**Mukesh Patel School of Technology Management and Engineering**

**Department of Information Technology**

**Course Policy**

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| --- | --- | --- |
| **Program/Branch/Semester** | **:** | MCA, Semester II |
| **Academic Year** | **:** | 2024-25 |
| **Course Code & Name** | **:** | Python Programming |
| **Credit Details** | **:** | |  |  |  |  | | --- | --- | --- | --- | | L | T | P | C | | 2 | 0 | 4 | 4 | |
| **Course Coordinator Faculty** | **:** | Prof.Kshamta Mathur |
| **Contact No. & Email** | **:** | 022-42334018  Kshamta.mathur@nmims.edu |
| **Office** | **:** | 602, MPSTME, Mumbai |
| **Contact hours** | **:** | 2:00 pm to 3:00pm (Tuesday) |
| **Other Course Faculty members teaching this course** | **:** | **Prof.Archana Lakhe (Mumbai Campus)** |
| ***Queries by Emails are encouraged.*** | | |
| **Course link** | **:** | [DAP (for students)](https://svkmmumbai-my.sharepoint.com/:f:/g/personal/kshamta_m_nmims_edu/Et93DNUinCBFpLMO1--MxSABKgLqnpLNK4YO9lkkNCHQSg?e=c6BXMM) |

# Introduction to the Course

## Importance of the course

The course is designed to provide basic knowledge of Python programming, database connectivity. It has more emphasis on data analysis with the help of python libraries. This course will be the foundation to analyse data and implement machine learning algorithms (in semester III). The python libraries covered in this course are essential in implementation and development of complete application in the industry.

## Objective of the Course

The course is designed to provide basic knowledge of Python programming and how to analyze and visualize data using Python programming.

## Pre-requisite

Nil

## Course Outcomes

After completion of the course, the student will be able to -

1. Understand the basic syntax and data structures.
2. Implement database connectivity in python
3. Identify appropriate data analysis and visualization technique for given

Scenario

## 2.2 CO-PO Mapping

# Syllabus, Pre-class activity and References

## Teaching and evaluation scheme

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Teaching Scheme** | | | | **Evaluation Scheme** | |
| **Lecture**  **Hours per week** | **Practical**  **Hours per week** | **Tutorial**  **Hours per week** | **Credit** | **Internal Continuous Assessment (ICA)**  **As per Institute Norms**  **(50 Marks)** | **Practical Exam**  **(50 Marks)** |
| 2 | 4 | 0 | 4 | Marks Scaled to 50 | Marks Scaled to 50 |

## 3.2 Syllabus

|  |  |  |
| --- | --- | --- |
| **Detailed Syllabus** | | |
| **Unit** | **Description** | **Duration** |
| **1** | **Introduction to Python**  Installation, Features, Python Interpreter and its working, Syntax and Semantics, comments, imports, indentation, variables, data types, math arithmetic, operators (comparison, logical, bitwise), expressions, print, formatting print, generating random numbers | 03 |
| **2** | **Python Data Structures & Flow Control**  Strings, Lists, Dictionaries, Tuples, Sets; Slicing; properties, operations and methods of these data structures  Conditional blocks using if, else and elif, Simple For loop, For loop using Ranges, While loops, Loop manipulation using Pass, Continue, Break  List and dictionary comprehension. | 04 |
| **3** | **Python Functions**  Defining and calling functions, return, scope, function arguments (args and kwargs), recursive functions;  Built-in functions: Lambda, Map, Filter, Reduce, Zip, Enumerate | 03 |
| **4** | **Database connectivity using Python**  Database connectivity using SQLite3 and performing basic  CRUD operations | 04 |
| **5** | **Data Analysis using numpy and pandas:** Introduction Numpy Array, Difference between list and Numpy Array, Operations on 1-D and 2-D Numpy Array, Introduction to Pandas and DataFrame,  Understanding Data,  Importing and Exporting Data, Preprocessing of Data, Data cleaning, Data normalization in python, Exploratory data Analysis, Groupby in Python | 10 |
| **6** | **Data Visualization:** Introduction to Data Visualization, Introduction to Matplotlib and line plot, **Basic Visualization tools**: Area Plot, Histogram and bar charts. **Advanced Visualization tools**: Waffle Charts, World Cloud, Seaborn and Regression Plot | 06 |
|  | **Total** | **30** |

## Pre-class activity

Outline for preliminary study to be done for each unit will be provided prior to commencement of each unit. Preliminary study material (video links, presentation, notes etc) will be made available on Google Classroom. Students are expected to go through this material before attending the upcoming session. It is expected that the students put in at least two hours of self-study for every one hour of classroom teaching. During the practical session, more emphasis will be given on in-depth topics, practical applications and doubt solving.

