Semester	**3**
Course	**BSc Statistics Honours**
Paper Code	S2ST230311P
Paper Title	Programming in C and R
No. of Credits	**3**
Theory / Practical / Composite	**Practical**
Minimum No. of preparatory hours per week a student has to devote	**3**
Number of Modules	**2**
Syllabus	**Module – I: (C-programming)** **Unit 1:** **Introduction:** Constants, Variables and Keywords. Relational and logical operators. Conditional statements – If, If-Else. Loop structures – For, While, Do-While. Control statements: Break, Exit and Continue functions. [14L] **Unit 2:** **Array:** Single dimensional array, Two dimensional array. [14L] **Unit 3:** **User-defined functions:** A multi-function program using user-defined functions, definition of functions, return values and their types, function prototypes and calls. Category of functions – no arguments and no return values, arguments but no return values, arguments with return values, no arguments but returns a value. Recursion function. [14L] **Unit 4:** Generation of random samples from different probability distributions and their applications. [10L] **Module – II (Introduction to R):** **UNIT 1:** **Introduction to R:** History and overview of R, the CRAN, installing the R Software, The R-console and the R-script. Saving and accessing files. Libraries in R. Loading and installing packages in R. The *ls()* and the *rm()* commands. R as a calculator – Basic mathematical functions. Defining variables, calling variables, Unary and Binary operators on variables. [3L] **UNIT 2:** **Modes of Data Storage:** Vectors, Matrices, Data Frames, Lists.

	The *c(), edit()* commands. Defining attributes. Creating patterned data – the *rep()* and *seq()* commands. Extracting rows and columns in data frames and lists. Assigning names to columns of data frames and matrices and rows of lists. The *$* operator. The *attach()/detach()* command. Conditional selections and subsetting of objects. The *length()* command. Merging multiple vectors or columns of different data frames into one - The *cbind(), rbind()* and *merge()* commands. Inter-conversions of the various modes of storages. [6L] **UNIT 3:** **Diagrammatic representations of data:** *plot()* command. Line Diagram, bar (horizontal and vertical) diagrams, multiple bar diagrams, multiple line diagrams, pie and subdivided charts. Column diagrams and histograms. Box plots - the *summary()* command. Cumulative frequency diagrams. Adding legends, title, labels, limits on the axis. The *par()* parameter and its arguments. [8L] **UNIT 4:** **Applications in Probability and Statistics:** Descriptive measures of central tendency, dispersion, skewness and kurtosis. The *'moments'* package and its functions. Scatterplot, Various forms of correlations. Regression theory – the *lm()* command, *abline()* command, polynomial regression. Residual plots. Density, distribution function, quantile function and random generation for different distributions. [9L] List of suggested Practicals: • Basic statistical measures using C and R. • Problems on numerical analysis using C. • Frequency distribution and Diagrammatic representation of data.
Learning Outcomes	o To understand the loop structures and their uses in C. o To implement conditional statements and user-defined functions in C. o To apply C programming in some selected fields of Statistics and Mathematics. o To store data and represent them diagrammatically in R. o To compute statistical measures using built-in functions in R.
Reading/Reference Lists	1. Kernighan, B.W. and Ritchie, D. (1988): C Programming Language, 2nd Edition, Prentice Hall. 2. Balagurusamy, E. (2011): Programming in ANSI C, 6th Edition, Tata McGraw Hill. 3. Gottfried, B. S. (1998): Schaum's Outlines: Programming with C, 2nd Edition, Tata McGraw Hill. 4. Kanetkar Y. (2016) : Let us C, 15th Edition, BPB publication.

	5. Dalgaard, P : Introductory Statistics with R, Springer Publications, 2nd Edition, 2008. 6. Maindonald, J. & Braun, J. : Data Analysis and Graphics Using R , Cambridge University Press, Cambridge, 2nd Edition, 2007. 7. Faraway, J. J. : Linear Models with R ,Chapman &Hall/CRC Texts in Statistical Science.
Evaluation	CA: Module – I: 30 Module – II: 20 End Sem: NA