

# **DEBRA THANA SAHID KSHUDIRAM SMRITI MAHAVIDYALAYA**

Gangaram Chak, Chak Shyampur, Debra, West Bengal



*PROPOSED SYLLABUS (DRAFT) OF*

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## **BACHELOR OF SCIENCE (HONOURS) MAJOR IN MATHEMATICS**

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### **4-YEAR UNDERGRADUATE PROGRAMME**

*(w.e.f. Academic Year 2024-2025)*

*Based on*

**Curriculum & Credit Framework for Undergraduate Programmes (CCFUP), 2023 & NEP, 2020**

# SEMESTER – 1

Course Type	Course Code	Course Title	Course Details		L-T-P	Credit	Marks Distribution			
							IA	CA	ESE	Total
MAJOR-01	MATHMJ01	Calculus, Geometry & Ordinary Differential Equations	Unit I	Differential Calculus	3-1-0	4	10	5	60	75
			Unit II	Integral Calculus						
			Unit III	Geometry						
			Unit IV	Ordinary Differential Equations						
SEC-01	MATHSEC01	MATLAB -1		MATLAB -1	0-0-6	3	5	5	30	40
MINOR-01	MATHMI01	Calculus, Geometry & Ordinary Differential Equations	Unit I	Differential Calculus	3-1-0	4	10	5	60	75
			Unit II	Integral Calculus						
			Unit III	Geometry						
			Unit IV	Ordinary Differential Equations						

MJ = Major, MI = Minor Course, SEC = Skill Enhancement Course, CA= Continuous Assessment, ESE= End Semester Examination, L-T-P = Lecture-Tutorial-Practical

# MAJOR (MJ)

**MATHMJ01: Calculus, Geometry & Ordinary Differential Equations**

**Credits 04, Full Marks: 75**

**MATHMJ101T: Calculus, Geometry & Ordinary Differential Equations**

**Credits 04, Full Marks: 75**

## **Course contents:**

### **UNIT-1 (Differential Calculus):**

Higher order derivatives, Leibnitz rule, and its applications to problems of type  $e^{ax+b \sin x}$ ,  $e^{ax+b \cos x}$ ,  $(ax + b)^n \sin x$ ,  $(ax + b)^n \cos x$ , Hyperbolic functions; Concavity and inflection points; Curvature; Envelopes; Asymptotes; Curve tracing in cartesian coordinates, tracing in polar coordinates of standard curves; L' Hospital's rule; Applications in business, economics, and life sciences.

### **UNIT-2 (Integral Calculus):**

Reduction formulae, derivations, and illustrations of reduction formulae of the type  $\int \sin^n x dx$ ,  $\int \cos^n x dx$ ,  $\int \tan^n x dx$ ,  $\int \sec^n x dx$ ,  $\int (\log x)^n dx$ ,  $\int \sin nx \sin mx dx$ ; Parametric equations; Parameterizing a curve; Arc length of a curve, arc length of parametric curves; area under a curve; area and volume of surface of revolution,

### **UNIT-3 (Geometry):**

#### **Geometry 2D**

Reflection properties of conics, rotation of axes, and second-degree equations; Classification of conics using the discriminant, canonical form of a conic; Polar equations of conics.

#### **Geometry 3D**

Recapitulation of the coordinate system, Plane and Straight Line, Tangent and Normal; Spheres; Cylindrical surfaces; Central conicoids; Paraboloids; Plane sections of conoids; Generating lines; Classification of quadrics

### **UNIT-4 (Differential Equations):**

General, Particular, Explicit, Implicit, and Singular solutions of a Differential equation; First order but not first-degree differential equation; Exact differential equations and integrating factors, and equations reducible to this form; Linear equation; Bernoulli equation and special integrating factors and transformations.

# Marking scheme on question paper

## MATHMJ01T: Calculus, Geometry & Ordinary Differential Equations

UNIT	Marks	QUESTION PATTERN	
		Mark of each question	Number of Questions to be attempted
UNIT-I (Differential Calculus)	16	2	3
		10	1
UNIT-II (Integral Calculus)	14	2	2
		5	2
UNIT-III (Geometry)	21	2	3
		5	1
		10	1
UNIT-IV (Ordinary Differential Equations)	9	2	2
		5	1

# Suggested Readings:

1. G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
2. M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007.
3. H. Anton, I. Bivens and S. Davis, Calculus, 7th Ed., John Wiley and Sons (Asia) P. Ltd., Singapore, 2002.
4. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989.
5. G. F. Simmons, Differential Equations, Tata Mcgraw Hill.
6. S. Goldberg, Calculus and mathematical analysis.
7. S. K. Mapa, Introduction to Real Analysis, 8th Edition, Sarat Book House, 2014.
8. Maity & Ghosh, An Introduction to Analysis (Differential Calculus), New Central Book Agency (P) Limited.
9. Maity & Ghosh, An Introduction To Differential Equations, New Central Book Agency (P) Limited.
10. Chakravorty & Ghosh, Advance Analytical Geometry, U. N. Dhur & Sons Private Limited.
11. A. N. Das, Analytical Geometry of Two and Three Dimensions, New Central Book Agency (P) Limited.
12. Mukharjee & Bej, Analytic Geometry of Two & Three Dimensions (Advanced Level), Books and Allied (P) Ltd.
13. R. M. Khan, Analytical Geometry and Vector Algebra, New Central Book Agency (P) Limited.
14. K. C. Pal, Analytic Geometry including Vector Analysis, Books and Allied (P) Ltd.
15. Maity and Ghosh, An Introduction To Analysis (integral Calculus), New Central Book Agency (P) Limited.
16. D.A. Murray, Introductory Course In Differential Equations, Orient Longman Limited.
17. Shepley L. Ross, Differential Equations, 3rd Ed, Wiley India Pvt. Limited.
18. Chakravorty and Ghosh, Differential Equations, U. N. Dhur & Sons Private Limited.
19. Tom M. Apostol, Calculus (Vol – I and Vol – II), Wiley India Pvt. Limited.

