

Shah & Anchor Kutchhi Engineering College

2025-26 *Scheme & Syllabus*

Bachelor of Vocational (B.Voc.) in Artificial Intelligence and Data Science

First Year – Semester I & II (With Effect from 2025-2026 onwards)

Shah & Anchor Kutchhi Engineering College

CURRICULUM STRUCTURE

FIRST YEAR B.Voc.

Artificial Intelligence and Data Science

B.Voc. UG Program in Artificial Intelligence and Data Science

VISION:

To be globally recognized for contributing professional and ethical engineers in the field of Artificial Intelligence and Data Science with commitment to industry, academia and research for research.

MISSION:

1. To provide problem solving and analytical skill based education to students that will enhance their expertise in the field of AI and DS through industry collaboration and research.
2. To develop ethical and ethical professionals who are capable of providing AI and DS based solutions to societal challenges.
3. To create students for pursuing research in the area of mathematical, computational and modelling methodologies and contribute towards innovation in the field of AI and DS.

Shah & Anchor Kutchhi Engineering College

B.Tech. (CS) Program in Artificial Intelligence and Data Science

Program Structure for First Year B.Tech. in Artificial Intelligence & Data Science
(With Effect from 2021-2022)

Semester I

Scheme of Examination					Scheme of Examination					
General Component										
Course Code	Name of the Course	Hours per Week		Total Credits	Duration in Hours	Maximum Marks				Total Marks
		L	P			CIA			ESE	
						Mid Sem	CCE	Total		
Skill Component						CIA			ESE	
TOTAL										

NOTE: ESE & MSE (Theory & Practical) will be conducted for 100 marks and converted to the appropriate Teaching and Examination scheme.

CIA – Continuous Internal Assessment
ESE – End Semester Examination (Theory)

CCE – Continuous Comprehensive Evaluation
CIA – Continuous Comprehensive Evaluation

Head, Shah & Anchor Kutchhi Engineering College, Institute of Chemical Technology (Mumbai) Matunga

Dean, Academics

Shah & Anchor Kutchhi Engineering College

An Autonomous Institute affiliated to University of Mumbai

B.Tech. (CS: Program in Artificial Intelligence and Data Science)

Program Structure for First Year B.Tech. in Artificial Intelligence & Data Science
(With Effect from AY 2024-25)

Semester II

Scheme of Instruction					Scheme of Examination					
General Component										
Course Code	Name of the Course	Hours per Week		Total Credits	Duration in Hours	Maximum Marks				Total Marks
		L	P			CIA		ESE		
						Test	CCA	Total	ESE	
Skill Component						CIA		ESE		

* All ESE & CIA (Theory & Practical) will be conducted for 100 marks and converted to appropriate Teaching and Examination scheme.

CIA – Continuous Internal Assessment | CCA – Continuous Comprehensive Assessment | CIA – Continuous Internal Examination Practical
ESE – End Semester Examination Practical | CCA – Continuous Comprehensive Assessment | ESE – End Semester Examination

SEMESTER I

Course Objectives	
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2	
3	
4	

Course Outcomes	
After successful completion of the course, the students will be able to	
CO1	
CO2	
CO3	
CO4	

Pre-requisite courses, if any:

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component) 2. Assignments (Tutorials/Programming/Drawing/Numerical Problems/Case studies/Design Projects/Laboratory Experiments/Writing/Mapping etc) 3. Practical / Experiments (Lab Tests/Experiments/Viva-Voce for each Experiment/Lab Records/Experiments Completion/Tutorials/Programming/Drawing/Numerical Problems/Case studies/Design Projects/Laboratory Experiments/Writing/Mapping etc/Laboratory Component) 4. End Semester Examination (Theory and Laboratory components)
INDIRECT
1. Course end survey 2. Industry Feedback etc. (If any)

[illegible]
Module 1: Introduction to Mathematical Foundations — [illegible] Hours
1.1 Arithmetic – Operations, Properties, Elementary Number Theory 1.2 Geometry – Basic Shapes, Areas, Perimeters, Volumes 1.3 Trigonometry – Basic Trigonometric Functions and their properties, Trigonometric identities and equations, practical applications in real-world scenarios 1.4 Algebra – Introduction to Basic Algebraic expressions, Polynomials, Factorization, Solving linear and quadratic equations, Partial fractions and applications 1.5 Calculus – Basic Concepts, Limits, continuity, differentiation, integration, Applications of derivatives and integrals in practical problems
Module 2: Linear Algebra Basics — [illegible] Hours
2.1 Vectors: Introduction, Basic Operations 2.2 Matrices: Introduction, Basic Operations, Determinants, Applications 2.3 Systems of Linear equations
Module 3: Probability and Statistics — [illegible] Hours
3.1 Probability – Basic Concepts, Events, Probability Distributions 3.2 Statistics: Descriptive statistics, Mean, Median, Mode, Variance, Standard Deviation
Module 4: Discrete Mathematics — [illegible] Hours
4.1 Set Basic Concepts, Operations on Sets 4.2 Relations: Introduction, Types of Relations 4.3 Functions: Introduction, Types of Functions

