PROGRAME NAME: **B.Sc.(H) Mathematics**
COURSE NAME: **Computer Algebra Systems and Related Software**
SEMESTER DURATION: **January to May**

Week	Topic(s)	Teaching Methodology Adopted/ Continuous Internal Evaluation
1.	Computer Algebra System (CAS), Use of a CAS as a calculator.	Presentations
2.	Computing and plotting functions in 2D, producing tables of values, working with piecewise defined functions	Lectures/Discussions
3.	Combining graphics. Simple programming in a CAS.	Lectures
4.	Plotting functions of two variables using Plot3D and ContourPlot	Presentations/lectures
5.	Plotting parametric curves surfaces, Customizing plots, Animating plots.	Case Study/Practicals
6.	Working with matrices, Performing Gauss elimination, operations (Transpose, Determinant, Inverse)	Practicals
7.	Minors and cofactors, working with large matrices, Solving system of linear equations	Lectures
8.	Rank and nullity of a matrix, Eigenvalue, Eigenvector and diagonalization.	Demonstration/Lectures

9.	R as a calculator, explore data and relationships in R. Reading and getting data into R: Combine and scan commands	Lectures
10.	Types and structure of data items with their properties. Manipulating vectors, Data frames, Matrices and Lists.	Practicals
11.	Viewing objects within objects. Constructing data objects and conversions.	Practicals
12.	Summary commands: Summary statistics for vectors, Data frames, Matrices and lists	Case study/Lectures
13.	Summary tables. Stem and leaf plot, histograms. Plotting in R: Box-whisker plots, Scatter plots, Pairs plots, Line charts, Pie charts, Cleveland dot charts and Bar charts.	Assignments
14.	Copy and save graphics to other applications.	Assignments

Course Objectives: This course aims at familiarizing students with the usage of computer algebra systems (/Mathematica/MATLAB/Maxima/Maple) and the statistical software R. The basic emphasis is on plotting and working with matrices using CAS. Data entry and summary commands will be studied in R. Graphical representation of data shall also be explored.

Course Learning Outcomes: This course will enable the students to:

i) Use CAS as a calculator, for plotting functions, animations and various applications of matrices.

ii) ii) Understand the use of the software R for entry, summary calculation, pictorial representation of data and exploring relationship between data.

iii) iii) Analyze, test, and interpret technical arguments on the basis of geometry.