 from CCE I, II & III Selected for final Score)

End Semester Examination (30 Marks):

- Question -1: Solve the following questions (5 questions of 2 Marks)
- Question -2: Attempt any two out of three questions (3 questions of 10 marks)
- Question -3: Attempt any four out of Six questions (6 questions of 05 marks)
(50 Marks converted to 30 marks)



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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester - VI

Type : Major

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Software Testing (BAIT 363)

Course Objectives: Student Should be able to...

- 1) Understand the basic concepts, principles, life cycle of software testing.
- 2) Explore various software testing types, techniques, methodologies like Black Box, White Box, Integration Testing.
- 3) Develop skills to design, execute, manage test cases, bug reports, apply defect tracking in real-world scenarios.
- 4) Understand defect life cycle and bug tracking.

Course Outcomes: Student will be able to...

- 1) Understand the principles, need, life cycle of software testing and differentiate between various testing types.
- 2) Apply different software testing methods like White Box, Black Box, Grey Box testing in practical scenarios.
- 3) Use testing tools like JIRA, Selenium, JUnit for defect tracking, automation, framework-based testing.
- 4) Develop proficiency in test planning and design.

Module	Title and Contents	Hrs
Module -1:	Introduction to Software Testing 1.1 Introduction to Software and Types of Software 1.2 Introduction to Software Testing 1.3 Advantages and Disadvantages of Software Testing 1.4 Difference between Manual and Automation Testing 1.5 Principles of Software Testing 1.6 Software Development Life Cycle (SDLC)	08
Module -2:	Software Testing Methods and Levels 2.1 White Box Testing 2.2 Black Box Testing 2.3 Static Testing Techniques 2.4 Dynamic Testing Techniques 2.5 Difference between Static and Dynamic Testing 2.6 Unit Testing and its Types 2.7 Integration Testing and its Types 2.8 System Testing and its Types 2.9 Difference between Functional and Non-Functional Testing	07
Module -3:	Test Management and Automation 3.1 Regression Testing and its Types 3.2 Retesting, Smoke Testing and Sanity Testing 3.3 Difference between Smoke and Sanity Testing 3.4 Exploratory Testing, Ad-hoc Testing and Monkey Testing 3.5 Positive Testing and Negative Testing	07

	3.6 End-to-End Testing 3.7 Globalization Testing and Localization Testing 3.8 Software Test Design Techniques	
Module -4:	Advanced Topics in Testing 4.1 Software Testing Life Cycle (STLC) and its Phases 4.2 Test Plan and its Contents 4.3 Test Case and its Contents 4.4 Defects/Bugs and Defect Report with its Contents 4.5 Defect Classification (Severity and Priority) 4.6 Defect Life Cycle 4.7 Defect Resolution Process 4.8 Test Metrics	08

Reference Books: -

- 1) Ammann, Paul, and Jeff Offutt. Introduction to Software Testing. 3rd ed. Cambridge: Cambridge University Press, 2023.
- 2) Kaner, Cem, James Bach, and Bret Pettichord. Lessons Learned in Software Testing: A Context-Driven Approach. New York: Wiley, 2022.
- 3) Whittaker, James A. How to Break Software: A Practical Guide to Testing. 2nd ed. Boston: Addison-Wesley, 2022.
- 4) Adams, J. Foundations of Software Testing: ISTQB Certification. 4th ed. Boston: Cengage Learning, 2021.
- 5) Beizer, Boris. Software Testing Techniques. 2nd ed. New York: Van Nostrand Reinhold, 2021.

Evaluation Pattern:

Total Marks: 100 / 50

Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (Best of 2 from CCE I, II & III Selected for final Score)	End Semester Examination (30 Marks): • Question -1: Solve the following questions (5 questions of 2 Marks) • Question -2: Attempt any two out of three questions (3 questions of 10 marks) • Question -3: Attempt any four out of Six questions (6 questions of 05 marks) (50 Marks converted to 30 marks)
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Karmaveer Bhaurao Patil University, Satara

(A State Public University Est. u/s 3(6) of MPUA 2016)

Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences
(Artificial Intelligence)

Programme: B.Sc.

