

Estd. 1962

"A++" Accredited by NAAC (2021)

With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR - 416004, MAHARASHTRA

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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र

दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४ ०२३१—२६०९४८७



Date: 03/05/2025.

Ref.No.SU/BOS/Science/ 274

To,

The Principal, All Concerned Affiliated Colleges/Institutions Shivaji University, Kolhapur The Head/Co-ordinator/Director All Concerned Department (Science) Shivaji University, Kolhapur.

Subject: Regarding revised syllabi of degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, nature of question paper and equivalence of degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

1.	B.C.A. Part II	
2.	B.ScM.Sc. Part III Nano Science and Technology	
3.	B.A./B.A.B.Ed Part II Geography	
4.	B.ScM.Sc. Part II Artificial Intelligence & Machine Learning	

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website <u>www.unishivaji.ac.in NEP-2020 (Online Syllabus)</u>

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully, Registrar .S. M. Kubal

Encl: As above

for Information and necessary action

Copy to: Dean, Faculty of Science & Technology Appointment Section A & B 6 1 Director, Board of Examinations and Evaluation 7 I.T.Cell /Computer Centre 2 8 **Eligibility Section** 3 Chairman, Respective Board of Studies 4 B.A., OE-II & B.Sc.-M.Sc. Exam Section 9 Affiliation Section (T.1) (T.2) Internal Quality Assurance Cell (IQAC Cell) 10 P.G. Seminar Section 5

SHIVAJI UNIVERSITY, KOLHAPUR



NAAC A++ Grade with CGPA 3.52

Multiple Entry and Multiple Exit Option (NEP-2020)

Syllabus for B.Sc- M.Sc. (AI-ML)

Five year Integrated Programme (Under Faculty of Science and Technology)

PART- II SEMESTER- III & IV

(Syllabus to be implemented from Academic year 2025-26)

Multiple Entry and Multiple Exit Option (NEP-2020)B.Sc-M.Sc(AI-ML) Program Structure B.Sc-M.Sc (AI-ML) (Level-5.0)

SEMESTER-III (Duration- Six Month)										
Sr.	Course Code	Teaching Scheme			Examination Scheme					
No.		Theory and Practical			Univers	ity Asses (UA)	sment	Internal Assessment (IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximu m Marks	Minimu m Marks	Exam minute s	Maximu mMarks	Minimum Marks	Exam minutes
1	Subject I Major V: Data Structure	2	-	2	40	14	90	10	04	20
2	Subject I Major VI: Database Management System	2	-	2	40	14	90	10	04	20
3	Subject I Practical III : Practical Based on Subject I Major V & Major VI	-	4	2	40	14	90	10	04	-
4	Subject II Minor V: Exploratory Data Analysis	2	-	2	40	14	90	10	04	20
5	Subject II Minor VI: Advanced Python Programming	2	-	2	40	14	90	10	04	20
6	Subject II Practical III : Practical Based on Subject Minor VI	-	4	2	40	14	90	10	04	-
7	OE – III (T) : Discrete Mathematics-I	2	-	2	40	14	90	10	04	20
8	VSC – I (P): Major specific Web Design using JavaScript	2	-	2	40	14	90	10	04	20
9	SEC-I (P): Core Java Programming	-	4	2	40	14	90	10	04	20
10	AEC-I: Verbal Communication	2	-	2	40	14		10	04	20
11	CC-I: Basics of Yoga	2	-	2	40	14	90	10	04	20
	Total (A)			22	440			110		

Multiple Entry and Multiple Exit Option (NEP-2020)B.Sc-M.Sc(AI-ML) Program Structure B.Sc-M.Sc (AI-ML) (Level-5.0)

SEMESTER-IV (Duration- Six Month)										
Sr.	Course Code	Teaching Scheme Examination Scheme								
No.		Theory and Practical			University Assessment (UA)			Internal Assessment (IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximu m Marks	Minimu m Marks	Exam minutes	Maximum Marks	Minimum Marks	Exam minutes
1	Subject I Major VII: Advanced Data Structures	2	-	2	40	14	90	10	04	20
2	Subject I Major VIII: Relational database Management System	2	-	2	40	14	90	10	04	20
3	Subject I Practical IV: Practical Based on Subject I Major VII & Major VIII	-	4	2	40	14	90	10	04	-
4	Subject II Minor VII: Feature Engineering	2	-	2	40	14	90	10	04	20
5	Subject II minor VIII: Basics of Artificial Intelligence	2	-	2	40	14	90	10	04	20
6	Subject II Practical IV: Practical Based on Subject II Minor VII	-	4	2	40	14	90	10	04	-
7	OE – III (T): Discrete Mathematics - II	2	-	2	40	14	90	10	04	20
8	SEC-II (T): Advanced Java Programming	2	-	2	40	14	90	10	04	20
9	AEC-II: Business Communication	2	-	2	40	14	90	10	04	20
10	VEC-II: Environmental Studies	2	-	2	40	14		10	04	20
11	CEP-I (P): Field work	-	4		10	4		40	14	90
	Total (A)			22	440			110		

• Student contact hours per week : 24 Hours (Min.)	Total Marks for B.Sc-MSc(AI-ML)-I: 1100				
• Theory and Practical Lectures : 60 Minutes Each	• Total Credits for B.Sc- MSc(AI-ML)-II (Semester III & IV) : 44				
	 Practical Examination is Semester wise before theory Examination. Subject I Practical III Subject II Practical III SEC-I (T/P) Practical *Duration of Practical Examination as per respective BOS guidelines Separate passing is mandatory for Theory, Internal and PracticalExamination 				
• Requirement for Entry at Level 5.0: Must have completed Level 4.5					
• Exit Option at Level 5.0: Students can exit after Level 5.0 with under Diploma course in AI-ML if he/she completes the courses equivalent to minimum of 44 credits					