Lecture Hours: [illegible] — Total Hours: [illegible]

Textbooks

1. "Higher Engineering Mathematics" by Dr. B. S. Grewal, Khanna Publishers
2. "Advanced Engineering Mathematics" by E. K. Jain and S. R. K. Iyengar, Narosa Publishers
3. "Complex Variables and Applications, Brown and Churchill, McGraw-Hill Education
4. "Probability and Statistics for Engineers and Scientists" by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, and Keying Ye

References

1. "Advanced Engineering Mathematics" by Erwin Kreyszig
2. "Numerical Methods for Engineers" by Steven C. Chapra and Raymond P. Canale
3. "Introduction to Operations Research" by Frederick S. Hillier and Gerald J. Lieberman
4. "Linear Algebra and Applied Linear Algebra" by Carl D. Meyer

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OBJECTIVES DECLARED	
Module 1 : [illegible] TECHNICAL WRITING	**[illegible] Hours**
1.1 Purpose and Characteristics of Reports Brief Overview on the needs of Technical Report Preparation, Understanding Business Undertaking and Their Scope of Activities, Overview Against Personnel Communication, Instructions etc., Business Research, Communication, Letters, Memo and Reports	
1.2 Format of a Long Formal Report: Sections/ Parts (Prefatory Elements, Report Proper, Other Parts), Appropriate Page Layout, Margins	
1.3 Language and Style of Reports: Tense, Person of Voice of Reports, Transitioning Style of Diagrams, Accurate Purpose, Tables and Appropriate Referencing System as APA & MLA Format, Understanding about Plagiarism Guidelines	
1.4 Definitions, Purpose & Types of Proposals (Informal) in conformation with APA & Conventional Proposals, Types, Characteristics and Long proposals, Parts of a Proposal, Structure, Scope and Limitations, Development	
1.5 Technical Report Writing, Parts of a Technical Report (Prefatory, Introduction, Research Methods, Findings and Conclusion, Discussion, Conclusion, Recommendations, Bibliography and Appendices), Language and Presentation, References in IEEE Format	
Module 2 : EXPLORATORY/INVESTIGATION TECHNIQUES	**[illegible] Hours**
2.1 Data Sources & Resources, Primary and Secondary Data, Collection Sources, Questionnaire, Interview, Observation, Use of a Questionnaire, Types of Research, Chronological Progression & Considerations	
2.2 Importance of Diagrams, Importance of Visual Aids for Writing an Effective Visual, Graphical Aids, Objectives of Visual Aids, Use of Visual Aids, Visual Aids Should Be Simple, Principles of Visual Aids, Preparation of Visual Aids, Types of Visual Aids (Pictorial, Conventional & Data Plots), Visual Aids Should Be Relevant, Interpretation, Planning and Preparation, Types of Questions, Types of Questions on Background, Issues, Behavioural, Problem Solving & Case Study, Modes of Interviews, Telephone Mail, Conferences and Panel, Disciplinary Trends	
Module 3 : TECHNICAL PRESENTATIONS AND FORMAL MEETINGS	**[illegible] Hours**
3.1 Effective Presentation Strategies, Planning Purpose, Analyzing Audience, Location and Time, Gathering, Assessing & Arranging Material, Developing a Presentation, Making Effective Notes, Types of Presentations, Audio Visuals, Presentation, Practice, Delivery	
3.2 Group Communication, Meeting Responsibilities, Team Building, Interpersonal and Leadership Communication Skills	
3.3 Conducting Formal Meetings, Types of Meetings, Roles and Responsibilities of Chairperson, Secretary and Members, Meeting Etiquettes	
3.4 Communication Audits, Journals, Memos	
Module 4 : CORPORATE CULTURE	**[illegible] Hours**
4.1 Organizational Etiquette, Ethical Considerations, Environmental Factors, Technology, Cultural Considerations, Intercultural Diversity, Ethical Issues, Confidentiality, Professionalism	
4.2 Case Studies, Communication in Multinational Corporate Culture	

[illegible] Coordinator — [illegible] Dean (Academics)

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Course Objectives	
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Course Outcomes	
After successful completion of this course, the student will be able to	
CO 1	[illegible]
CO 2	[illegible]
CO 3	[illegible]
CO 4	[illegible]

Pre-requisite courses: Basic Mathematics

Course Assessment Methods

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1. [illegible]
2. [illegible]

