Enclosure-XVII

NIRMA UNIVERSITY
Institute of Technology
B. Tech. Computer Science and Engineering
Open Elective

L	T	P	C
2	0	2	3

Course Code	XXXX
Course Name	Scientific Programming

Course Learning Outcomes (CLO):

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 — **02**

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

Unit II — **06**

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

Unit III — **04**

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

Unit IV — **09**

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

Unit V — **04**

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

Unit VI — **05**

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

18.3

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 above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings^:

1. Hans PetterLangtangen, A Primer on Scientific Programming with Python (Link)
2. Claus Fuhrer, 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