Title of course: Subject I Major V: Data Structure

Course Outcomes:

After completion of this course students will be able to;

- 1. Understand concept of time complexity, space complexity
- 2. Understand concept of linear data structure linked list, stack, queue
- 3. Explore concepts of searching and sorting algorithm

UNIT I

Definition of data structure, data structure operations. Algorithms : Complexity, Time Complexity of Algorithms, Types of time complexity, Space complexity, Asymptotic Notations for Complexity of Algorithms, Sub algorithms, Variables, data. Linear data structures and non linear data structures, Arrays, Traversing linear arrays, Inserting and Deleting, Multidimensional arrays: Representation of Two-Dimensional arrays in memory, Pointers: Pointers arrays, Matrices, Sparse Matrices.

UNIT II

(15 Hours)

Linear search, Binary search, Sorting, Bubble sort, Selection sort, insertion sort, Quick sort, Radix sort, Merge sort, Concept of link list, singly linked list, singly circular, doubly link list, stack queue using array, Infix expression, postfix expression, prefix expression.

Reference Books:

1. Robert Kruse, C.L Tondo and Bruce Leung, "Data Structure and Programming in C", Pearson Education.

2. Yedidyah Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, "Data Structure using C and C++", Pearson Education 2nd Edition.

3. "C" Programming in an Open Source Paradigm: A Hands on Approach by K.S.Oza, S.R.Patil and R.K.Kamat

(15 Hours)

Title of course: Subject I Major VI: Database Management System

Course Outcomes:

After completion of this course students will be able to:

- 1. Analyze Data Models and Database Schema.
- 2. Differentiate between schema and instances, data models.
- 3. Apply Tuple and Domain Relational Calculus for query formulation.

UNIT I

(15 Hours)

An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models, schema and instances, data independence and database language and interfaces, Data definitions language, DML, Overall Database Structure, role of a DBA, Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, Specialization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

UNIT II

(15 Hours)

Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, and Domain constraints. Relational Algebra: Relational algebra, relational calculus, tuple and domain calculus. Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL.

- 1. Database Management System A C Shah & A R Patel, MacMillan Publication
- 2. Introduction to Database System C. J. Date (7th edition) Low Price Edition
- 3. Database system concepts Henry F. Korth (3rd edition) TMH Publications

Title of course: Subject I Practical III: Practical Based on Subject I Major V & Major VI

Course Outcomes:

After completion of this course students will be able to:

- 1. Implement Linear and Non-Linear Data Structures
- 2. Apply DML, cursors, aggregate functions for analytical queries.

There will be around 20 programs (10 programs on each subject) based on Major V & Major VI.

Practical Based on Subject I Major V: Data Structure

- 1. Write a program to read n number of values in an array and display them in reverse order.
- 2. Write a program to find the maximum and minimum elements in an array.
- 3. Write a program to search particular element in an array.
- 4. Write a program to read and display elements of two dimensional array.
- 5. Write a program for the addition, subtraction and multiplication of two matrices.
- 6. Write a program to implement linear search.
- 7. Write a program to implement binary search.
- 8. Write a program to implement bubble sort.
- 9. Write a program to implement quick sort.
- 10. Write a program to implement singly linked list.
- 11. Write a program to perform insert and delete operations on singly linked list.
- 12. Write a program to implement doubly linked list.
- 13. Write a program to implement bubble sort.
- 14. Write a program to perform PUSH and POP operations on stack using array.
- 15. Write a program to perform ENQUEUE and DEQUEUE operations on queue using array.

B.Sc.-M.Sc. Artificial Intelligence & Machine Learning (AI & ML) Multiple Entry and Multiple Exit Option (NEP-2020) PART II SEM III Practical Based on Subject I Major VI: Database Management System

List of Programs based on Database Management System:

1. Write SQL queries to create the following relational tables with appropriate constraints:

Student (Student_ID, Name, Age, Dept_ID)

Department (Dept_ID, Dept_Name, HOD)

Course (Course_ID, Course_Name, Dept_ID)

Enrollment (Enroll ID, Student ID, Course ID, Marks)

- 2. Write SQL INSERT statements to add at least 5 records into each table.
 - a. Write an SQL query to display all students and their details from the Student table.
 - b. Write SQL queries to:

Set Student_ID as the Primary Key in the Student table.

Set Dept_ID as a Foreign Key in the Student table referring to Department.

3. Write SQL queries to:

Retrieve all students from the 'Computer Science' department.

Find the names of students aged above 20.

4. Write an SQL query to:

Update the Department name to 'IT' where Dept ID = 102.

Increase the marks of all students by 5 where $Course_ID = 'C101'$.

5. Write SQL queries to:

Delete students who have not enrolled in any course.

Remove a specific course from the Course table using Course_ID.

6. Write SQL queries to:

Find the total number of students in each department.

Get the average marks obtained by students in Course_ID = 'C102'.

7. Write SQL queries to:

Retrieve students with marks greater than 75.

Find the departments having more than 3 students enrolled.

8. Write SQL queries using different types of JOINs:

INNER JOIN: Show students along with their enrolled courses.

LEFT JOIN: Display all students and their department names (even if some students are not assigned to any department).

9. Write SQL queries to:

Find the student(s) with the highest marks in any course.

Retrieve students who have enrolled in more than one course.

- 10. Create a SQL VIEW to display student details along with their enrolled courses and department names.
- 11. Create an INDEX on the Student table for the Name column to optimize search queries.
- 12. Write SQL queries to:

Display the total number of students in each department, sorted in descending order.

Retrieve students grouped by department, showing the average age of students in each department.