DETAILED SYLLABUS:	
Module-1: Sets Theory:	**07 Hours**
1.1 Introduction of Sets, Sets Representation, Cardinality of a Sets 1.2 Types of Sets, Subsets of a Sets, Venn Diagrams 1.3 Operations on Sets, Laws of Sets, Principle of Sets, Difference of Sets, Complement of a Sets, Symmetric Difference of Sets 1.4 Algebra of Sets, Duality, Principle of Inclusion, Exclusion principle of two sets 1.5 Functions, Operations on Functions, Methods for Defining Functions	
Module-2: Boolean Algebra:	**07 Hours**
2.1 Boolean Algebra, Properties of Boolean Algebra 2.2 Boolean Expressions, Evaluation of Boolean Expressions, Equivalent Boolean Expressions 2.3 Canonical Forms, Disjunctive Normal Forms or Sum of Products or (SOP), Conjunctive Normal Forms or Products of Sums or (POS), Obtaining a Disjunctive Normal Form, Obtaining a Conjunctive Normal Form, Minimization of Circuits 2.4 Logic Gate and Circuits, Schematic or Graphical Representation of Boolean Expressions, Applications of Boolean Algebra to Switching Theory, Simple and Complex Expressions	
Module-3: Relations and Functions:	**07 Hours**
3.1 Binary Relations, Domain and Range of Relations, Composition of n-Ary Relations, Representation of Relations, Properties of Relations, Closure of Relations, Equivalence Relations and Partitions, Partial Ordering Relations and Lattices, Chains, Sequences, Hasse Diagrams of Partially Ordered Sets, Pseudo Ordering, Total Ordering 3.2 Functions, Domain, Co-Domain and Range of a Function, Representation of a Function, Types of Functions, Identity Functions, Constant Functions, Polynomial Functions, Characteristic Functions, Hashing Functions, Recursive Functions, Permutation Functions, Mathematical Functions	
Module-4: Graph Theory:	**07 Hours**
4.1 Introduction to Graphs, Types of Graphs, Representation of Graphs, Terminologies, Graphs, Multigraphs, Graphs, Weighted Graphs, Complete Graph, Regular Graph, Bipartite Graph, Complete Bipartite Graph, Planar Graph, Properties of Planar Graphs 4.2 Euler Paths, Graph, Properties of Euler Paths, Graph Coloring, Applications of Graph Coloring	

Lecture Schematic **Total Hours: 35 Hrs**

Textbooks

1. "Discrete Mathematics and its Applications" by Kenneth H. Rosen.
2. "Introduction to Graph Theory" by Douglas B. West
3. "Discrete Mathematics" by Norman L. Biggs

Reference Books:

1. "Fundamentals of Data Structures in C" by Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed

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Course Objectives	
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Course Outcomes	
[illegible]	
CO 1	[illegible]
CO 2	[illegible]
CO 3	[illegible]
CO 4	[illegible]

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Course Assessment Methods

DIRECT
1. [illegible] 2. [illegible] 3. [illegible] 4. [illegible]
INDIRECT
1. [illegible] 2. [illegible]

DETAILED SYLLABUS:

Module 1: Principles of Object Oriented Programming	7 Hours
1.1 Object oriented Paradigm: Differences between Object Oriented Programming and Procedure oriented programming 1.2 Basic concepts of Object Oriented Programming, Encapsulation, Inheritance and Polymorphism, Benefits of OOP, Structure of C++ program, [illegible] Data types, Tokens, Identifiers, Variables, Constants, Operators, Control structures & Loops	
Module 2: Functions, Classes and Objects	8 Hours
2.1 Functions: [illegible] function, [illegible] Friend function & virtual function 2.2 Classes and Objects: [illegible] Member functions, Objects, Array [illegible] [illegible] Static [illegible] Objects [illegible]	
Module 3: Constructors, Destructors, Inheritance	8 Hours
3.1 Introduction to Constructors, Default Constructors, Parameterized Constructors, Copy Constructors, Multiple Constructors in a Class, Destructors 3.2 Inheritance: Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Hybrid Inheritance	
Module 4: Pointers, Virtual Functions and Polymorphism	7 Hours
4.1 Introduction to Memory management, new operator and delete operator, Pointers to objects, Pointers to Derived Classes 4.2 Polymorphism: Compile time polymorphism, Run time polymorphism, Virtual Functions, Overloading Function, Overriding, Operator overloading	

Minimum 2 Revisions **Total Hours: 30 Hrs**

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Text Books:

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Reference Books:

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Course Objectives	
1	To introduce the students with the concept of AI
2	To familiarize the students to different branches of AI and how they are useful in different fields
3	To make the students aware of the major techniques and algorithms used in different branches of AI
4	To develop the skills to use these techniques in order to solve the real problems in different domains

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO 1	Understand the concept of AI and its branches
CO 2	Compare different techniques in the field of AI
CO 3	Identify the use cases of AI and its branches in different fields
CO 4	Understand the steps to use AI for solving real life problems and develop a solution in the fields of AI in which real life problems

Pre-requisite courses: Basic Knowledge about Computer and Mathematics

Course Assessment Methods:

DIRECT
1. Continuous Internal Examination (Theory component) 2. Assignments (Quizzes, Group presentations, Group discussions, Case analysis, Group Projects, Peer evaluation, Creative Thinking, Critical thinking, Debating, etc) 3. Student Satisfaction Survey (Course Exit Survey) (Close to the end of the Programme, but not in the last week of the Programme) 4. Assignments (Assignments, Quizzes, Group presentations, Group discussions, Case analysis, Case studies, Project Planning, Peer review, Creative Thinking, Critical thinking, Debating, etc) (Laboratory component) 5. Semester End Examination (Theory and Laboratory components)
INDIRECT
1. Course exit survey 2. Industry Interaction / Visits