# SKILL ENHANCEMENT COURSE (SEC)

**MATHSEC01: MATLAB-1**

**Credits 03, Full Marks: 50**

**MATHSEC01P: MATLAB -1**

**Credits 03, Full Marks: 50**

## **Course Outline:**

MATLAB interface, data types, variables, Flow control statements, arrays: creating, indexing, operations, Matrix creating, indexing, operations, Input and output function, Mathematical library functions, user-defined function: anonymous function.

Plotting of two-dimensional functions, Graph plotting, Graph formatting (title, axis, line styles, colors, etc.), multiple plots, matrix plots, polar plots, 3D plotting (line, surface, mesh, and contour) of three-dimensional functions.

- I. Find the sum, product, max, min of a list of number in an array, in a sub-array without library function.
- II. Find a sub-matrix of the given matrix.
- III. Find the column sum, product, max, min of the given matrix without library function.
- IV. Find the row sum, product, max, min of the given matrix without library function.
- V. Define any transcendental function and then find and show the table of its functional values.
- VI. Plotting of graph of functions  $e^{ax+b}$ ,  $\log(ax + b)$ ,  $\log \frac{1}{ax+b}$ ,  $\sin(ax + b)$ ,  $\cos(ax + b)$ ,  $|ax + b|$  and to illustrate the effect of  $a$  and  $b$  on the graph.
- VII. Plotting the graphs of polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.
- VIII. Sketching parametric curves (eg. trochoid, cycloid, epicycloids, hypocycloid).
- IX. Tracing of conics in cartesian coordinates/ polar coordinates.
- X. Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone, elliptic, paraboloid, and hyperbolic paraboloid using cartesian coordinates.

# Marking scheme on question paper

MATHSEC01P: MATLAB -1

Marks	QUESTION PATTERN			
	Note Book	Viva	Mark of each Question	Number of Questions to be attempted
40	5	5	10	3

\*Selection of questions for practical examination shall solely be made on lottery basis in the presence of external examiners.

# Suggested Readings:

1. Etter, Delores M., Introduction to MATLAB for Engineers and Scientists, Prentice-Hall.
2. R. Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, Oxford University Press.
3. A. Gilat, MATLAB: an Introduction with Applications, New York: Wiley.
4. Fausett, Laurene, Applied Numerical Analysis Using MATLAB, Prentice-Hall.
5. J. P. William, Introduction to MATLAB for Engineers, New York: McGraw-Hill.
6. C. Lopez, MATLAB programming for numerical analysis, Apress; 2014.



## MINOR (MI)

**MATHMI01: Calculus, Geometry & Ordinary Differential Equations**

**Credits 04 , Full Marks: 75**

**MATHMI01T: Calculus, Geometry & Ordinary Differential Equations**

**Credits 04, Full Marks: 75**

**Course contents:**

**UNIT-1 (Differential Calculus):**

Higher order derivatives, Leibnitz rule, and its applications to problems of type  $e^{ax+b \sin x}$ ,  $e^{ax+b \cos x}$ ,  $(ax + b)^n \sin x$ ,  $(ax + b)^n \cos x$ , Hyperbolic functions; Concavity and inflection points; Curvature; Envelopes; Asymptotes; Curve tracing in cartesian coordinates, tracing in polar coordinates of standard curves; L' Hospital's rule; Applications in business, economics, and life sciences.

**UNIT-2 (Integral Calculus):**

Reduction formulae, derivations, and illustrations of reduction formulae of the type  $\int \sin^n x dx$ ,  $\int \cos^n x dx$ ,  $\int \tan^n x dx$ ,  $\int \sec^n x dx$ ,  $\int (\log x)^n dx$ ,  $\int \sin nx \sin mx dx$ ; Parametric equations; Parameterizing a curve; Arc length of a curve, arc length of parametric curves; area under a curve; area and volume of surface of revolution,

**UNIT-3 (Geometry):**

### Geometry 2D

Reflection properties of conics, rotation of axes, and second-degree equations; Classification of conics using the discriminant, canonical form of a conic; Polar equations of conics.

### Geometry 3D

Recapitulation of the coordinate system, Plane and Straight Line, Tangent and Normal; Spheres; Cylindrical surfaces; Central conicoids; Paraboloids; Plane sections of conoids; Generating lines; Classification of quadrics

**UNIT-4 (Ordinary Differential Equations):**

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# Marking scheme on question paper

## MATHMI01T: Calculus, Geometry & Ordinary Differential Equations

UNIT	Marks	QUESTION PATTERN	
		Mark of each question	Number of Questions to be attempted
UNIT-I (Differential Calculus)	16	2	3
		10	1
UNIT-II (Integral Calculus)	14	2	2
		5	2
UNIT-III (Geometry)	21	2	3
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UNIT-IV (Ordinary Differential Equations)	9	2	2
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3. H. Anton, I. Bivens and S. Davis, Calculus, 7th Ed., John Wiley and Sons (Asia) P. Ltd., Singapore, 2002.
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