13. Write an SQL stored procedure with a cursor to fetch and display all students' names one by one.

Title of course: Subject II Minor V: Exploratory Data Analysis

Course Outcomes:

The course will enable students to:

- 1. To outline an overview of exploratory data analysis.
- 2. To implement data visualization using Matplotlib.
- 3. To perform univariate data exploration and analysis.

UNIT I

(15 Hours)

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data –

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data –Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques. Data Manipulation using Pandas – Pandas Objects – Data Indexing and Selection – Operating on Data – Handling Missing Data – Hierarchical Indexing – Combining datasets – Concat, Append, Merge and Join – Aggregation and grouping – Pivot Tables – Vectorized String Operation.

UNIT II

(15 Hours)

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread- Scaling and Standardizing – Inequality, Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables -Handling Several Batches - Scatterplots and Resistant Lines.Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

- 1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020
- 2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", First Edition, O Reilly, 2017
- 3. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019

Title of course: Subject II Minor VI: Advanced Python Programming

Course Outcomes:

After completion of this course students will be able to:

- 1. To learn how to design object-oriented programs with Python classes.
- 2. To learn about reading, writing and implementing other operation on files in Python.
- 3. To design GUI Programs and implement database interaction using Python.
- 4. To know about use of handling exceptions for writing robust python programs.

UNIT I

(15 Hours)

OOPs in python: Features of Object Oriented Programming system (oops)- classes and objects, encapsulation, abstraction, inheritance, polymorphism, constructors and destructors Classes and objects: Creating a class, the self-variable, types of variables, namespaces, types of methods, instance methods, class methods, static methods, passing members of one class to another class, inner classes Inheritance and polymorphism: Inheritance in python, types of inheritance- single inheritance, multilevel inheritance, hierarchical inheritance, multiple inheritance, constructors in inheritance, overriding ,polymorphism, duck typing, operator overloading, method overloading, method overriding, Abstract classes and interfaces.

UNIT II

(15 Hours)

Python SQL Database Access, introduction, installation, DB connection, Creating DB table, INSERT, DELETE, READ,UPDATE operations, COMMIT and ROLLBACK operations, Handling errors Exceptions in python: Errors in a python program, compile & run-time errors, logical error, exceptions-exception handling, types of exceptions, the except block, the assert statement, user-defined exceptions, logging the exceptions.

- 1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul ries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
- 2. Python for Informatics: Exploring Information, Charles Severance 3. Learning Python, Fourth Edition, Mark Lutz, O'Reilly publication
- 3. Advanced Python Programming, Dr. Gabriele Lanaro, Quan Nguyen, SakisKasampalis, Packt Publishing, 2019

Title of course: Subject II Practical III: Practical Based on Subject Minor VI

Course Outcomes:

After completion of this course students will be able to:

- 1. Understand Object-Oriented Programming (OOP) Principles in Python
- 2. Apply Inheritance and Polymorphism

There will be following programs based on Advanced Python Programming:

- 1. Write a Python program to create a person class. Include attributes like name, country and date of birth. Implement a method to determine the person's age.
- 2. Write a Python program to create a class representing a bank. Include methods for managing customer accounts and transactions.(Use inheritance)
- 3. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.
- 4. Write a Python program in python to elaborate single inheritance.
- 5. Write a Python program in python to elaborate multiple inheritance.
- 6. Write a Python program in python to elaborate single inheritance.
- 7. Write a Python program in python to elaborate multilevel inheritance.
- 8. Write a Python program in python to elaborate hierarchical inheritance.
- 9. Write a Python program in python to elaborate multilevel inheritance.
- 10. Write a Python program in python to elaborate function overloading.
- 11. Write a Python program in python to elaborate operator overloading.
- 12. Write a Python program in python to elaborate abstract class.
- 13. Write a program to alter table in MYSQL in python.
- 14. Write a program in python to insert a record in SQL Server
- 15. Write a program in python to delete a record in SQL Server
- 16. Write a program in python to apply CRUD operations on database.

Title of course: OE – III (T): Discrete Mathematics-I Course Outcomes:

The course will enable students to:

- 1. Basic knowledge of set theory, functions and relations concepts, matrix needed for designing and solving problems.
- 2. Construct simple mathematical proofs and possess the ability to verify them.

UNIT I

(15 Hours)

Recurrence Relations & Graphs:

Recurrence Relations: Introduction, Formation. Linear Recurrence Relations with constant coefficients. Homogeneous Solutions.Particular Solutions.Total Solutions. Graphs: Graphs and Graphs models, Graph terminology and special types of graphs, Representing graphs and Graph isomorphism, Connectivity, shortest path problems.

UNIT II

Counting Principles

Cardinality of Set: Cardinality of a finite set. Types of mapping, Injective, Surjective Bijective functions, Inverse function, Composition of functions Basics of Counting: The Product Rule, The Sum Rule, The Inclusion- Exclusion Principle. The Pigeonhole Principle: Statement, the Generalized Pigeonhole Principle, Its Applications. Generalized Permutations and Combinations: Permutation and Combination with Repetitions, Permutations with Indistinguishable Objects.

Reference Books:

- 1. Text book Elements of Discrete Mathematics, by C. L. Liu, Tata McGraw Hill,
- 2. Discrete Mathematics and its applications, by Kenneth Rosen, Tata McGraw Hill, Seventh Edition.
- 3. Discrete Mathematical Structures by Kolman, Busby, Ross.

(15 Hours)

Title of course: VSC-I (T): Web Design using JavaScript

Course Outcomes:

- 1. Understand different HTML tags.
- 2. Learn how to design and develop a Web page using HTML and CSS
- 3. Learn how to link pages so that they create a Web site.
- 4. Design and develop a web site using text, images, links, lists and tables.