Semester - VI

Type : Major Elective

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Digital Cyber Security (BAIT 364)

Course objectives: Student Should be able to...

- 1) Basics of computer, network and information security.
- 2) Study operating system security and malwares.
- 3) Acquaint with security issues in internet protocols.
- 4) Analyze the system for vulnerabilities.

Course outcomes: Student will be able to...

- 1) Use cryptographic techniques in secure application development.
- 2) Apply methods for authentication, access control, intrusion detection and prevention.
- 3) Apply the scientific method for security assessment.
- 4) Illustrate computer forensics knowledge.

Module	Title and Contents	Hrs
Module -1:	Basic concepts of Cyber Security: 1.1 Introduction, Elements of Information Security, 1.2 Security Policy, Techniques, Steps, Categories, 1.3 Operational Model of Network Security, 1.4 Basic Terminologies in Network Security. Threats and Vulnerability, 1.5 Difference between Security and Privacy.	08
Module -2:	Data Encryption Techniques and Standards 2.1 Introduction, Encryption Methods: Symmetric, Asymmetric, 2.2 Cryptography, Substitution Ciphers. Transposition Ciphers, 2.3 Stenography applications and limitations, 2.4 Block Ciphers and methods of operations, Feistel Cipher, 2.5 Data Encryption Standard (DES), Triple DES, Weak Keys in DES Algorithms, 2.6 Advance Encryption Standard (AES).	07
Module -3:	Public Key and Management 3.1 Public Key Cryptography, RSA Algorithm: Working, 3.2 Key length, Security, Key Distribution, Deffie-Hellman Key Exchange, 3.3 Elliptic Curve: Arithmetic, Cryptography, Security, Authentication methods, 3.4 Message Digest, Kerberos, X.509 Authentication service. 3.5 Digital Signatures: Implementation, Algorithms, Standards (DSS), 3.6 Authentication Protocol	07

Module -4:	Firewall and Intrusion 4.1 Computer Intrusions. Firewall Introduction, 4.2 Characteristics and types, Benefits and limitations. 4.3 Firewall architecture, Trusted Systems, Access Control. Intrusion detection, 4.4 IDS: Need, Methods, Types of IDS, 4.5 Password Management, Limitations and Challenges.	08
Reference Books:- 1) Walker, Shawn. Cybersecurity Bible: The Complete Guide to Detect, Prevent and Manage Cyber Threats. Independently Published, 2024. 2) Nichols, Lester. Cybersecurity Architect's Handbook. Birmingham: Packt Publishing, 2023. 3) Ozkaya, Erdal. Cybersecurity: The Beginner's Guide. Birmingham: Packt Publishing, 2019. 4) Steinberg, Joseph. Cybersecurity For Dummies. Hoboken, NJ: Wiley, 2019. 5) Kosseff, Jeff. Cybersecurity Law. Hoboken, NJ: Wiley, 2017. 6) Kaplan, Fred. Dark Territory: The Secret History of Cyber War. New York: Simon & Schuster, 2016..		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (Best of 2 from CCE I, II & III Selected for final Score)	End Semester Examination (30 Marks): • Question -1: Solve the following questions (5 questions of 2 Marks) • Question -2: Attempt any two out of three questions (3 questions of 10 marks) • Question -3: Attempt any four out of Six questions (6 questions of 05 marks) (50 Marks converted to 30 marks)	



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Faculty of Science & Technology

Yashvantrao Chavan Institute of Science, Satara

Board of Studies in Computational Science (Artificial Intelligence)

Programme: B.Sc.

Semester - VI

Type: Major Elective

Marks: 50

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: UI / UX Design (BAIT 365)

Course Objectives: Student Should be able to...