Module 1	10 Hours
1.1 Introduction to AI: The Reference Agent, Environments, Turing Test, Rational Agent, and Typical Tasks, Problem Solving Agents, Problem Formulation, Example Problems 1.2 Overview of Search: AI - Problem Solving - Search methods and Optimization	
Module 2	**10 Hours**
2.1 Introduction to Knowledge representation and reasoning: Propositional Logic, First Order Predicate Logic, Unification, Rules of Inference, Forward and Backward chaining 2.2 Overview of Natural Language Processing: Syntactic analysis (POS tagging), Semantic Analysis Statistical Concepts: Bayes probability, Inferential statistics, Hypothesis testing	
Module 3	**10 Hours**
3.1 Data Science: Introduction – definition and Data Science life cycle 3.2 Data Collection and Cleaning: Data sources and type (structured and unstructured data), Data collection methods, Data cleaning and preprocessing 3.3 Exploratory Data Analysis: Descriptive statistics, Data visualization using suitable graphs (e.g. histograms, scatter plots), Exploratory techniques to understand the distributions and patterns 3.4 Introduction to Machine Learning and Deep Learning: Definition and examples, Types of ML: Supervised, Unsupervised and Reinforcement learning, Linear Regression, Classification algorithms: Logistic regression, Decision trees, Naive Bayes, Support Vector Machines (SVM) 3.5 Introduction to Neural Networks: ANN, CNN, RNN	
Module 4	**10 Hours**
4.1 Introduction to Generative AI: Definition and goals of Generative models, Types of Generative models – Discriminative vs. generative models, Introduction of probabilistic models in relation to learning applications of Generative models in various domains, Example implementation 4.2 Ethical use of Generative AI: Responsible Generative AI Services – Microsoft's Overview, Google's Overview, Using the commercial Generative AI services responsibly (to take into account bias, safety, privacy, and security)	

Textbooks/References	Total Hours in the Course

Lab Experiments

a. Suggested Topics List of experiments (minimum 8 experiments)

i. Ice Breaker Activity: Discuss about Game idea, Scenario design, rough layout of the three game of their choice about theme.
ii. The AI Game: Scenario of participants in three games based on different AI domains
iii. AI Quiz (Regular Time Online Quiz)
iv. Video Analysis: To create a video - Introducing the concept of Smart Cities, Smart Vehicle and Smart Buildings.
v. Video on Generative Story - Learners to show a short glimpse of a Smart Island City, and video be assessed on story created in using Open Ai/other software on Google docs.
vi. AI Quiz Based Game - Learners to submit questions on Scenarios for beginners Levels
vii. Learners will be allotted a theme wherein they need to search for projects, AI trends and have to do research on theme of AI or will assign from experts videos
viii. Video Analysis: Discussing about AI Bias
ix. Video Analysis: AI Bias and AI Justice - Discussing about the possible bias in data collection. Discussing about the implications of AI technologies
x. Case study - to assess the ethical issues in using AI in Healthcare / Industrial / Agriculture

Projects: 3 Mini projects **Total Hours: 15 Hrs.**

Textbooks:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Second Edition", Pearson Education.
2. Dwight Goodner, "Game Development with Unity", Wiley Dreamtech India Pvt Ltd, 2015.
3. "Introduction to AI Robotics" by Robin R. Murphy, MIT Press, 2000.
4. "Introduction to AI" by Dan Pratap, Oxford University Press, 2016.

Reference Books:

1. "Artificial Intelligence" by Elaine Rich, Kevin Knight, & Shivashankar B Nair, 3rd Edition, TMH, 2017.
2. "Artificial Intelligence: Structures and Strategies for Complex Problem Solving" by George Luger, Pearson.
3. "Principles of Artificial Intelligence" by Nils J. Nilsson, Springer, 1982.