UNIT I

(15 Hours)

Introduction to HTML: Introduction, Basic structure of an HTML document, Basic HTML Tags, Text Formatting Tags, Table tags, Frame, HTML Headers, List tag, META Tag, Marquee, Hyperlinks, Hyperlinks. Introduction to CSS, CSS, Features, Types of CSS, id selector, class selector, universal selector, group selector, CSS border styles, CSS margins, text formatting, CSS fonts, CSS icons, Links, lists, table, counters, CSS grid.

UNIT II

(15 Hours) ronment, Writing and execut

Introduction to JavaScript, setting up the development environment, Writing and executing JavaScript code, Declaring and assigning variables, working with numbers, strings, booleans, and arrays, Type coercion and type conversion, Conditional statements, Switch statements, Loops, Break and continue statements, Element, Access in Java scripts, Event and event handling, dialog boxes, Defining and invoking functions, working with arrays, Introduction to objects and properties, Object-oriented programming concepts.

- 1. Head First HTML and CSS by Elizabeth Robson and Eric Freeman
- 2. HTML, CSS, and JavaScript All in One by Meloni and Kyrin's
- 3. HTML and Web designing Kris Jama and Konrad King, Tata McGraw Hill Publishing Ltd.

B.Sc.-M.Sc. Artificial Intelligence & Machine Learning (AI & ML) Multiple Entry and Multiple Exit Option (NEP-2020) PART II SEM III Title of course: SEC-I (P): Core Java Programming

Course Outcomes:

The course will enable students to:

- 1. Understand the working of java virtual machine.
- 2. Implement Object oriented concepts using java.
- 3. Implement control structures, operators of java.

List of programs:

- 1. Write a Java program to print the area and perimeter of a circle.
- 2. Write a Java program to reverse a string
- 3. Write a java program that Sum the odd integers between 1 and 99, using for statement.
- 4. Write a Java program to create a class called Student with instance variables studentId, studentName, and grade. Implement a default constructor and a parameterized constructor that takes all three instance variables. Use constructor chaining to initialize the variables. Print the values of the variables.
- 5. Print the integers from 1 to 20, using a while loop and the counter variable. Assume that the variable i has been declared, but not initialized. Print only five integers per line.
- 6. Write a java program to perform arithmetic operations using switch case.
- 7. Write a java program to generate prime number between 1 to 20.
- 8. Write a java Program to Add Two Matrix Using Multi-dimensional Arrays
- 9. Write a Java program to sum values of an array.
- 10. Write a java program to display the employee details using Scanner class
- 11. Write a java program to create user defined package.
- 12. Write a Java program to create a class known as "BankAccount" with methods called deposit() and withdraw(). Create a subclass called SavingsAccount that overrides the withdraw() method to prevent withdrawals if the account balance falls below one hundred.
- 13. Write a java program to implement method overloading.
- 14. Write a java program that shows inheritance. Create class vehicle with variables color, speed size etc., then create subclass car which have variables gears and cc and display all these data.
- 15. Write a Java program on implementing interface.

B.Sc.-M.Sc. Artificial Intelligence & Machine Learning (AI & ML) Multiple Entry and Multiple Exit Option (NEP-2020) PART II SEM III Title of course: AEC- I: Verbal Communication

Course Outcomes:

The course will enable students to:

- 1. Demonstrate Proficiency in Grammar and Sentence Structures
- 2. Enhance Vocabulary for Effective Communication
- 3. Participate Effectively in Group Discussions and Interviews

UNIT I

Basic Language Skills: Grammar: Sentence Structures/Patterns, Subject - Verb agreement, Tenses. Vocabulary : Synonyms and Antonyms, Homonyms, One-word substitutes, Idioms, Suffixes and prefixes Collocations. Speaking for Different Purpose: Meeting and Greeting People, introducing your Self Introducing People to One another, Apologies and Responses, Agreeing and Disagreeing, General Speaking Strategies. Conversational Activities – Monologues, Introducing yourself, Introducing others, One-minute impromptu speeches, Scaffolded storytelling, Conversational Activities – Dialogues. Role plays on everyday interactions, Information Gap Activities, Picture descriptions and feedback, Situational conversations.

UNIT II

Group Discussion, Interview and Interviewing Skills, Initiating a Group Discussion, Continuing a Group Discussion, Concluding Group Discussion, Preparing for an Interview, Facing an Interview, Interviewing Techniques. Conversational Activities - Pronunciation, Stress & Rhythm, Intonation, Neutralization of accent, Word stress, Rhythm & Pauses, Tonal variations/inflections Presentation Skills: Kinds of Presentation, Structuring Content, Visual Aids, the Language of Presentations, Making a Presentation.

Reference Books:

- 1. Barret Grant. Perfect English Grammar: The Indispensable Guide to Excellent Writing and Speaking. Fall River Press, 2016
- 2. Monippally, Matthukutty, M. Business Communication Strategies. New Delhi: Tata McGraw-Hill Publishing Company Ltd., 2001 Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraHillPublishingCompanyLimited,2001.

(15 Hours)

(15 Hours)

B.Sc.-M.Sc. Artificial Intelligence & Machine Learning (AI & ML) Multiple Entry and Multiple Exit Option (NEP-2020) PART II SEM III Title of course: CC-I: Basics of Yoga

Course Outcomes:

The course will enable students to;

- 1. To understand the importance of Yoga
- 2. To understand various Asans

UNIT I

(15 Hours)

Yoga Definition, Objectives of yoga Education Difference between Yoga Asana, and physical exercises, Importance of Yoga in daily life, Methods and benefits of Asanas, Pranayama and Concentration, Knowledge of five yama with more emphasis on 'Asteya', Knowledge of five Niyama with emphasis on 'Santosh', Knowledge of Aahar-Vihar, Methods and benefits of Sukshma, Vyayama, Asanas and prayers. Types of Yoga: Jnana Yoga, Bhakti Yoga, Karma Yoga, Hatha Yoga, Raja Yoga.