1. Understand the various phases in the Interface design process.
2. Study the theories of user interface for digital platforms.
3. Understand the needs, preferences, and behavior of the target users.
4. Learn intuitive interfaces.

Course Outcomes: Student will be able to...

1. Describe the User interface and user experience design for digital platforms.
2. Utilize the research in designing.
3. Identify UI/UX tools.
4. Differentiate the prototyping tools.

Module	Title and Contents	Hrs.
Module-1:	Introduction to UI/UX (User Interface) 1.1 Getting Started with UI/UX Design: Why Should one Learn UI/UX Design, 1.2 What is User Interface (UI) Design?, What is User Experience (UX)? 1.3 What is UI Development? An overview of the human experience design process – UX design to UI design. 1.4 What is Big Picture? What is Persona in UX Design, 1.5 Stages used to design in UX, Heuristic Evaluation	08
Module-2:	Principles and Practices of UX Design 2.1 What is Design Thinking, What is Research in User Experience Design? 2.2 What are design Principles, What is User Centered Design, Wire framing & Storyboarding. 2.3 Learning Google Material Design, Role of a UX Designer Steps to Follow before UX Design: Requirement Gathering. 2.4 Research of various techniques, Analysis, 2.5 Creating Scenarios, Flow Diagrams, Flow Mapping, Making our first UX Design Road Map	07
Module-3:	Testing, Prototyping and Usability Analysis 3.1 Design Testing Methods and Techniques. 3.2 Usability Testing – Types and Process, Create plan for the Usability, What is Tests? 3.3 What is Prototype and how we design it. Various Prototyping Tools, 3.4 How to prepare Usability Testing? How to understand & refine Usability Test Results	08

Module-4:	Applying Usability Insights in UX Design 4.1 Understanding the Usability Test findings, 4.2 Applying the Usability Test feedback in, 4.3 improving the design UX Delivery Process: 4.4 How to communicate with implementation team, 4.5 UX Deliverables and its process	07
Reference Books: - 1) Garrett, Jesse James. The Elements of User Experience. Berkeley: New Riders, 2023. 2) Unger, Russ, and Carolyn Chandler. A Project Guide to UX Design: For User Experience Designers in the Field or in the Making. 2nd ed. Berkeley: New Riders, 2021. 3) Hartson, Rex, and Pardha Pyla. The UX Book: Process and Guidelines for Ensuring a Quality User Experience. 2nd ed. Amsterdam: Morgan Kaufmann, 2021. 4) Preece, Jennifer, Helen Sharp, and Yvonne Rogers. Interaction Design: Beyond Human–Computer Interaction. 5th ed. Hoboken, NJ: Wiley, 2019. 5) Norman, Don A. The Design of Everyday Things. Revised and Expanded ed. New York: Basic Books, 2013		
Evaluation Pattern:		
Total Marks: 50		
Internal Continuous Evaluation (20 Marks): • CCE - I : 10 Marks: Activity • CCE - II: 10 Marks: Activity • CCE - III: 10 Marks: MCQ Test (Best of 2 from CCE I, II & III Selected for final Score)	End Semester Examination (30 Marks): • Question -1: Solve the following questions (5 questions of 2 Marks) • Question -2: Attempt any two out of three questions (3 questions of 10 marks) • Question -3: Attempt any four out of Six questions (6 questions of 05 marks) (50 Marks converted to 30 marks)	



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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester – VI

Type : Major Practical

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical Lab (BAIP 366)

Practical Batch: 12 Student/ Batch

Course Objectives: Student Should be able to...

- 1) Understand the Django architecture and setup Django projects.
- 2) Develop database-driven web applications using Django models and ORM.
- 3) Gain hands-on experience with deep learning frameworks (e.g., TensorFlow, PyTorch) to build and evaluate models.
- 4) Learn how to evaluate deep learning models.

Course Outcomes: Student will be able to...