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Module 1: PC Assembling and Software Installation	**7 Hours**
1.1 Introduction to PC Components: Identify and understand the various hardware components of a computer such as CPU, motherboard, RAM, storage devices, power supply, etc. 1.2 Assembling Process: Demonstrate the step-by-step process of assembling a PC, including proper handling techniques, cable management, and connecting peripherals. 1.3 Operating System Installation: Provide guidance on installing a PC operating system (e.g., Windows, Linux, macOS), including partitioning, formatting, and configuring settings. 1.4 Troubleshooting Basics: Identify common issues during PC assembly and troubleshooting techniques.	
Module 2: Windows Operating System Installation	**6 Hours**
2.1 Introduction to Operating Systems: Overview of different operating systems (Windows, Linux, macOS), Understanding the role of an operating system in a computer. 2.2 Choosing and Preparing Installation Media: Creating bootable installation media, BIOS/UEFI settings, Understanding BIOS/UEFI settings and secure boot considerations. 2.3 Installation Process Walkthrough: Step-by-step guide to installing the chosen operating system, Partitioning drives and formatting during installation. 2.4 Post-Installation Checklist: Essential drivers for hardware components, Basic configuration and setup, Setting up user accounts, network settings, and basic security configurations post-installation.	
Module 3: Networking Basics	**6 Hours**
3.1 Introduction to Computer Networking: Basic Concepts of Networking, Network topologies (star, mesh, bus, ring), Understanding IP addresses, subnets, and DNS, Overview of networking devices (routers, switches, access points), Concept of configuring networking devices. 3.2 Types of Networks: Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), Personal Area Network (PAN), Characteristics and differences between different types of networks, Use cases and applications of each network type. 3.3 Network Protocols and Communication: TCP/IP, HTTP, FTP, SMTP, DHCP, DNS, Role of protocols in ensuring reliable and secure communication, Packet switching and routing. 3.4 Network Security Fundamentals: Introduction to network security concepts, Firewalls, antivirus software, and intrusion detection systems, Best practices for securing a network, including password policies and encryption.	
Module 4: Computer Maintenance and Troubleshooting	**7 Hours**
4.1 Preventive Maintenance: Importance of regular maintenance, Cleaning procedures for hardware components, Software updates and patch management, Backup strategies and data recovery options. 4.2 Common Hardware Issues: Identifying symptoms of hardware failures (e.g., overheating, power issues, peripheral malfunctions), Troubleshooting techniques for diagnosing hardware problems, Replacement procedures for faulty components. 4.3 Software Troubleshooting: Operating system errors, application crashes, and performance issues, Using diagnostic tools and utilities, Malware removal techniques and prevention strategies, Recovery options for corrupted software installations.	

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Course Objectives	
1	To introduce fundamental concepts of data science, statistics, and the CRISP-DM methodology.
2	To develop skills for managing, processing, and analyzing data effectively using R.
3	To provide practical exposure to tools and techniques used in data analysis.
4	To enhance professional skills for effective communication, performance optimization, and ethical practices.

Course Outcomes	
After successful completion of this course, the student will be able to:	
CO 1	Understand data science concepts, statistical methods, and the role of data in the CRISP-DM process.
CO 2	Apply methodologies to collect, manage, and analyze data from various sources.
CO 3	Use appropriate tools and software to perform data analysis and visualization.
CO 4	Demonstrate intelligent problem-solving efficient communication, teamwork, and ethical practices.

Prerequisite (if any): (Nil)
Course assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory and Lab components)
2. Assignments, Tutorials, Term work, presentations, Group discussions, Quiz, mini-projects, Case studies, Design Thinking, Innovation, Creativity
3. End Sem / Supplement Test (Theory), Experiential Learning (Lab Experiments, Viva, Lab Experiments)
Assignments, Tutorials, Term work, presentations, Group discussions, Quiz, mini-projects, Case studies, Design Thinking, Innovation, Creativity, Lab Components
4. End Semester Examination (Theory and Lab components)
INDIRECT
1. Course exit survey



Model Curriculum

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SEMESTER II

Program: [illegible]	Semester: III	L	P	C
Course Name: Mechanical Design for [illegible]	Course Code: [illegible]	3	0	3

Course Objectives:	
1	To develop a clear understanding of various machine elements and their applications in [illegible]
2	To introduce students to an engineering problem in any real life scenario in selecting a machine element in [illegible]
3	To provide a comprehensive overview of advanced materials commonly used in [illegible] for their selection and reliability
4	To acquire all needed topics in these subjects with ease for [illegible], and to gain these experiences and mature during the course

Course Outcomes:	
After successful completion of the course, the students will be able to:	
CO 1	[illegible] strength theories and techniques to solve problems in [illegible], their applications and modelling of machine elements
CO 2	Demonstrate proficiency in selecting and modelling mechanical components using advanced engineering and research methods, and for practical applications in [illegible]
CO 3	[illegible] materials, selecting appropriate materials for engineering applications, and use in analysis, and their associated mechanisms in [illegible] scenarios
CO 4	[illegible] advanced tools and the ability to integrate knowledge in solving problems in [illegible], including the development, fabrication and implementation of [illegible]

Prerequisites: Applied Basic Mathematical Concepts

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component)
2. Laboratory Tutorials (Lab Component) - Design Exercises (Lab Component) - Case Studies (Design Thinking Implementation) - Mini Projects (Design Thinking, etc)
3. Mini Tests - Assignments - Tutorials - Experimental Learning (Lab Component) - Quiz on Open Source Software Components - Seminars (Theory and Lab Component) - Case Studies (Design Thinking Implementation) - Mini Projects (Design Thinking, etc) - Laboratory Components - Viva Questions (Theory and Laboratory components)
INDIRECT
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2. Course Exit Survey

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Course Objectives	
1	To acquire comprehension into Bhagavad Gita, including its historical context and themes and teachings.
2	To explore how the practical wisdom of the Gita can be integrated into modern life to promote holistic well-being.
3	To foster introspection and self-reflection from the Gita to cultivate mental resilience and emotional balance in everyday life.
4	To gain insights from the Gita on building meaningful and harmonious relationships, promoting effective communication, and conflict resolution.