UNIT II

(15 Hours)

Role of yoga in character building, Therapeutic values of yoga, Introduction of yoga literature, Life history of Arvindo, Vivekanand and other yogis, Knowledge of Bandha, Mudra and Chakras, Methods and benefits of Asans, Pranayama and Concentration Effects of Asanas and Pranayama on physiology of human body, Concept of Nishkama Karma Yoga, Role of Yoga practices in eveloping concentration, will power and discipline, Techniques of stress management, Methods and benefits of Asanas, Pranayama and concentration

- 1. Light on Yoga by B.K.S. Iyengar
- 2. The Yamas & Niyamas: Exploring Yoga's Ethical Practice by Deborah Adele

Title of course: Subject I Major VII: Advanced Data Structures

Course Outcomes:

After completion of this course students will be able to:

1. Apply non-linear data structures to solve real-world problems efficiently and effectively.

2. Understand the fundamental concepts of non linear data structures such as trees and graphs.

3. Understand the concept of BFS and DFS.

UNIT I

Introduction of non linear data structure, tree data structure, Binary Search trees, Searching and Inserting in Binary Search trees, Deleting in a Binary search tree. Traversing Binary Tree: Preorder, In-order, Post-ordered traversal, Traversal algorithms using stacks, Headed nodes: Threads, AVL trees, m-trees and B-Trees

UNIT II

Graphs-. Introduction, Graph theory terminology: Graph and multi graphs. Directed Graphs, Sequential representation of graphs: Adjacent matrix, Path matrix, Linked representations of a Graph, Operations on Graphs: Searching in a Graph, Inserting in a graph, traversing a graph: Breadth- First search, Depth Final search, Spanning tree.

Reference Books:

1. Alfred V Aho, John E Hopcroft and Jeffery D Ullman, "Data Structures and Algorithms", Pearson Education.

2. Samiran Chattopadhyay, Debabrata Ghosh Dastidar and Matagini Chattopadhyay, "Data Structures through C Language", BPB Publication.

(15 Hours)

(15 Hours)

Title of course: Subject I Major VIII: Relational Database Management System

Course Outcomes:

The course will enable students to:

- 1. Understand Functional Dependencies and Normalization Concepts
- 2. Demonstrate Concurrency Control Techniques
- 3. Implement Recovery Techniques for Transaction Failures

UNIT I

(15 Hours)

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, and Higher Normal forms, inclusion dependencies, lossless join decompositions, Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

UNIT II

(15 Hours)

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

- 1. C.J Date, S. Swamynathan, "An Introduction to Database System", Pearson Edition
- 2. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
- 3. Elmasri, Navathe, "Fundamentals of Database Systems", Addision Wesley
- 4. Desai, "An introduction to Database Systems", Asian Students Edition

Title of course: Subject I Practical IV: Practical Based on Subject I Major VII & Major VIII

Course Outcomes:

After completion of this course students will be able to:

- 1. Implement advanced data structures such as trees, heaps, and graphs.
- 2. Implement normalization techniques to optimize database structure.

There will be around 10 programs each based on Subject I Major VII & Major VIII.

Title of course: Subject II Minor VII: Feature Engineering

Course Outcomes:

The course will enable students to:

- 1. Learn multiple techniques for missing data imputation.
- 2. Extract useful features from dates and time variables
- 3. Transform categorical variables into numbers while capturing meaningful information.

UNIT I

Importance of Feature Engineering in Data Science, Dealing with Complex Relationships, Handling Missing Data, Normalization and Scaling, Categorical Variable Encoding, Reducing Dimensionality, Creating Informative Interaction Terms, Improving Model Interpretability, Domain-Specific Knowledge Integration, Adapting to Model Requirements, Date Time Features, Text Data, Encoding Categorical Variables, Creating Interaction Terms, Polynomial Features, Handling Missing Data, Aggregations, Scaling Numeric Features, Binning or Discretization, Domain-Specific Features, Feature Crosses.

UNIT II

(15 Hours)

(15 Hours)

Logarithmic Transformation, Handling Non-Linearity, Dealing with Missing Data, Normalization and Scaling, Encoding Categorical Variables, Creation of Interaction Terms, Dimensionality Reduction, Handling Skewed Distributions, Temporal and Spatial Aggregation, Feature Engineering in Machine Learning, Iterative Process, Validation and Evaluation, Best Feature Engineering in Data Science Tools, Imputation of Missing Values, Handling Categorical Variables, Binning or Discretization, Feature Scaling, Principal Component Analysis.

- 1. Feature Engineering for Machine Learning by Alice Zheng, Amanda Casari, 2018, O'Reilly Media, Inc.
- 2. Feature Engineering Bookcamp, Sinan Ozdemir, 2022.
- 3. Python Feature Engineering Cookbook by Soledad Galli.
- 4. Bad Data Handbook: Cleaning Up The Data So You Can Get Back To Work by Q. Ethan McCallum.

Title of course: Subject II Minor VIII: Basics of Artificial Intelligence

Course Outcomes:

The course will enable students to:

- 1. Learn Artificial Intelligence and describe its future scope.
- 2. Implement problem-solving methods and various search strategies.
- 3. Analyze reasoning systems with default and incomplete information.

UNIT-I

(15 Hours)

Introduction of AI and Problem Solving: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, uninformed search and informed search, heuristic search, hill climbing, Best first search, A* algorithm, AO* algorithm, constraint satisfaction, Game playing: Minmax search procedure, refining Minmax, Alpha – Beta pruning.