## References

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| --- |
| **Text Books:**   1. Dr. R. Nageswara Rao, *Core Python Programming*, 2nd Edition, Dreamtech Pres, Wiley Publication, 2018. 2. Paul Barry, *Head first Python: A Brain Friendly guide*, 2nd Edition, O'Reilly publication, 2016. 3. Martin C. Brown, *Python: The Complete Reference*, 4th Edition, McGrawHill Education, 2018. |
| **Reference Books:**   1. Bill Lubanovic, *Introducing Python Modern computing in simple packages*, 3rd Edition, O'Reilly publication, 2019. 2. Wes McKinney, *Python for Data Analysis*, 2nd Edition, O'Reilly publication, 2017. 3. Jeeva Jose, P. Sojan Lal, *Introduction to Computing and Problem Solving with Python*, 1st Edition, Khanna Publication, 2019. |

# Laboratory details

The practical list depicts the topics which would be the focus for each experiment.

The following 13 programming exercises will form the submission for laboratory coursework.

|  |  |  |  |
| --- | --- | --- | --- |
| **Week No.#** | **Session No.#** | **List of Lab Exercises** | **Mapped CO** |
| 1 | 1 and 2 | Data Types, Data Scope, Input / Output Statements and Operators (Arithmetic, Relational, Logical, Bitwise) | CO-1 |
| 2 | 3 and 4 | Conditional Statements (if, if…else, nested if), Looping Statements (while, for, nested loops, break, continue) | CO-1 |
| 3 | 5 and 6 | Programs on data structures | CO-1 |
| 4 | 7 and 8 | Data Analysis with data structures | CO-1 |
| 5 | 9 and 10 | Programs using python functions | CO-2 |
|  |  | Practical examination 1 |  |
| 6 | 11 and 12 | Basic programs on Data base connectivity | CO-2 |
| 7 | 13 and 14 | Application development using Data base connectivity | CO-2 |
| 8 | 15 and 16 | Built-in Package: Numpy (1-d, 2-d array) | CO-3 |
| 9 | 17 and 18 | Built-in Package: Pandas (dataframes) | CO-3 |
| 10 | 19 and 20 | Data analysis- preprocessing, cleaning, normalization | CO-3 |
| 11 | 21 and 22 | Data analysis – Exploratory data analysis | CO-3 |
|  |  | Practical Examination 2 |  |
| 12 | 23 and 24 | Data Visualization | CO-3 |
| 13 | 25 and 26 | Data Visualization | CO-3 |
| 14 | 27 and 28 | Mini Project Presentation |  |
| 15 | 29 and 30 | Practical Examination – Term End |  |

# Tutorial Plan

No Tutorial for this course

# Assessment Policy

## Component wise Continuous Evaluation Internal Continuous Assessment (ICA) and Term End Examination (TEE)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Assessment Component** | **ICA (100 Marks)**  **(Marks scaled to 50)** | | | | | **Practical Exam (50 marks)**  **(Marks scaled to 50)** |
|  | **Lab Performance** | **Class Test1 (Lab Exam)** | **Class Test2**  **(Lab Exam)** | **Quiz based on Programming** | **Mini Project** | **TEE** |
| **Weightage** | 20% | 20% | 20% | 20% | 20% | 50% |
| **Marks** | 10 | 10 | 10 | 10 | 10 | 50 |
| **Occurrence** | Weekly (every week after submission of the write-up it will be evaluated as per rubric) | Once (between 3rd February 2025 to 8th February 2025) | Once (between 17th March 2024 to 22nd March 2025) | To be conducted in week after M2 | Presentation to be conducted in week of 1st to 5th April 2025 | Once (between 28th April 2024 to 13th  May 2025) |

## Assessment Policy for Internal Continuous Assessment (ICA)

Assessment of ICA comprises of the following components.

1. **Class Test1 Lab Exam (20 marks)**

Tentative Syllabus:

1. Data Types, Data Scope, Input / Output Statements and Operators (Arithmetic, Relational, Logical, Bitwise)
2. Conditional Statements (if, if…else, nested if)
3. Looping Statements (while, for, nested loops, break, continue)
4. Sequence: List (create, access, update, delete)
5. Sequence: Tuple (create, access, update, delete)
6. Data structures and its applications
7. **Lab performance evaluation (20 marks) (Every week the writeup submitted would be evaluated as per the rubrics given in Point 14)**

Lab experiments (15 marks each)

* + 1. Continuous assessment for laboratory experiments will be conducted. There are 13 practicals, each carrying weightage of 15 marks. At the end of the course, average of total marks will be taken to obtain marks out of 30.
    2. Discussion of your work with your peers is allowed. However, each student is expected to submit his/her original work. Submissions which are very similar will be marked zero. Assessment of each practical experiment is based on rubrics attached as Point 14.