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO-1	Understand the principles of Bhagavad Gita and its moral, Dharma, Karma and Yog.
CO-2	Apply the principles to solve contemporary problems.
CO-3	Apply the principles to daily human conduct and behavior.
CO-4	Apply the principles and to meditate and attain clarity of mind for the go to challenges.

Correlation between Course Outcomes and Program Outcomes

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component) 2. Assignments / Seminars / Group Discussions / Quizzes / Case studies / Group Projects / Problem Solving / Role playing / Presentations etc. 3. Mid Term Examinations / Term Examinations / Viva-Voce / Practical Examinations / Lab Experiments / Lab Observations / Lab Records / Lab Viva / Internship / Industrial Training / Project Work / Dissertation / Thesis / Publications / Conferences / Seminars / Group Discussions / Case studies / Group Projects / Problem Solving / Role playing / Presentations etc. / Laboratory Components / Viva Examinations / Semester End Examinations (Theory and Laboratory components)
INDIRECT
1. Course end survey 2. Others (Parent survey, if any)

LAB COMPONENTS

a. Suggested Topics/Use of experiential/immersive (Lecture)

1. Activity: Board Learning - Introduction of Bhagavad Gita
   A. Activity: 1 based on Bhagavad Gita: Universal Wisdom, Sri Aurobindo Ashram Publication
   B. Activity: 2 based on Bhagavad Gita: Overview of each chapter and its central theme
2. Activity: Board Learning - Karma Yoga in Bhagavad Gita
   A. Activity: 1 based on chapter 2 from Bhagavad Gita: Karma Yoga
   B. Activity: 2 based on chapter 4 from Bhagavad Gita: Karma Yoga
   C. Activity: 3 based on chapter 5 from Bhagavad Gita: Karma Yoga
   D. Activity: 4 based on chapter 18 from Bhagavad Gita: Karma Yoga
3. Activity: Board Learning - Bhagavad Gita for Successful Relationships
   A. Activity: 1 based on Bhagavad Gita's view of life and relationships
   B. Activity: 2 based on chapter 3 from Bhagavad Gita
   C. Activity: 3 based on chapter 16 from Bhagavad Gita
   D. Activity: 4 based on chapter 17 from Bhagavad Gita
4. Activity: Board Learning - Bigger Life Lessons from Bhagavad Gita
   A. Activity: 1 based on chapter 4 from Bhagavad Gita
   B. Activity: 2 based on chapter 5 and 12 from Bhagavad Gita
   C. Activity: 3 based on Inner Control, Success and Compassion Lessons from Bhagavad Gita

Activity may include:

1. Assessment of current and desired level of learning.
2. Preparation by the students on acknowledgement, gratefulness and how to connect to get guidelines of Bhagavad Gita.
3. Group Discussion of the applicability/ importance of teachings of Gita for the proposed level of personal transformation/ guidelines.
4. Distribute among the students groups on applicability of teachings of Bhagavad Gita on the given guidelines.
5. Field work – Going to a nearby area (Vegetable Market, or park or temple), playing with them for a certain duration, trying to learn environment for practicing Ahimsa, not paying thought and trying to find out solutions to get the teachings of Gita inside may also include Brainstorming sessions on the problems as assigned by the teacher at the time of teaching the module.

Suggested Evaluation Methods — **Total Marks: 50 Marks**

Textbooks

1. Prabhupada, A.C. Bhaktivedanta Swami, and Bhaktivedanta Swami Bhagavad Gita as it is (Los Angeles: Bhaktivedanta Book Trust, 1972)
2. The Gospel of Buddha (source: The Sacred Anthology of Buddha) by Unknown (Sacred Publishing House)
3. Bhagavad Gita and Its Message by Sri Aurobindo (Lotus Press)

Program: First Year B.Sc.	Semester: II	L	P	C
Introduction to Data Structures	Course Code: [illegible]	3	2	4

Course Objectives:	
1	Introduce students to essential data structures such as stacks and queues.
2	To teach concepts and implementation of linear and nonlinear data structures.
3	Familiarize students with a broad range of data structures including Trees, Graphs.
4	[illegible]

Course Outcomes	
After successful completion of the course, the students will be able to:	
CO 1	To gain the basic understanding of data structures, [illegible]
CO 2	Understand the Arrays and Linked List with their properties, basic operations [illegible]
CO 3	Understand [illegible] of Stacks and Queues.
CO 4	[illegible] Trees and Graphs [illegible]

Prerequisite course: C++

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component) [illegible]
2. [illegible]
3. [illegible]
4. End Semester Examination (Theory and Laboratory components)
INDIRECT
1. Course-end survey
2. Student feedback survey [illegible]