UNIT-II

(15 Hours)

Knowledge Representation: Introduction, Propositional Logic, Syntax and Semantics, Interpretations, Properties, Predicate logic, WFF, Free and Bound Variables, Normal Forms, Inference Techniques, Resolution, Unification, Modes Pones, Frames, Frame Representation Language, Semantic Net, Forward and Backward Reasoning.

- 1) Artificial Intelligence, 2nd Edition, Rich and Knight.
- 2) Machine Learning, Tom M Mitchell.
- 3) Artificial Intelligence: A New Synthesis, Nils J. Nilsson.

Title of course: Subject II Practical IV: Practical Based on Subject II Minor VII

Course Outcomes:

After completion of this course students will be able to;

There will be around 20 programs each based on Subject II Minor VII.

Title of course: OE-III (T): Discrete Mathematics -II

Course Outcomes:

After completion of this course students will be able to;

1. Understand the fundamental concepts of discrete mathematics, including logic.

2. Understand functions, and counting principles.

UNIT I

(15 Hours)

Lattices and Boolean Algebra: Relations, types of relations, equivalence relations, Partial ordering relations Digraphs of relations, matrix representation and composition of relations. Transitive closure and Warshall's Algorithm Poset, Hasse diagram. Lattices, Complemented lattice, Bounded lattice and Distributive lattice. Boolean Functions : Introduction, Boolean variable, Boolean Function of degree n, Boolean identities, Definition of Boolean Algebra. Representation of Boolean Functions : Minterm, Maxterm Disjunctive normal form, Conjunctive normal Form.

UNIT II

(15 Hours)

LOGIC: Revision: Propositional Logic, Propositional Equivalences. Rules of Inference : Argument in propositional Logic, Validity Argument(Direct and Indirect methods) Rules of Inference for Propositional Logic, Building Arguments. Predicates and Quantifiers : Predicate, n-Place Predicate or ,n-ary Predicate, Quantification and Quantifiers, Universal Quantifier, Existential Quantifier, Quantifiers with restricted domains, Logical Equivalences involving Quantifiers.

- 1. Discrete mathematics by S. R. Patil and others, NIRALI Prakashan.
- 2. Discrete mathematics by Bhopatkar, Nimbkar, Joglekar, VISION Publication.

Title of course: SEC-II (P): Advanced Java Programming

Course Outcomes:

The course will enable students to:

- 1. Develop programs using the concepts of inheritance, interfaces and packages.
- 2. Understand the multithreading concepts.
- 3. Handle exceptions while executing programs.
- 4. Understand the JDBC connectivity.

List of programs:

- 1. Write a program that shows the implementation of final keyword.
- 2. Write a Java program to create an abstract class Animal with an abstract method called sound(). Create subclasses Lion and Tiger that extend the Animal class and implement the sound() method to make a specific sound for each animal.
- 3. Write a Java program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.
- 4. Write a java program to create an abstract class named Shape that containstwo integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea() that prints the area of the given shape.
- 5. Write a Java program to create an abstract class Vehicle with abstract methods startEngine() and stopEngine(). Create subclasses Car and Motorcycle that extend the Vehicle class and implement the respective methods to start and stop the engines for each vehicle type.
- 6. Write a Java program to create an abstract class Shape2D with abstract methods draw() and resize(). Create subclasses Rectangle and Circle that extend the Shape2D class and implement the respective methods to draw and resize each shape.
- 7. Write a Java program to create a class known as Person with methods called getFirstName() and getLastName(). Create a subclass called Employee that adds a new method named getEmployeeId() and overrides the getLastName() method to include the employee's job title.
- 8. Write a Java program that throws an exception and catch it using a try-catch block.
- 9. Write a program that shows arithmetic exception.
- 10. Write a Java program to create a method that takes an integer as a parameter and throws an exception if the number is odd.
- 11. Write a Java program to create a basic Java thread that prints "Hello, World!" when executed.

- 12. Write a Java program that creates two threads to find and print even and odd numbers from 1 to 20.
- 13. Write a Menu driven RMI program that shows four arithmetic operations like addition, substraction, multiplication and division.
- 14. Write a program to perform CRUD operations on the student table in a database using JDBC
- 15. Write a java program that connects to a database using JDBC and does add, deletes, modify and retrieve operations

Title of course: AEC-II: Business Communication

Course Outcomes:

After completion of this course students will be able to:

- 1. To provide an overview of Prerequisites to Business Communication
- 2. To put in use the basic mechanics of Grammar
- 3. To underline the nuances of Business communication

UNIT I

(15 Hours)

Need and Importance of effective communication skills, Basic ways of communication (Listening, Speaking, Reading, Writing), Forms/methods of Communication (verbal-oral and written; nonverbal- Body language, facial expressions, eye contact, gestures, postures, paralinguistic features, signs, symbols, signals etc.), Communication cycle/process (sender, receiver, message, medium/channel, feedback, encoding and decoding) (Thinking, getting ideas, determining intent, selecting notes, and media, encoding, transmitting messages, decoding, receiving, perceiving, and interpreting, giving feedback, etc.), Barriers to communication (physical, mechanical, psychological, socio-cultural, linguistic, inter-personal, organizational, etc.) and techniques to overcome them.

UNIT II

(15 Hours)

Levels of communication: importance and nature (extra-personal, intrapersonal, interpersonal, transpersonal, organizational, mass and media communication, Communication in business context (channel/flow of communication in business context: formal, informal, vertical, horizontal/lateral, crosswise, grapewine, etc.), Written Communication, the process of formal written communication, designing a message, deciding purpose, analyzing audience, organizing, selecting, arranging ideas, and preparing outlines, enveloping a message – writing, evaluating, revising, and editing. Reading and analysis of Business articles, short reports, success stories and case lets. Seven Cs of Business Writing - Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness.

