

# UNITIZATION OF SYLLABUS & TEACHING PLAN

Department of MATHEMATICS

Bankura Christian College

**Mathematics (Minor)**

1<sup>st</sup> Semester (July to December, 2023), A.Y.: 2023 – 24

**Subject: Mathematics (Minor-1). Paper: Minor-1\* (Unit 1 and Unit 3)**

**Course Title: Calculus, Geometry & Vector Analysis** [\* The Paper contains 4 units]

**Course Instructor: Sri Samiran Patra**

**Course Objectives:** The main objective of this course is to give a deep insight of the differentiation and its applications and advanced analytical geometry.

**Course Learning Outcomes:** After completion of this course a student would have acquired a significant knowledge of Differential Calculus and its application, which they can use for their further study. This course will also enable the students to develop a clear concept of two dimensional and three dimensional analytical geometry.

## SYLLABUS:

### Unit 1:

Higher order derivatives, Leibnitz rule and its applications to problems of type  $e^{ax} + b \sin x$ ,  $e^{ax} + b \cos x$ ,  $(ax+b)^n \sin x$ ,  $(ax+b)^n \cos x$ , Arc length, Derivative of arc length (Cartesian and Polar), Pedal equations, Curvature, Radius of curvature, Centre of curvature, concavity and inflection points, envelopes, asymptotes (Cartesian), Singular points, Classification of double points, Curve tracing in Cartesian coordinates and polar coordinates, Indeterminate forms: L'Hospital's rule.

### Unit 3:

Reflection properties of conics, Transformation of axes and second degree equations, Invariants, classification of conics using the discriminant, Pair of straight lines, polar equations of straight lines, circles and conics. Spheres, Cone, Cylindrical surfaces. Central conicoids, paraboloids, plane sections of conicoids, Tangent, Normal, Enveloping Cone and Cylinder, Generating lines, classification of quadrics, Transformation of axes in space and general equation of second degree.

## Reference Books:

- R. K. Ghosh and K. C. Maity, An introduction to analysis: Differential Calculus (Part I), New Central Book Agency, 13<sup>th</sup> Edition, 2011
- G.B. Thomas and R. L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
- Stewart J., Calculus – Early Transcendental, Cengage Learning, 2015.
- M.J. Strauss, G.L. Bradley and K.J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007.
- H. Anton, I. Bivens and S. Davis, Calculus, 7th Ed., John Wiley and Sons (Asia) P. Ltd., Singapore, 2002.
- R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer-Verlag, New York, Inc., 1989.
- E.H. Askwith, The Analytical Geometry of the Conic Sections, Adam and Charles Black, London, 1908.
- B.K. Kar, Advanced Analytical Geometry and Vector Analysis, Books & Allied Pvt. Ltd., Kolkata, 2000.

## Teaching Plan:

MONTH & YEAR	WEEK	PORTIONS	No. of Lectures
August 2023 [Date of Commencement of Regular Classes: 07 - 08 - 2023]	1	-----	-----
	2	<b>Differential Calculus:</b> Higher order derivatives, Leibnitz rule and its applications to problems of type $e^{ax}+bsinx$ , $e^{ax}+bcosx$ , $(ax+b)^n sinx$ , $(ax+b)^n cosx$ .	2
	3	Arc length, Derivative of arc length (Cartesian and Polar).	1
	4	Pedal equations.	2
	5	Curvature, Radius of curvature, Centre of curvature.	2
September 2023	1	-----	-----
	2	Curvature, Radius of curvature, Centre of curvature continued. <b>CLASS TEST / ASSIGNMENTS</b>	2
	3	Concavity and inflection points.	2
	4	Envelopes.	2
	5	Asymptotes (Cartesian).	2
October 2023	1	Singular points, Classification of double points, Curve tracing in Cartesian coordinates and polar coordinates.	2
	2	Indeterminate forms: L'Hospital's rule.	2
	3	<b>REVISION/ CLASS TEST / ASSIGNMENTS</b>	2
	4	<b>Puja Holidays (18-10-2023 TO 28-10-2022) As per Academic Calendar</b>	-----
	5	<b>Puja Holidays</b>	-----
November 2023	1	-----	-----
	2	<b>Geometry:</b> Reflection properties of conics.	2
	3	<b>Holidays (Kali Puja, Bhatri dwitiya etc.)(12-11-23 To 16-11-23)</b>	-----
	4	Transformation of axes and second degree equations, Invariants.	1
	5	Classification of conics using the discriminant. Pair of straight lines, polar equations of straight lines.	1
December 2023	1	-----	-----
	2	Spheres, Cone, Cylindrical surfaces.	2
	3	Central conicoids, paraboloids, plane sections of conicoids, Tangent, Normal, Enveloping Cone and Cylinder, Generating lines, classification of quadrics.	2
	4	Transformation of axes in space and general equation of second degree. <b>REVISION/ CLASS TEST / ASSIGNMENTS</b>	2
	5	<b>Christmas Holidays &amp; Study Leave</b>	-----