- 1) Apply how to design Django forms.
- 2) Build secure web applications.
- 3) Optimize deep learning models through regularization and hyperparameter tuning.
- 4) Implement advanced architectures like CNNs, DNNs, ANNs, GANs, Transformers.

Practical	List of Experiments (Any 15)	Hrs.
BAIP 366	1. Implement a Simple RNN Model 2. Perform Sequence Prediction Using RNN 3. Implement Text Classification Using RNN 4. Build a Simple LSTM Model 5. Implement Sentiment Analysis Using LSTM 6. Build a Simple GRU Model 7. Compare RNN, LSTM and GRU Models 8. Implement a Simple Attention Mechanism 9. Implement Self-Attention Using Python 10. Build a Simple Transformer Model for Text Classification 11. Install Django using pip and create a new Django project. 12. Run the Django development server and open the project on localhost. 13. Connect Django templates to views and render a static HTML page. 14. Create a simple Django app using python manage.py startapp. 15. Create a login page (only front-end form, no authentication needed). 16. Set up a URL mapping for the homepage and connect it to the view. 17. Add a second page called "About Us" with its own view and URL. 18. Basic CRUD (Create, Read, Update, Delete) Operations. 19. Load a CSS file and change the background colour. 20. Create a view that displays "Hello World" text on the browser.	60

Reference Books: -

- 1) Vincent, W. S. Django for Beginners: Build Websites with Python and Django. 5th ed., WelcomeToCode, 2025.
- 2) López, W. Django for Beginners: Build Websites with Python and Django. 1st ed. New York: Packt Publishing, 2022.
- 3) Holovaty, Adrian, and Jacob Kaplan-Moss. The Django Book. 2nd ed. San Francisco: Django Software Foundation, 2021.
- 4) Desikan, S., and G. Ramesh. Software Testing: Principles and Practices. 1st ed. New Delhi: Pearson Education, 2017.
- 5) Patton, Ron. Software Testing. 2nd ed. Indianapolis: Sams Publishing, 2005.

Evaluation Pattern:**Total Marks: 50****Internal Evaluation (20 Marks):**

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Attempt any TWO questions (10 Marks each)
- Section II: Attempt any TWO questions (05 marks each)



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(Artificial Intelligence)

Programme: B.Sc.

Semester – VI

Type :Major Practical

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical Lab E-I(BAIP 367)
Practical Batch: 12 Student/ Batch

Course objectives: Student Should be able to...

- 1) Acquaint with security issues in internet protocols.
- 2) Analyze the system for vulnerabilities.
- 3) Understand the basic concepts, principles, life cycle of software testing.
- 4) Explore various software testing types, techniques, methodologies like Black Box, White Box, Integration Testing.

Course outcomes: Student will be able to...

- 1) Apply the scientific method for security assessment.
- 2) Illustrate computer forensics knowledge.
- 3) Develop skills to design, execute, manage test cases, bug reports, apply defect tracking in real-world scenarios.
- 4) Understand defect life cycle and bug tracking.

Practical	List of Experiments (Any 15)	Hrs.
BAIP 367 E-I	1. Study basic introduction of opencart website and understand the functionality of its various pages. 2. Study Functional Requirement document (FRS)/SRS Document of opencart website and understand the functionality in detail of its various pages. 3. Develop the Test Plan Document of opencart website. 4. Writing the Test Scenarios of opencart website. 5. Writing the Test Cases for opencart website. 6. Writing the Bug Report Document for opencart website. 7. Study and apply Equivalence Class Partitioning (ECP) technique for designing effective test cases in software testing. 8. Study and apply Boundary Value Analysis (BVA) technique for designing effective test cases in software testing. 9. Study and apply Decision Table Testing technique for designing effective test cases in software testing. 10. Study and apply State Transition Testing technique for designing effective test cases in software testing. 11. Study of basic concepts of Cyber Security and Information Security elements 12. Preparation of a Security Policy for an organization 13. Identification of threats and vulnerabilities in a system 14. Study of Network Security operational model 15. Comparison between Security and Privacy with case examples 16. Implementation of Symmetric Encryption technique 17. Implementation of Asymmetric Encryption technique 18. Implementation of Substitution Cipher technique	60