DETAILED SYLLABUS	
Module 1: Introduction to Data Structures	[illegible] Hours
1.1 Introduction: [illegible] Data Structure [illegible]	
Module 2: Arrays and Linked List	[illegible] Hours
2.1 Arrays: [illegible] Arrays [illegible] 2.2 Linked List: [illegible] Linked List [illegible]	
Module 3: Stacks and Queues	[illegible] Hours
3.1 Stacks: [illegible] Stack [illegible] 3.2 Queues: [illegible] Queues	
Module 4: Trees and Graph	[illegible] Hours
4.1 Trees: [illegible] Tree [illegible] 4.2 Graph: [illegible] Graph [illegible] Graph	

Lecture Approach: [illegible] Total Hours: [illegible] Hrs

Lab Exercises

A. Assignment Topics List of [illegible]

1. Write a C++ program to create and print Array elements.
2. Write a C++ program to create and print Dynamic Array elements.
3. Write a C++ program for Converting a Decimal Value.
4. Write a C++ program to Create a Table on a Desired Size.
5. Write a C++ program to Implement a Stack using an Array, and perform stack operations such as push, pop, and displaying of the stack is empty or full.
6. Write a C++ program to create a queue of the desired data type.
7. Write a C++ program for Reversing a Queue.
8. Write a C++ program to Implement Queue using Two Stacks.
9. Write a C++ program to implement queue operations like enqueue and dequeue.
10. Write a C++ program to get the time between various other log 8
11. Write a C++ program to Determine Size of a Tree
12. Write a C++ program to Find the Depth of a Binary Search Tree
13. Write a C++ program to calculate the height of Binary Search Tree
14. Write a C++ program to Create a directed graph using an adjacency list representation
15. Write a C++ program to Implement Depth First Search (DFS) for an Undirected Graph
16. Write a C++ program to Implement Breadth First Search (BFS) for an Undirected Graph

Practical: Theoretical **Total Hours: 30 Hrs**

Textbooks

1. [illegible]
2. [illegible]
3. [illegible]

Reference Books

1. [illegible]
2. [illegible]

[illegible]	[illegible]			
[illegible]	[illegible]			

Course Objectives	
1	[illegible]
2	[illegible]
3	[illegible]
4	[illegible]

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO 1:	[illegible]
CO 2:	[illegible]
CO 3:	[illegible]
CO 4:	[illegible]

[illegible]

Course Assessment Methods:

DIRECT
[illegible]
INDIRECT
[illegible]

DETAILED SYLLABUS	
Module 1: Basics of Database	**[illegible] Hours**
1. The Introduction and applications of DBMS, Purpose of database, View of Data, Database Language, Database architecture, Database users and Database Administrator.	
Module 2: Relational Model	**[illegible] Hours**
2. The Structure of Relational Databases, Database Schema, Keys, Relational Operations and Relational Algebra.	
Module 3: Entity Relationship Model	**[illegible] Hours**
3. Basic Concepts and definitions: ER Model, Entity types, [illegible] entity sets, [illegible], Types of attributes, Keys, Relationship constraints: Cardinality and Participation, Extended Entity-Relationship (EER) Model: Generalization, Specialization and Aggregation.	
Module 4: Structured Query Language (SQL)	**[illegible] Hours**
4. Introduction to SQL, Data Definition [illegible], Basic structure of SQL queries, Basic SQL operations, [illegible], Set operations, Null values, Aggregate functions, Nested Subqueries, Modification of Database, [illegible], Views, Integrity constraints, Data types and Schemas, Authorization.	

[illegible] **Total Hours: [illegible] Hrs**

[illegible]

a. [illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]
9. [illegible]
10. [illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]

Program: First Year	Semester: II	3	0	0
Basic Python Programming	Course Code: [illegible]	3	0	3

Course Objectives	
1	To teach Basics of Python programming
2	Familiarize students with Conditional Statements, Control statements, Classes and Objects using Python
3	To understand the need and significance of Functions and Strings using Python
4	Familiarize students with Lists, Tuples and Dictionaries, Classes and Objects using python

Course Outcomes	
After successful completion of the course, the students will be able to:	
CO1	To understand and use the Basics of Python
CO2	To understand Conditional Statements, Control statements, Classes and Objects
CO3	To understand Functions and Strings
CO4	To understand Lists, Tuples and Dictionaries, Classes and Objects

Pre-requisite courses: Knowledge of any programming language like C++

Course Assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory component)
2. Assignments / Tutorials / Mini project / presentations / Group discussions / Quiz / seminar / Case studies / Design Thinking / Innovation / Creativity / Blog / Video / Flipped class etc.
3. Pre/Post - Experiment Test / Viva; Experimental Validation for each Experiment; Pre or Post Experiment Assignments / Tutorials / Mini project / presentations / Group discussions / Quiz / seminar / Case studies / Design Thinking / Innovation / Creativity / Blog / Video / Flipped class etc. and Laboratory Components
4. End Semester Examination (Theory and Laboratory components)
INDIRECT
1. Course-end survey
2. [illegible]