- 1. Communication Skills by Meenakshi Raman and Sangeeta Sharma
- 2. Communication Skills by Kumar and Lata
- 3. Business Communication by Raman and Sing
- 4. A Complete Course in Communication Skills by Dr. Ravi S. Sharma

Title of course: VEC-II: Environmental Studies

• To be taken from Environmental Science BoS

Title of course: CEP-I: Field work

Field work as per NEP 2.0 (CEP, CC), University circular enclosed



संदर्भ क. : शिवाजी वि./अ.म./400 प्रति,

दिनांक : 15/07/2024

- मा. प्राचार्य / संचालक, सर्व संलग्नित महाविद्यालये / मान्यताप्राप्त संस्था, शिवाजी विद्यापीठ, कोल्हापूर
- मा. अधिविभाग प्रमुख, सर्व अधिविभाग, शिवाजी विद्यापीठ, कोल्हापूर

विषय : राष्ट्रीय शैक्षणिक धोरण, 2020 (NEP 2.0) नुसार CEP, CC अभ्यासकमाबाबत.

महोदय / महोदया,

उपरोक्त संदर्भिय विषयास अनुसरुन आपणास आदेशान्वये कळविण्यात येते की, राष्ट्रीय शैक्षणिक धोरण २०२० (NEP 2.0) नुसार शैक्षणिक वर्ष २०२४—२५ पासून लागू करण्यात आलेल्या सर्व पदवी कोर्सला लागू असणा—या Community Engagement Programme (CEP), Co-Curricular Courses (CC) अभ्यासक्रम/त्याची नियमावली सोबत पाठवित आहे.

सदर Community Engagement Programme (CEP), Co-Curricular Courses (CC) अभ्यासकमाच्या प्रती जोडल्या आहेत. तसेच विद्यापीठाच्या <u>www.unishivaji.ac.in</u>,NEP-2020@suk (Online Syllabus) या संकेतस्थळावर ठेवण्यात आल्या आहेत.

सदर अभ्यासकम/त्याची नियमावलीची सर्व संबंधित विद्यार्थी व शिक्षकांच्या निदर्शनास आणून द्यावेत ही विनंती. कळावे.

> अफ्ल्ला विश्वासू, (ड. एस. एम. कुबल) उपकुलसचिव

सोबत : अभ्यासकमाची प्रत.

प्रत : माहितीसाठी व पुढील योग्यत्या कार्यवाहीसाठी

अधिष्ठाता, सर्व विद्याशाखा	पात्रता विभागास
अध्यक्ष, सर्व अभ्यास व अस्थायी मंडळे	पी.जी. सेमिनार विभागास
संचालक, परीक्षा व मुल्यमापन मंडळ कार्यालयास	पी.जी. प्रवेश विभागास
परिक्षक नियुक्ती ए व बी विभागास	संलग्नता टी. १ व टी २ विभागास
दूरस्थ व ऑनलाईन शिक्षण विभागास	नॅक विभागास
संगणक केंद्र/आय. टी. सेल विभागास	सर्व ऑन परीक्षा विभागास

SHIVAJI UNIVERSITY, KOLHAPUR



Established: 1962

 $A^{\scriptscriptstyle ++}$ Accredited by NAAC (2021) With CGPA 3.52

New Syllabus For

Community Engagement Programme (CEP)

All Bachelor Degree Programme

STRUCTURE AND SYLLABUS IN ACCORDANCE WITH *NATIONAL EDUCATION POLICY - 2020* HAVING CHOICE BASED CREDIT SYSTEM WITH MULTIPLE ENTRY AND MULTIPLE EXIT OPTIONS

(TO BE IMPLEMENTED FROM ACADEMIC YEAR 2024-25 ONWARDS)

Community Engagement Programme (CEP):

1. INTRODUCTION:

New generation of students are increasingly unaware of local rural and peri-urban realities surrounding their HEIs, as rapid urbanization has been occurring in India. A large percentage of Indian population continues to live and work in rural and peri-urban areas of the country. While various schemes and programs of community service have been undertaken by HEIs, there is no singular provision of a well- designed community engagement course that provides opportunities for immersion in rural realities. Such a course will enable students to learn about challenges faced by vulnerable households and develop an understanding of local wisdom and lifestyle in a respectful manner

2. OBJECTIVES:

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

To achieve the objectives of the socio-economic development of New India, HEIs can play an important role through active community engagement. This approach will also contribute to improve the quality of both teaching and research in HEIs in India. India is a signatory to the global commitment for achieving Sustainable Development Goals (SDGs) by 2030. Achieving these 17 SDG goals requires generating locally appropriate solutions. Community engagement should not be limited to a few social science disciplines alone. It should be practiced across all disciplines and faculties of HEIs. These can take the forms of enumerations, surveys, awareness camps and campaigns, training, learning manuals/films, maps, study reports, public hearings, policy briefs, cleanliness and hygiene teachings, legal aid clinics, etc. For example, students of chemistry can conduct water and soil testing in local areas and share the results with the local community. Students of science and engineering can undertake research in partnership with the community on solid and liquid waste disposal Therefore, students are being encouraged to foster social responsibility and community engagement in their teaching and research.