	19. Implementation of Transposition Cipher technique 20. Study and implementation of Steganography technique	
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Reference Books: - 1) Ammann, Paul, and Jeff Offutt. Introduction to Software Testing. 3rd ed. Cambridge: Cambridge University Press, 2023. 2) Kaner, Cem, James Bach, and Bret Pettichord. Lessons Learned in Software Testing: A Context-Driven Approach. New York: Wiley, 2022. 3) Walker, Shawn. Cybersecurity Bible: The Complete Guide to Detect, Prevent and Manage Cyber Threats. Independently Published, 2024. 4) Nichols, Lester. Cybersecurity Architect's Handbook. Birmingham: Packt Publishing, 2023. 5) Stallings, W., & Brown, L. Computer Security: Principles and Practice. 4th ed., Pearson, 2018.		
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Evaluation Pattern:		
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Total Marks: 50		
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Internal Evaluation (20 Marks): • Journal: 10 Marks • Students' Performance: 05 Marks • Viva: 05 Marks		Practical Exam Paper (30 Marks): • Section I: Attempt any TWO questions (10 marks each) • Section II: Attempt any TWO questions (05 marks each)
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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester – VI

Type : Major Practical

Marks: 50

Credits : 2

From: A. Y. 2026-27

**Name of the Course and Code: Practical Lab E-II (BAIP 367)
Practical Batch: 12 Student/ Batch**

Course Objectives: Student Should be able to...

- 1) Acquaint with security issues in internet protocols.
- 2) Analyze the system for vulnerabilities.
- 3) Understand the basic concepts, principles, life cycle of software testing.
- 4) Understand the fundamentals of UI/UX design, design principles, user-centered design approach.
- 5) Design interactive user interfaces using tools like Figma or Adobe XD.

Course Outcomes: Student will be able to...

- 1) Apply the scientific method for security assessment.
- 2) Illustrate computer forensics knowledge.
- 3) Develop skills to design, execute, manage test cases, bug reports, apply defect tracking in real-world scenarios.
- 4) Apply principles of form design to create intuitive, accessible, user-friendly input Interfaces.

Practical	List of Experiments (Any 15)	Hrs.
BAIP 367 E-II	11. Study basic introduction of opencart website and understand the functionality of its various pages. 2. Study Functional Requirement document (FRS)/SRS Document of opencart website and understand the functionality in detail of its various pages. 3. Develop the Test Plan Document of opencart website. 4. Writing the Test Scenarios of opencart website. 5. Writing the Test Cases for opencart website. 6. Writing the Bug Report Document for opencart website. 7. Study and apply Equivalence Class Partitioning (ECP) technique for designing effective test cases in software testing. 8. Study and apply Boundary Value Analysis (BVA) technique for designing effective test cases in software testing. 9. Study and apply Decision Table Testing technique for designing effective test cases in software testing. 10. Study and apply State Transition Testing technique for designing effective test cases in software testing. 11. Identify UI vs UX elements in 3 popular apps/websites. 12. Create a simple persona for a student using an e-learning app. 13. Apply design thinking to solve a common problem (e.g., finding bus timings). 14. Sketch a wireframe for a login/sign-up page on paper. 15. Create a storyboard (4 frames) showing how a user orders food online. 16. Identify Google Material Design principles in two mobile apps. 17. Draw a flow diagram for “User signs up for an app.” 18. Write a usability test plan with 5 questions for a college website.	60

