

Course Code	Course Name	Credits
<b>MEL403</b>	<b>Python Programming</b>	<b>01</b>

**Objectives:**

1. To introduce basic concepts of Python programming language as well as common packages and libraries.
2. To generate an ability to design, analyze and perform experiments on real life problems in mechanical engineering using python.

**Outcomes:** Learner will be able to....

1. Demonstrate understand of basic concepts of python programming.
2. Identify, install and utilize python packages
3. Develop and execute python programs for specific applications.
4. Develop and build python program to solve real-world engineering problems
5. Prepare a report on case studies selected.

Module	Details	Hrs.
1.	Introduction to python and its applications. Installation of Python and setting up a programming environment such as Anaconda and Spyder Python Basics: Variable and variable types, Booleans, Numbers (integers, floats, fractions, complex numbers), strings, lists, tuples, sets, dictionaries. bytes and byte arrays, Manipulating variables, indexing, slicing, basic operators (arithmetic, relational, logical, membership, identity). String methods, list methods, list slicing, set methods, in built python functions, input and output functions.	<b>04</b>
2.	Basic Coding in Python: If, else, elif statements, for loops, range function, while loops, List comprehensions, functions in python. Introduction to OOP, Classes, Objects, Reading and writing files.	<b>02</b>
3.	Python libraries: Installing of different libraries, packages or modules. Basic concepts of the following libraries: NumPy, Matplotlib, Pandas, SciPy Optional libraries based on case studies in Module 4: Pillow, Scikit, OpenCV, Python in Raspberry Pi	<b>04</b>
4.	Case Studies using Python (Select any 3): <ol style="list-style-type: none"> <li>1. Solving a linear differential equation using SciKit and plotting the result in matplotlib. Students can use differential equations from any previous topic studied in the programme such as mechanics, materials science, fluid mechanics, kinematics of machines, thermodynamics, production etc.</li> <li>2. Image processing and manipulation and auto detection of any object. Applications in self-driving cars may be discussed.</li> <li>3. Python programming of a Raspberry PI: Students can sense using a sensor, process the reading and then control some physical output (like motor or LED)</li> <li>4. Project involving basic machine learning (Students should understand the basic concepts of machine learning and apply to specific situation)</li> <li>5. Any other case study that uses Python to solve Mechanical Engineering problems.</li> <li>6. Customizing applications by writing API programs using python like to create joints, get physical properties, get circle and arc data from edge.</li> </ol>	<b>06</b>

**Note:** In module 4: Advanced learners may opt to do multiple case studies beyond minimum required. Student with laptops or personal computers should be encouraged to install Python on it and independently work on these projects. Students should prepare a short report for each case study and submit their findings. They should also give a presentation on their case study as well as a live demonstration of their projects.

**Assessment:**

**Internal:**

**Distribution of term work marks as below;**

- |   |          |
|---|----------|
| 1. Laboratory Work:                                   | 5 Marks  |
| 2. Case Study Reports and Presentation: 5 marks each: | 15 marks |
| 3. Attendance:  | 5 Marks  |

**External Practical/Oral:**

1. Practical examination of 2 hours duration followed by Oral to be conducted by Pair of Internal and External Examiner based on contents
2. Evaluation of practical examination to be done by examiner based on the printout of students work
3. Distribution of marks
  - a. Practical examination: 20 marks
  - b. Oral based on practical examination: 05 marks

Note: Students work along with evaluation report to be preserved till the next examination

**References:**

1. Core Python Programming, Dr. R. NageswaraRao, Dreamtech Press
2. Programming through Python, M.T.Savaliya and R.K.Maurya, StarEdu Solutions
3. Beginning Python: Using Python 2.6 and Python 3.1. James Payne, Wrox publication2.
4. Any digital resources and online guides for python or its packages. Such as "The Python Tutorial", <http://docs.python.org/release/3.0.1/tutorial/>