

**ATMIYA UNIVERSITY**  
**Faculty of Science**

<b>Core Course (Theory)</b> For the students admitted from A.Y. 2023-2024 & onwards		
Offering Department: <b>Mathematics</b>		Offered to: <b>B.Sc. Mathematics</b>
<b>Semester – II</b>		
Course Code	Course Title	Course Credit and Hours
<b>23UGMT201</b>	<b>Core 1: Mathematics(F)* (Matrix Algebra and Multivariate Calculus)</b>	<b>4 Credits - 4 hrs/wk (4 Theory)</b>

**Course Description:**

This course deals with the fundamental aspects of mathematics. The learners are benefited with this course as a progress to the broad areas of algebra and calculus. This course is designed to introduce learners with some concepts of matrix theory and multivariate Calculus.

**Course Purpose:**

This course aims to provide basic understanding of matrix algebra. Multivariate calculus provides us with the tools to do so by extending the concepts that we find in calculus. This is designed in such a way that learners will be able to understand the application of concept of matrices.

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

CO No.	CO Statement	Blooms taxonomy Level (K <sub>1</sub> to K <sub>6</sub> )
CO <sub>1</sub>	Define and utilize the concept of matrix	K1,K2
CO <sub>2</sub>	Understand the concept of Rank, determinant and Cayley Hamilton theorem.	K2,K3
CO <sub>3</sub>	Solve the systems of linear equations using concept of matrix	K1,K2,K3
CO <sub>4</sub>	Sketch curves in Cartesian and polar coordinate systems	K2,K3,K4
CO <sub>5</sub>	Find the length of an arc and area enclosed by the given curve	K1,K2

<b>Course Contents</b>	<b>Hours</b>
<b>Unit-I: Introduction to matrices</b>	8
<ul style="list-style-type: none"> <li>• Introduction</li> <li>• Definition and examples of different Types</li> <li>• Elementary operation</li> <li>• Adjoint</li> <li>• Inverse</li> </ul>	
<b>Unit-II: Rank, determinant and Cayley Hamilton theorem</b>	12
<ul style="list-style-type: none"> <li>• Rank</li> <li>• Determinant</li> <li>• Characteristic roots</li> <li>• Eigen values and Eigen vector</li> <li>• Cayley Hamilton theorem and its application</li> </ul>	
<b>Unit- III: Application of matrices</b>	8
<ul style="list-style-type: none"> <li>• Theorems related Solution of system of non-homogeneous linear equation</li> <li>• Examples</li> <li>• Theorems related Solution of system of homogeneous linear equation</li> <li>• Examples</li> </ul>	
<b>Unit- IV: Curve tracing</b>	10
<ul style="list-style-type: none"> <li>• Tracing of Cartesian curves</li> <li>• Tracing of parametric curves</li> <li>• Tracing of polar curves</li> </ul>	
<b>Unit- V: Rectification and Sectorial area</b>	10
<ul style="list-style-type: none"> <li>• Rectification of curves</li> <li>• Area between two curves</li> <li>• Area of parametric curves</li> <li>• Area of polar curves</li> </ul>	

**Pedagogic Tools:**

- Chalk and board
- Power point presentation
- Seminars

**Text Books:**

- N. Saran and J. K. Goyal, (2010), Introduction to Matrices, 20th Edition, Pragati Prakashan.
- Gorakh Prasad (2015), Integral Calculus. Pothishala Pvt. Ltd., Allahabad.

**Reference Books:**

- Howard Anton and Chris Rorres, (2014), Elementary Linear Algebra, 11th Edition, Wiley.
- George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education.
- Jerrold Marsden, Anthony J. Tromba & Alan Weinstein (2009). Basic Multivariable Calculus, Springer India Pvt. Limited.

**Suggested reading / E-resources:**

- <https://ecampusontario.pressbooks.pub/linearalgebrautm/chapter/chapter-2-matrix-algebra/>
- <https://www.scribd.com/presentation/489163932/4-Quadrature-rec>

**Suggested MOOCs:**

- [https://ugcmoocs.inflibnet.ac.in/index.php/courses/view\\_ug/312](https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/312)
- <https://nptel.ac.in/courses/111106051>

**Methods of Assessment & Tools:**

Components of CIA: 30 marks

Sr. No.	Component	Content	Duration	Marks	Sub Total
A	Test 1	Any 2 units	1 $\frac{1}{2}$ hours	5 (Set for 30)	20
	Test 2	Remaining 3 units	2 $\frac{1}{2}$ hours	15 (Set for 45)	
B	Assignment			04	10
C	Class activity			06	
<b>Grand Total</b>					<b>30</b>
<b>Assignment</b>		<ul style="list-style-type: none"> <li>• Hand Book.</li> <li>• Problem solving.</li> </ul>			
<b>Class activity</b>		<ul style="list-style-type: none"> <li>• Quiz / Surprise Quiz</li> <li>• Seminar.</li> </ul>			

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