KOLHAN UNIVERSITY, CHAIBASA
JHARKHAND

Revised Curriculum and
Credit Frame work for SEM – I as per
FYUGP, NEP- 2020
(U.G. Mathematics – 2022 Onward)

University Department of Mathematics
Kolhan University, Chaibasa
West Singhbhum, Jharkhand-833202

UNIVERSITY DEPARTMENT OF MATHEMATICS
KOLHAN UNIVERSITY
CHAIBASA

Four-Year under Graduate Programme (FYUGP)

As per Provisions of NEP-2020 to be implemented

from Academic Year 2022-23

COMPOSITION OF BOARD OF STUDIES

1. **Dr. Bijay Kumar Sinha**
   Head, University Department of Mathematics
   Kolhan University Chaibasa

2. **Mr. Mahendra Kumar Rana**
   Assistant Professor,
   University Department of Mathematics
   Kolhan University Chaibasa

3. **Dr. Md. Moiz. Ashraf**
   Head, P.G. Department of Mathematics
   Karim City, College, Jamshedpur

4. **Dr. P. C. Banerjee**
   Assistant Professor,
   P.G. Department of Mathematics
   Karim City, College, Jamshedpur

($\boldsymbol{Dr. Bijay\ Kumar\ Sinha}$)
(Chairman & Head)
University Department of Mathematics,
Kolhan University, Chaibasa.

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Semester	**Paper**	**Code**	**Course Title**	**Credit**
I	Major 1	MJ-1	Calculus	4
	Minor-1	MN-1	Calculus	4

Program: **Certificate** Class: **UG**	Year: **First**	Semester: **I**
Subject: **Mathematics**		
Course Code: **MJ-1**	Course Title: **Calculus**	

Course Learning Outcomes: This course will enable the students to:
a) Apply the rules of differentiation, including the chain rule, to compute derivatives of functions. Also, able to apply different mean value theorems, such as Rolle's theorem and Lagrange's mean value theorem, to establish results about the behavior of differentiable functions.
b) Approximate functions using Maclaurin's and Taylor's series, analyze the error of these approximations using Taylor's theorem with Lagrange, Cauchy, and Roche-Schlomilch forms of remainder, and use these results to find extrema of functions.
c) Define and compute the curvature of a curve at a given point, and understand its geometric significance and identify the different types of asymptotes of general algebraic curves, including parallel asymptotes, asymptotes parallel to axes, and slant asymptotes.
d) Trace Cartesian, polar, and parametric curves and identify their key features, as well as use calculus techniques to analyze the behavior of curves and solve real-world problems that involve curve tracing.
e) Derive and apply reduction formulae, parameterize curves, and compute arc length, area of bounded curves, volume, and surface area of surfaces of revolution.

Credit: **4 (Theory)**	**Compulsory**	
Full Marks: **75**	Time: **3 Hours**	

Unit	Content	Hours
I	**Differential calculus:** Differentiability of a real valued function, Geometrical interpretation of differentiability, Rules of differentiation, Chain rule of differentiation; Darboux's theorem, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Geometrical interpretation of mean value theorems, Successive differentiation, Leibnitz's theorem.	**15 h**
II	**Expansions of Functions:** Maclaurin's and Taylor's theorems for expansion of a function in an infinite series, Taylor's theorem in finite form with Lagrange, Cauchy and Roche–Schlomilch forms of remainder, Maxima and minima.	**12 h**
III	**Curvature and Asymptotes:** Curvature; Asymptotes of general algebraic curves, Parallel asymptotes, Asymptotes parallel to axes; Symmetry, Concavity and convexity, Points of inflection, Tangents at origin, Multiple points, Position and nature of double points.	**13 h**
IV	**Curve Tracing:** Tracing of Cartesian, polar and parametric curves; Envelope and evolutes.	**10 h**
V	**Integral Calculus:** Reduction formulae, derivations and illustrations of reduction formulae of the type $\int \sin^n x\, dx, \int \cos^n x\, dx, \int \tan^m x\, dx, \int \sin^n x \cos^m x\, dx$ and $\int \sin^m x \cos nx\, dx$, parametric equations, parameterizing a curve, arc length, arc length of parametric curves, Area of bounded curve, volume and area of surface of revolution.	**10 h**
Sessional Internal Assessment (SIA) Full Marks – 25 Marks **A – Internal written Examination – 20 Marks (1 Hr)** **B – Over All Performance including Regularity – 05 Marks**	

Books Recommended:
1. R. K. Dwivedi, Calculus, 1st Edition, Pragati Prakashan, Meerut, India (2019).
2. Howard Anton, I. Bivens & Stephan Davis (2016). Calculus (10th edition). Wiley India.

3. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag.

4. Wieslaw Krawcewicz & Bindhyachal Rai (2003). Calculus with Maple Labs. Narosa.

5. Gorakh Prasad (2016). Differential Calculus (19th edition). Pothishala Pvt. Ltd.

6. George B. Thomas Jr., Joel Hass, Christopher Heil & Maurice D. Weir (2018). Thomas' Calculus (14th edition). Pearson Education.

Program: **Certificate** **Class: UG**	Year: **First**	Semester: **I**
Subject: **Mathematics**		
Course Code: **MN-1**	Course Title: **Calculus**	

Course Learning Outcomes: This course will enable the students to:
a) Understand the concept of functions, limits, and continuity, and apply them to solve mathematical problems.
b) Use differentiation rules, including the chain rule and mean value theorem, to differentiate real-valued functions and apply successive differentiation and Leibnitz's theorem to solve calculus problems.
c) Develop skills in finding antiderivatives, computing definite integrals using Riemann sums and the fundamental theorem of calculus, and using various integration techniques to solve real-world problems.
d) Gain proficiency in integrating various types of functions, analyzing curves, and calculating area and volume of surfaces of revolution using integration techniques.

Credit: **4 (Theory)**	**Compulsory**
Full Marks: **75**	Time: **3 Hours**

Unit	Content	Hours
I	**Functions and Limits:** Definition of functions and their properties, Limits of functions and their properties, Continuity of functions.	**12 h**
II	**Differential calculus:** Differentiability of a real valued function, Geometrical interpretation of differentiability, Rules of differentiation, Chain rule of differentiation, Mean value theorem and its applications, Successive differentiation, Leibnitz's theorem.	**18 h**
III	**Integration**: Antiderivatives, Indefinite and definite integrals, Riemann sums and the definite integral, Fundamental theorem of calculus, Properties of definite integrals, Integration Techniques.	**12 h**
IV	**Integral Calculus:** Integration of rational and irrational functions, Reduction formula, Computing of definite integral, Curve tracing, Length of curve, Computing of double and triple integrals, Area and Volume of surface of revolution.	**18 h**

Sessional Internal Assessment (SIA) Full Marks – 25 Marks **A – Internal written Examination – 20 Marks (1 Hr)** **B – Over All Performance including Regularity – 05 Marks**

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1. R. K. Dwivedi (2019). Calculus, 1st Edition, Pragati Prakashan, Meerut, India.
2. Howard Anton, I. Bivens & Stephan Davis (2016). Calculus (10th edition). Wiley India.
3. Gabriel Klambauer (1986). Aspects of Calculus. Springer-Verlag.
4. Wieslaw Krawcewicz & Bindhyachal Rai (2003). Calculus with Maple Labs. Narosa.
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