	19. Design a basic prototype screen using Figma/Canva. 20. List 3 prototyping tools and describe one feature of each.	
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Reference Books: - 1) Myers, Glenford J., Corey Sandler, and Tom Badgett. The Art of Software Testing. 3rd ed. Hoboken, NJ: John Wiley & Sons, 2011. 2) Kaner, Cem, Jack Falk, and Hung Q. Nguyen. Testing Computer Software. 2nd ed. New York: Wiley, 1999. 3) Norman, Donald A. The Design of Everyday Things. Revised and Expanded ed. New York: Basic Books, 2013. 4) Krug, Steve. Don't Make Me Think: A Common Sense Approach to Web Usability. 3rd ed. Berkeley: New Riders, 2014. 5) Cooper, A., Reimann, R., Cronin, D., & Noessel, C. About Face: The Essentials of Interaction Design. 4th ed., Wiley, 2014.		
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Evaluation Pattern:		
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Total Marks: 50		
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Internal Evaluation (20 Marks): • Journal: 10 Marks • Students' Performance: 05 Marks Viva: 05 Marks		Practical Exam Paper (30 Marks): • Section I: Attempt any TWO questions (10 marks each) • Section II: Attempt any TWO questions (05 marks each)
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Faculty of Science and Technology

Yashvantrao Chavan Institute of Science, Satara

Board of Studies in Computational Sciences (Artificial Intelligence)

Programme: B.Sc.

Semester – VI

Type : Vocational Skill Course IV

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical Based on vocational skill course: Data Visualization using Power BI (BAIP VSC IV)
Practical Batch: 12 Student/ Batch

Course Objectives: Student Should be able to...

- 1) Understand the fundamentals of Power BI and its applications.
- 2) Learn different types of visualization services and their implementations.
- 3) Analyse visualizations challenges, benefits, real-world applications.
- 4) Understand how to publish and share Power BI reports with others using Power BI Service

Course Outcomes: Student will be able to...

- 1) Connect, clean, transform data from various sources using Power BI tools.
- 2) Create data models and implement simple DAX calculations.
- 3) Build effective visualizations and dashboards for business data analysis.
- 4) Publish, share, collaborate using Power BI Service and Workspaces.

Practical	List of Experiments (Any 15)	Hrs
BAIPVSC IV	1. Installation and setup of Microsoft Power BI Desktop 2. Importing dataset from Excel file 3. Importing dataset from CSV file 4. Create Report View in Power BI 5. Exploring Data View in Power BI 6. Exploring Model View in Power BI 7. Creating a simple table visualization 8. Creating a bar chart visualization 9. Saving and exporting a Power BI report 10. Data cleaning using Power Query Editor 11. Transforming data (remove duplicates, change data types) 12. Merging two datasets using Power Query 13. Creating relationships between multiple tables 14. Writing basic DAX functions (SUM, AVERAGE) 15. Creating calculated columns and measures using DAX 16. Building a basic star schema data model 17. Creating different visuals (pie chart, map, table) 18. Formatting visuals (titles, colors, themes, backgrounds) 19. Adding slicers and filters to reports 20. Designing an interactive dashboard with bookmarks and drill-through	60

Reference Books: -

- 1) Harrison, M. Power BI: A Complete Guide to Building Dashboards and Reports with Power BI. 1st ed. New York: McGraw-Hill, 2022.
- 2) Kocakulak, M. Mastering Power BI: Expert Techniques for Effective Data Analytics and Business Intelligence. 1st ed. Birmingham: Packt Publishing, 2022.

- 3) Rushton, C. Power BI for the Excel Analyst: A Practical Guide to Power BI. 1st ed. Hoboken, NJ: Wiley, 2020.
- 4) Wickham, D. Power BI Cookbook: Creating Business Intelligence Solutions of Analytical Data Models, Reports, and Dashboards. 1st ed. Birmingham: Packt Publishing, 2020.
- 5) Russo, M., & Ferrari, A. Introducing Microsoft Power BI. Microsoft Press, 2016

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Attempt any TWO questions (10 marks each)
- Section II: Attempt any TWO questions (05 marks each)



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(Artificial Intelligence)**

Programme: B.Sc.