1. **Class Test2 Lab Exam (20 marks) (A lab date per batch will be fixed a week between** **4th Mar 2024 to 9th March 2024)**

Tentative Syllabus:

1. **Functions**
2. **Data base connectivity**
3. **Data preparation**
4. **Competitive Programming (10 marks) (Every week practice session from CodeChef and submission of report with selected medium and complex two problems solved on the last week of term)**
   1. Register on CodeChef.
   2. Continue every week with the practice session given by CodeChef.
   3. Identify the problem statements (medium to complex) of your liking.
   4. Get the approval (approval will be based on completion of week-wise practice session and the problem statement chosen relevance for medium and complex).
   5. Perform the topic (atleast two real-time medium to complex problems) on codechef platform.
   6. Create a Competitive Programming Report mentioning (codechef username, problem statement, code, sample input-output, screenshot of successful problem solved on codechef). The Report to be submitted to the faculty incharge.
   7. Assessment will be based on timely submission of weekly practice sessions and timely submission of report and the correctness of the problem solved.
   8. Evaluation Scheme: Average of the problem test attempted and scored 50% above and then the average to be scaled to 20 marks.
5. **Implementation of Mini Project (20 marks)**
   1. Faculty will ask to make group of 2-3 students
   2. Every group will be asked to design one unique and relevant problem statement and develop mini project. Each group will present and demonstrate project done. This activity will be evaluated for 20 Marks.
   3. Assessment will be based on the concepts used to implement the problem, demonstration, results obtained, originality, and understanding.
6. **Class Participation**

The faculty will ask some questions in every class based on the content being taught. The question could be asked to a chosen student or a student group (which is formed at the beginning of the semester). One mark can be given to the correct answer. The idea is to encourage students to pay attention in class and actively participate. These marks will be added in ICA class participation component

# Assessment Policy for Term End Examination (TEE)

A Practical Exam of 50 Marks would be conducted.

# 8 Lesson Plan

|  |  |  |
| --- | --- | --- |
| **Session No.** | **Topics** | **Mapped CO** |
| 1 | **Unit 1-Introduction to Python**  Installation and Features explanation, Python Interpreter and its working, Syntax and Semantics, concept of indentation, comments, imports, exports in python. | CO1 |
| 2 | variables, data types, math arithmetic, operators (comparison, logical, bitwise | CO1 |
| 3 | Expressions, print, formatting print, generating random number etc | CO1 |
| 4 | Unit 2 **Python Data Structures & Flow Control**  Strings, Lists, Dictionaries, Tuples, Sets; Slicing; properties, | CO1 |
| 5 | operations and methods of the data structures  Regular expressions, classes and objects. Data Analysis with Data Structures. | CO1 |
| 6 | User defined data structures: Arrays, need of arrays in python. Difference between arrays and lists, stack, queue, trees etc. | CO1 |
| 7 | Conditional blocks using if, else and elif, Simple For loop, For loop using Ranges, While loops, Loop manipulation using Pass, Continue, Break  List and dictionary comprehension. | CO1 |
| 8 | Unit 3 Python Functions  Defining and calling functions, return, scope, function calling, Types of functions in python: inbuilt functions, user defined functions and anonymous functions. | CO1 |
|  | arguments of functions and its different types and their impact on results.Args and kwargs and their use, recursive functions; | CO2 |
| 9 | Built-in functions: Lambda, Map, Filter, Reduce, Zip, Enumerate | CO2 |
| 10 | **Class test 1** |  |
| 11 | **Unit 4 Database connectivity using Python**  Need of Database connectivity, Various ways of database connectivity | CO2 |
| 12 | Database connectivity using SQLite3 and performing basic | CO2 |
| 13 | Create, read (Select, from and Where causes), Update and Delete operations. | CO2 |
| 14 |  |  |
| 15 | Unit 5 **Data Analysis using numpy and pandas**  What is the need of data analysis, Things to be done in data Analysis: Cleaning, Normalizing, Exploratory Data Analysis., Understanding Data, Importing and Exporting Data. | CO3 |
| 16 | Introduction Numpy Array, Difference between list and Numpy Array, Operations on 1-D and 2-D Numpy Array, | CO3 |
| 17 | Introduction to Pandas and DataFrame.Creation of data frame and its analysis using different functions. | CO3 |
| 18 | Understanding Data and checking whether it is clean or cleaning is required, Importing and Exporting Data -csv file, excel file ,json file etc, | CO3 |
| 19 | Data pre-processing- Data profiling, Data cleansing, Data reduction, Data transformation, Data enrichment, Data validation, Identify and sort out missing data, Reduce noisy data. | CO3 |
| 20 | Data cleaning: Remove duplicate or irrelevant observations, remove unwanted observations from your dataset, including duplicate observations or irrelevant observations, Fix structural errors, Filter unwanted outliers, Handle missing data, Validate and QA. | CO3 |
| 21 | Data normalization in python: Need of data normalization, process of normalization etc. Examples for understanding | CO3 |
| 22 | Exploratory data Analysis with various datasets and their outcomes | CO3 |
| 23 | Groupby, loc in Python, Code using groupby and LOC to setup a new dataframe. | CO3 |
| 24 | More details about Pandas dataframe with case study | CO3 |
| 25 | Class Test 2 | CO3 |
| 26 | **Unit 6 Data Visualization**  Introduction to Data Visualization, Introduction to Matplotlib and line plot., Seaborn and Regression Plot | CO3 |
| 27 | **Basic Visualization tools**: Area Plot, Histogram and bar charts | CO3 |
| 28 | **Advanced Visualization tools**: Waffle Charts, | CO3 |
| 29 | **Advanced Visualization tools**: World Cloud | CO3 |
| 30 | Seaborn and Regression Plot | CO3 |