DETAILED SYLLABUS

Module 1: Introduction and Basics of Python Programs	**10 Hours**
1.1 Introduction: The C Core Programming Language, Macro Essence, Installing Python, Running Python programs, Debugging, Some Simple Scripts Worth Scripting, Command-Driven Programs, Command-Line Arguments, The Difference Between Numbers, Strings, and Characters 1.2 Identifiers and Expressions: Values and Types: Variables, Names, Values and Expressions, Type conversion, Operators and Operands, Expressions, Comments, Input and Output, Order of Operations	
Module 2: Conditional Statements, Control statements, Classes and Objects	**10 Hours**
2.1 Conditional Statements: If, If-else, nested if-else, Looping, for, while, nested loops 2.2 Control statements: Terminating loops, Skipping specific conditions 2.3 Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instance as Arguments, Returning Instance from Method, Built-in Class Attributes, Modifying Class Attributes, Class Inheritance, Data Hiding	
Module 3: Functions and Strings	**10 Hours**
3.1 Functions: Function Calls, The Construction Function, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions?, Importing with from, Boolean Values, Boolean Expressions, Logical Operators, Conditional Execution, Alternative Execution, Chained Conditionals, Nested Conditionals, Iteration, Assignment, Updating Variables, The while Statement, Break, Square Roots, Algorithms, Recursion, Stack Diagrams for Recursive Functions, Infinite Recursion, The Eleventh Day, Hello, Recursion, Leap of Faith, Visibility Rules 3.2 Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations	
Module 4: Lists, Tuples and Dictionaries, Classes and Objects	**10 Hours**
4.1 Lists: Values and Accessing Elements, Lists are Mutable, Traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List Functions and Methods 4.2 Tuples and Dictionaries: Tuples, accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument Tuples, Basic Tuple operations, Concatenation, Repetition, In Operator, Iteration, Built-in Tuple Functions Creating a Dictionary, Accessing Values in a Dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary Keys, Operations in Dictionary, Built-in Dictionary Functions, Built-in Dictionary Methods	

Lecture Hours: 40 **Total Hours: 50 Hrs**

[illegible]

A. [illegible]

[illegible]

[illegible]

B. [illegible]

[illegible]

Textbooks
[illegible]

Reference Books
[illegible]

[illegible]	[illegible]	L	T	P	C
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Course Objectives:	
1	[illegible]
2	[illegible]
3	[illegible]
4	[illegible]

Course Outcomes:	
After successful completion of the course, the students will be able to:	
CO 1	[illegible]
CO 2	[illegible]
CO 3	[illegible]
CO 4	[illegible]

Course Assessment Methods:

DIRECT
1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
INDIRECT
1. [illegible]
2. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Program: Second Year B.Tech.	Designed: [illegible]	L	P	C
Core Elective: [illegible]	Course Code: [illegible]	3	[illegible]	1

Course Objectives:	
1	To introduce fundamental concepts of data science, statistics, and the [illegible] industry.
2	To develop skills for managing, processing, and analyzing data effectively and ethically.
3	To provide practical exposure to tools and techniques used in data science.
4	To develop professional skills for effective collaboration, communication, and ethical practices.

Course Outcomes:	
After successful completion of this course, the student will be able to:	
CO 1	Understand data science concepts, statistical methods, and the role of data in the [illegible] industry.
CO 2	Apply techniques to collect, manage, and analyze data from various sources.
CO 3	Use appropriate tools and software to perform data analysis and visualization.
CO 4	Demonstrate effective problem-solving skills in communication, teamwork, and ethical practices.

Prerequisite (if any): [illegible]
Course assessment Methods:

DIRECT
1. Continuous Internal Assessment (Theory and Lab components)
2. [illegible] Semester End Examination (Theory/Lab/Mini Project/Case Study/Design Project/Presentation/Viva)
3. [illegible] Assignments (Theory and Lab components)
4. [illegible]
INDIRECT
1. Course Exit Survey



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		L	P	C
		1	02	4

Course Objectives	
1	
2	
3	
4	

Course Outcomes	
After successful completion of this course, the student will be able to	
CO 1	
CO 2	
CO 3	
CO 4	

Prerequisite courses:

Course Assessment Methods:

DIRECT
1 Continuous Internal Assessment (Theory and Lab components)
2 Assignments/Tutorials/Term work/ group presentation/Design Activities/Quiz sessions/Case studies/Design Thinking/Innovation/Creativity
3 End Exam: Examination Scheme/Theory/Practical/Viva/Oral/Term work/Experiments/Any other/Components
Assignments/Tutorials/Term work/ group presentation/Design Activities/Quiz sessions/Case studies/Design Thinking/Innovation/Creativity (Lab Component)
4 End Semester Examination (Theory and Lab components)
INDIRECT
1 Course exit survey





Model Curriculum

Contents

[redacted]

[illegible] ..... [illegible]
[illegible] ..... [illegible]
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[illegible] ..... [illegible]
[illegible] ..... [illegible]
[illegible] ..... [illegible]

Shah & Anchor Kutchhi Engineering College

CURRICULUM SCHEME SECOND YEAR B.Voc.

Artificial Intelligence and Data Science



SHAH & ANCHOR

विद्यार्थिनं सर्वविद्याय पथानम्॥