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

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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
<b>Unit I</b> Introduction to Computational Science, Applications involving scientific computing, Tools and languages to solve complex scientific problems	02
<b>Unit II</b> 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
<b>Unit III</b> Object-oriented programming, classes and methods - encapsulation, inheritance	04
<b>Unit IV</b> Array computing and curve plotting, vectors and higher-dimensional arrays, matrices, numPy, sciPy and Matplotlib	09
<b>Unit V</b> Python Pandas - Data alignment, aggregation, summarization, computation and analysis with Pandas	04
<b>Unit VI</b> Scientific computation using python - Statistical data analysis, image processing, web development and hardware interfacing using Python	05

## 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 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