

NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Open Elective (open to all branches except Dept. of CSE)

L	T	P	C
2	0	2	3

Course Code	2CSOE78
Course Title	Scientific Programming

Course Outcomes:

At the end of the course, students will be able to –

1. write computational programs at a high level of abstraction
2. use standard programming constructs like repetition, selection, functions, composition, modules, aggregated data
3. implement and evaluate the results of scientific computing problems, using established program libraries.

Syllabus:

**Teaching
Hours**

Unit I

Introduction to Computational Science, Applications involving scientific computing, Tools and languages to solve complex scientific problems

02

Unit II

Programming in Python- Interpreter and its environment; Introduction to data types, concepts of mutability, operators and variables; random numbers, user inputs, statements; branching, conditional and iteration; functions, file handling, error handling and exceptions

06

Unit III

Object-oriented programming, classes and methods - encapsulation, inheritance

04

Unit IV

Array computing and curve plotting, vectors and higher-dimensional arrays, matrices, numPy, sciPy and Matplotlib

09

Unit V

Python Pandas - Data alignment, aggregation, summarization, computation and analysis with Pandas

04

Unit VI

Scientific computation using python - Statistical data analysis, image processing, web development and hardware interfacing using Python

05

DS

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on applications of the above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings[^]:

1. Hans Petter Langtangen, A Primer on Scientific Programming with Python (Link)
2. Claus Fuhner, Jan Erik Solem, Olivier Verdier, Scientific Computing with Python 3, Packt Publishing Limited
3. Martin C. Brown, Python: The Complete Reference, McGraw Hill Education
4. Hemant Kumar Mehta, Mastering Python Scientific Computing, Packt Publishing Limited
5. Sergio J. Rojas G., Erik A. Christensen, Francisco J. Blanco-Silva, Learning SciPy for Numerical and Scientific Computing, Packt Publishing Limited

L=Lecture, T=Tutorial, P=Practical, C=Credit

[^]this is not an exhaustive list