

Enclosure-

Core Course (Practical) For the students admitted from A.Y. 2021-2022 & onwards		
Offering Department: Mathematics		Offered to: B.Sc. Mathematics
Semester - III		
Course Code	Course Title	Course Credit and Hours
21UMTCC304	Core Practical 3: Computer Aided Mathematics	3 Credits - 6 hrs/wk

Course Description:

This course is an introduction to the use of mathematical software in calculus, advanced calculus, differential equations, sequence, series and linear algebra. Although mathematics is still largely taught as a pen-and-paper subject, this approach ignores the fundamental role played by computing technology in the process of mathematical discovery. This course will introduce students to a broad but coherent collection of open-source software tools, and to diverse examples of their use in mathematical study. In this course students will visualize function of multivariable and its property through mathematical software and learn to solve various problems of mathematics using computer algebraic system.

Course Purpose:

This course aims to provide basic understanding of calculus, advanced calculus, differential equations, sequence, series and linear algebra using Open-source mathematical software. In this course learners will be able to visualize various concepts of mathematics; it also provides the learner with the computer skills required to use the mathematical software. The purpose of this course is to enable learners to apply techniques of mathematical software to solve mathematical problems numerically.

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Blooms taxonomy Level (K ₁ to K ₆)
CO ₁	Explain the nature of solution curve using computer algebra system.	K ₁
CO ₂	Utilize the software to compute derivative and integration.	K ₃
CO ₃	Plot the 2D and 3D graphs of mathematical functions using mathematical software.	K ₁ ,K ₃

CO ₄	Analyze the mathematical functions using commands of mathematical software.	K ₄
CO ₅	Utilize the different tools of mathematical software to understand the mathematical concepts	K ₃

List of Practical		
Sr.	Experiments	Hrs
1	Introduction to the user interface and components of the different mathematical software.	4
2	Introduction to the inbuilt constants variables and library functions of different mathematical software.	4
3	To solve the linear equations, polynomial equations, system of linear equations using mathematical software.	6
4	Find the derivatives and nth derivatives, partial derivative using mathematical software.	6
5	Find the definite integration, indefinite integration, and numerical integration using mathematical software.	6
6	Evaluation of limits using mathematical software.	4
7	Illustrate continuity and Differentiability of a function and unequal left hand and right hand limits for discontinuous functions using mathematical software.	5
8	Find the Taylor series expansion of a given function and sum of the series using mathematical software.	4
9	Practical based on Simplification, Factorization and expansion of symbolic functions using mathematical software.	5
10	Method of solving differential equations using mathematical software.	6
11	Solve matrices and determinants using mathematical software	6
12	Find the solution of problems of Linear Algebra by using mathematical software.	6
13	Evaluate mean, median, variance, standard deviation, histogram, bar plot, pie chart etc. using mathematical software	5
14	To draw a line passing through a given points, polygon, circle and using options in plotting of 2D graphs using mathematical software.	6
15	To plot the 2D and 3D graphs, including formatting of plotted figures. -Plotting of standard Cartesian curves, polar curves and parametric curves using mathematical software.	6
16	To draw the graph of given function in 3D including line, sphere, platonic solids using mathematical software.	6

Pedagogic Tools:

- Chalk and Board
- Power point presentation
- Handouts
- Computer
- Video

Text books:

- Tuteja G. (2010), Practical Mathematics Using Maxima: An Open Source Computer Algebra System, IBH.
- Joyner David, William Stein, (2008), Sage Tutorial.

Reference books:

- James Stewart, (2018), Calculus, 9th Edition, Brooks Cole.
- Hannan Z. (2010), wxMaxima for Calculus I and II, Solano Community College. Brin L.Q., Maxima (5.18.1) and the Calculus.
- Dodier R. (2010), Minimal Maxima.
- Rand R. H., Introduction to Maxima, Cornell University
- Gkioulekas E., Introduction to Maxima, University of Texas-Pan American, Edinburg, TX, United States
- Woollett E. L. (2009), Maxima by Example, August 11.
- De Souza P. N., Fateman R. J., Moses J. (2003), The Maxima Book, Cliff Yapp.
- Finch Craig, (2011), Sage Beginner's Guide, Packt publishing (Open Source Community).

Suggested reading / E-resources:

- <https://maxima.sourceforge.io>
- <https://www.sagemath.org/>

Suggested MOOCs:

- https://onlinecourses.nptel.ac.in/noc22_ma24/preview

Methods of Assessment & Tools:

Components of CIA: 40 marks

Sr. No.	Component	Content	Duration (if any)	Marks	Sub Total
A	Test 1	1-10 Experiments	1 $\frac{1}{2}$ hours	15	30
	Test 2	11-20 Experiments	1 $\frac{1}{2}$ hours	15	
B	Attendance and Regularity			5	10
C	Record Book			5	
Grand Total					40
Class activity		<ul style="list-style-type: none">• Surprise Quiz• Quiz• Situation based question			

Note: Any other assessment tools or methods can be adopted as per requirement of the course.