Semester	**FOUR**
Course	**Skill (Paper 1)**
Paper Code	**S2ST230411P**
Paper Title	**Programming in Python and R**
No. of Credits	**3**
Theory/Composite/ Practical	**Practical**
Minimum No. of preparatory hours per week a student has to devote	**3**
Number of Modules	**Two**
Syllabus	***Module 1: Introduction to Python*** ***Unit 1:*** ***Python Basics and Data Structures***: Introduction to Python programming, basic input output operations, string operations, arithmetic operators, logical operators, lists, tuples, and dictionaries. [6L] ***Unit 2:*** ***Programming in Python*:** Conditions and branching, loops, user-defined functions. [9L] ***Unit 3:*** ***Use of libraries*:** *math, numpy, pandas, matplotlib, random, scipy, sympy*. [24L] ***Module 2: Advanced R*** ***Unit 1:*** ***File Handling*:** Importing and exporting data from/to other software. [3L] ***Unit 2:*** ***Programming in R*:** Conditional statements: if, if else. Loop structures. User defined functions. The *curve()* function. [11L] ***Unit 3:*** ***Statistical Simulations*:** Drawing random samples from different finite and infinite probability distributions – the *set.seed()* command. Illustrations through statistical problems: probability estimates by long-run relative frequencies, sampling distribution, bias and MSE's of estimates, coverage of confidence intervals, calculating empirical level and power of tests. Optimisation of functions – the *optim()* function and its various arguments. [25L]
List of suggested practicals	Practicals based on Linear Algebra and Statistical Inference.
Learning Outcomes	o To compute basic mathematical functions, drawing diagrams using Python. o To write and debug programmes in Python.

	o To compute statistical measures using built-in functions in Python. o To read and write data from external file sources in R. o To write programmes in R. o To solve problems on linear algebra and statistical inference using Python and R.
Reading/ Reference list	1. Guttag, J. V. (2021): Introduction to Computation and Programming Using Python, Third Edition, MIT Press. 2. Nelli, F. (2018): Python Data Analytics, 2nd Edition, Apress. 3. Dalgaard, P: Introductory Statistics with R, Springer Pubications, 2nd edition, 2008. 4. Maindonald, J. & Braun, J.: Data Analysis and Graphics Using R, Cambridge University Press, Cambridge, 2nd edition, 2007.
Evaluation	Continuous Assessment: Module – I: 25 Module – II: 25 End Sem: NA