3. LEARNING OUTCOMES:

After completing this course, students will be able to

- Gain an understanding of rural life, Indian culture, and social realities.
- Develop empathy and bonds of mutuality with the local community.
- Appreciate the significant contributions of local communities to Indian society and economy.
- Learn to Value local knowledge and wisdom.
- Identify opportunities to contribute to the community's socioeconomic improvement.
- 4. Credits: Two credit Course; Students are expected to complete 60 hours of participation

5. COURSE STRUCTURE:

Sr.	Module Title	Module Content	Teaching/Learning/Methodology			
1	Appreciation	Rural lifestyle, rural society, joint family, caste and	Classroom discussionsField visit			
	of Rural	gender relations, rural values with respect to community,	Individual /Group conference			
	Society	rural culture nature and public resources, ponds and	Report/journal submission &			
		fisheries, elaboration of soul of India lies in villages'	VIVA			
		rural infrastructure,				
2	Understandin	Agriculture, farming, land ownership, water management,	Classroom discussionsField visit			
	g rural and	animal husbandry, non-farm livelihood and artisan's rural	Individual /Group conference			
	local	entrepreneurs, rural markets, migrant labour, social	Report/journal submission &			
	economy and	innovation projects	VIVA			
	livelihood					
3	Rural	Traditional rural and community organization, self-help	Classroom discussionsField visit			
	an	groups, decentralized planning, panchayat raj institutions	Individual /Group conference			
	d local	Gram panchayat, Nagarpalika and Municipalities, local	Report/journal submission &			
	Institution	Civil Society, Local administration, National rural,	VIVA			
		Livelihood Mission [NRLM], Mahatma Gandhi National				
		Rural Employment. Guarantee [MGNREGA].				
4	Rural	History of rural development and current National	Classroom discussionsField visit			
	an	Programms in India: Sarva shiksha Abhiyan, Beti Bachao-	Individual /Group conference			
	d National	Beti Padhao, Ayushman Bharat, eShram	Report/journal submission &			
	development	Swachh Bharat, PM Awas yojana, Skill India, Digital	VIVA			
	programmers	India, Start-Up India, Stand-Up India, Scheme of Fund				
		for Regeneration of Traditional Industries (SFURTI), Jal				
		Jeevan Mission, Mission Antyodaya, ATMANIRBHAR				
		Bharat, etc				

Note: Faculty can make addition in the list of activities as per domain content:

Recommended field-based activities (Tentative):

- □ Participate in Gram Sabha meetings, and study community participation;
- □ Visit to Swachh Bharat Mission project sites, conduct analysis and initiate problem solvingmeasures;
- □ Interaction with Self Help Groups (SHGs) women members, and study their functions and challenges; planning for their skill-building and livelihood activities;
- □ Visit Mahatma Gandhi National. Rural Employment Guarantee Act 2005 (MGNREGS) project sites, interact with beneficiaries and interview functionaries at the work site;
- □ surveys on Mission Antyodaya to support under Gram Panchayat Development Plan
- Visit Rural Schools/mid-day meal centres, study academic and infrastructural resources, digital divide and gaps;
- □ Associate with Social audit exercises at the Gram Panchayat level, and interact with programme beneficiaries;
- □ Visit to local Nagarpalika office and review schemes for urban informal workers and migrants;
- □ Attend Parent Teacher Association meetings, and interview school drop outs;
- □ Visit local Anganwadi and observe the services being provided;
- □ Visit local NGOs, civil society organisations and interact with their staff and beneficiaries;
- □ Organize awareness programmes, health camps, Disability camps and cleanliness camps;
- □ Conduct soil health test, drinking water analysis, energy use and fuel efficiency surveys and building solar powered village;
- □ Understanding of people's impacts of climate change, building up community's disaster preparedness;
 - □ Organise orientation programmes for farmers regarding organic cultivation, rational use of irrigation and fertilizers, promotion of traditional species of crops and plants and awareness against stubble burning;
 - □ Formation of committees for common property resource management, village pond maintenance and fishing;
 - □ Identifying the small business ideas (handloom, handicaraft, khadi, food products, etc.) for rural areas to make the people self-reliant.
 - □ Interactive with local leaders, panchayat functionaries, grass-root officials and local institutions regarding village development plan preparation and resource mobilization;

- □ Financial Literacy Awareness Programme
- Digital Literacy Awareness Programme
- □ Education Loan Awareness Programme
- □ Entrepreneurship Awareness Programme
- □ Awareness Programmes on Government Schemes
- □ Products Market Awareness
- □ Services Market Awareness
- □ Consumer Awareness Programme
- □ Accounting Awareness Programme for Farmers
- □ Accounting Awareness Programme for Street Vendors etc.

6. IMPORTANT RULES AND REGULATIONS FOR CEP:

Concurrent Fieldwork:

Students must conduct comprehensive studies on various challenges that they face in their chosen field. Every work relevant to the subject matter should be compiled and documented.

Students should keep separate fieldwork diary or maintain journal in order to record their fieldwork experiences i.e. reading, e- contents, tasks, planning and work hours have to be recorded in the diary. Detailed work records report on students' fieldwork experiences and activities to be submitted and should be presented. The fieldwork conference is part of the timetable and is mandatory. Faculty should hold a fieldwork conference FOREIGHTNIGHTLY for all students.

In addition to the principal curriculum, the students engage in a variety of community development- related activities. They are encouraged to plan and carry out programs, processions, and events for social causes. These activities seek to enhance students' personal and professional skills as well as foster self- development. "Rural Camp" should be embedded in the curriculum for first-year students to be held in the backward and neglected areas of District's

Concurrent Fieldwork is the core curriculum activity in the CEP course. Hence, 100% attendance of the students is mandatory in case of absence on any student, supplementary fieldwork must be arranged and accomplished with the approval of the faculty supervisor.

7. EVALUATION/ASSESSMENT SCHEME:

Students should keep a Field Diary / journal to record, content, readings and field visit planning. The assessment pattern is internal and external i.e. 40+10.

Internal continuous Assessment: Participation in concurrent field visits 40%; individual/group field project conference, report/journal submission 40%.

External Assessment: Presentation of field project findings (VIVA) should be assigned 20%.