Semester - VI

Type : SEC

Marks: 50

Credits : 2

From: A. Y. 2026-27

Name of the Course and Code: Practical Based on Skill Enhancement
Course :Fundamentals of Jenkins (BAIPSEC)
Practical Batch: 12 Student/ Batch

Course Objectives: Student Should be able to...

- 1) Understand the fundamentals of Jenkins as an automation server.
- 2) Install and configure Jenkins on different operating systems.
- 3) Create and manage freestyle and pipeline jobs for automation.
- 4) Integrate Jenkins with version control systems like GitHub.

Course Outcomes: Student will be able to...

- 1) Demonstrate practical knowledge of Jenkins setup and job creation.
- 2) Automate software builds and deployments using Jenkins pipelines.
- 3) Integrate Jenkins with tools such as Maven, Docker, testing frameworks.
- 4) Apply CI/CD principles in real-world projects.

Practical	List of Experiments (Any 15)	Hrs
BAIT SEC III	1. Installing Jenkins on Windows 2. Setting up a Jenkins pipeline 3. Configuring Jenkins for first-time use 4. Creating a simple freestyle project 5. Running a Hello World build job 6. Using Jenkins environment variables 7. Creating parameterized builds 8. Scheduling jobs with cron syntax 9. Setting up Jenkins email notifications 10. Managing Jenkins plugins 11. Configuring Jenkins credentials securely 12. Integrating Jenkins with GitHub 13. Automating build triggers with webhooks 14. Using Jenkins Blue Ocean interface 15. Monitoring Jenkins jobs and logs 16. Backing up Jenkins configuration 17. Restoring Jenkins configuration 18. Creating a pipeline with Jenkinsfile 19. Running builds on multiple agents 20. Creating multi-branch pipelines	60

Reference Books: -

- 1) Smart, John Ferguson. Jenkins: The Definitive Guide to Continuous Integration and Deployment. 2nd ed. Sebastopol, CA: O'Reilly Media, 2020.
- 2) Langemak, Thorsten. Jenkins 2: Up and Running: Evolving CI/CD Pipelines with Jenkins. 1st ed. Birmingham: Packt Publishing, 2021.

- 3) Shah, Vishal. Jenkins Essentials: Continuous Integration and Continuous Deployment with Jenkins. 1st ed. Birmingham: Packt Publishing, 2022.
- 4) CloudBees. Jenkins: The Definitive Guide to Automation and Continuous Delivery. 1st ed. Boston: Addison-Wesley, 2021.
- 5) Humble, Jez, and David Farley. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation. Boston: Addison-Wesley, 2010.

Evaluation Pattern:

Total Marks: 50

Internal Evaluation (20 Marks):

- Journal: 10 Marks
- Students' Performance: 05 Marks
- Viva: 05 Marks

Practical Exam Paper (30 Marks):

- Section I: Attempt any TWO questions (10 marks each)
- Section II: Attempt any TWO questions (05 marks each)



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**Board of Studies in Computational Sciences
(Artificial Intelligence)**

Programme: B.Sc.

Semester – VI

Type: FP

Marks: 100

Credits: 2

From: A. Y. 2026-27

Name of the Course and Code: BAIP FP-I

Field Project (FP)

1. Objective of Field Project

The field project is designed to:

1. apply theoretical knowledge to real-world situations
2. develop research, observation, analytical skills
3. encourage interdisciplinary and experiential learning
4. enhance problem-solving and communication skills

2. Nature of Project

Students can choose:

1. Field-based study (survey, industry visit, environmental study)
2. Experimental/project-based work
3. Industry-oriented or community-based project
4. Interdisciplinary project (e.g., animation + AI, science + media)

Practical Evaluation Pattern:

Total Marks: 50

- Report = 10 Marks
- Log Book = 10 Marks
- Presentation = 10 Marks
- Day To Day Performance = 10 Marks
- Demonstration = 10 Marks