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# Teaching-learning methodology

Faculty will make a group of 2-3 students for any group based activity such as project, presentation etc. Lecture and laboratory session will be conducted as follows-

1. **Laboratory:**
   * Lab manual consisting of Part-A theory and scenario and Part-B related questions in support to the lab experiment will be uploaded on Teams Channel.
   * Regular lab assessment and grading will be done. Students will be marked based on parameters given in the Rubrics added in Point 14.

**10. Active learning techniques**

Active learning is a method of learning in which students are actively or experientially involved in the learning process. Following active learning techniques will be adopted for the course.

1. **Brainstorming:** **S**tudents will be asked to generate ideas on a practical problem statement by thinking of the logic to be used and also to later twik the problem statement with some change in the input/output. The answers are recorded by the students in their practical submission document as commented program snippet.
2. **Real-life Scenario (Competitive Programming):** It is a major assessment component of this course. This course is practical oriented and requires all the knowledge and problem solving skills to develop python scripts which are time consuming. The queries would be dealt with during the practical sessions regularly so that students can build scripts successfully.

**11. Course Material**

Following course material is uploaded on the MS Teams / Portal:

* Course Policy
* Online References and E-Courses
* Books / Reference Books given in Syllabus
* Class Quiz and Activity as Class Participation taken on MS-Teams
* Lab Write-ups

**12. Course Outcome Attainment**

Following means will be used to assess attainment of course learning outcomes.

* Use of formal evaluation components of class participation, competitive programming, lab work, class Lab Exam, semester end lab exam
* Informal feedback during course conduction

**13. Academic Integrity Statement**

Students are expected to carry out assigned work under Internal Continuous Assessment (ICA) independently. Copying in any form is not acceptable and will invite strict disciplinary action. Evaluation of corresponding component will be affected proportionately in such cases. Plagiarism detection software will be used to check plagiarism wherever applicable. Academic integrity is expected from students in all components of course assessment.

**14. RUBRICS for Evaluation Practical Write-up Submission (30 Marks)**

**Practical Write-up Submission Rubrics (15 Marks each Experiment, Total 195 scaled to 30 Marks):**

|  |  |  |  |
| --- | --- | --- | --- |
| **1. Preparedness and Efforts** | 3: Well prepared and puts efforts | 2: Not prepared but puts efforts or prepared but doesn't put efforts | 1: Neither prepared nor puts efforts |
| **2. Knowledge of concepts and tools** | 3:Good knowledge | 2: Partial knowledge | 1:Minimal knowledge |
| **3. Debugging and results** | 3: Gets accurate results and can debug errors | 2: Does not get expected results and needs some help from faulty to debug | 1: Doesn’t get results and cannot debug |
| **4. Punctuality** | 3: Gets all the experiments checked in-time and is always in-time to the lab sessions | 2: Some time delays the experiment checking or is late to the lab sessions for few times | 1: Most of the time delays experiment checking and / or comes late for lab sessions |
| **5. Documentation** | 3: Outstanding documentation | 2: Above average documentation | 1: Poor documentation |