FIRST-YEAR OF BACHELOR OF SCIENCE MAJOR MATHEMATICS REVISED SYLLABUS ACCORDING TO CBCS NEP2020

COURSE TITLE: CALCULUS I SEMESTER-I, W.E.F. 2023-2024

RECOMMENDED BY THE BOARD OF STUDIES IN MATHEMATICS
AND
APPROVED BY THE ACADEMIC COUNCIL

Devrukh Shikshan Prasarak Mandal's
Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and
Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.
Tal.Sangmeshwar, Dist. Ratnagiri-415804, Maharashtra, India

Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce and Vid. Dadasaheb Pitre Science College, Devrukh (An Autonomous College Affiliated with University of Mumbai)

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Academic Council Item No: _____

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangmeshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Bachelor of Science
Name of the Department	:	Mathematics
Name of the Class	:	First Year
Semester	:	First
No. of Credits	:	04
Title of the Course	:	Calculus-I
Course Code	:	S101MTT
Name of the Vertical in adherence to NEP 2020	:	Major and Minor
Eligibility for Admission	:	Any 12th Pass seeking Admission to Degree Programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	UG
Pattern of Marks Distribution for TE and CIA	:	60:40
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2023-2024
Ordinances /Regulations (if any)		

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Syllabus for First Year of Bachelor of Science in Mathematics

(With effect from the academic year 2023-2024)

SEMESTER-I **Paper No.– Mathematics Paper – I**

Course Title: Calculus-I **No. of Credits - 02**

Type of Vertical: Major and Minor **COURSE CODE: S101MTT**

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to…		
Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Remember	Remember the fundamental properties of R, bounded sets, limit of function and derivative of functions
CLO-02	Understand	Understand the AM-GM inequality, Cauchy-Schwarz inequality, Algebraic properties of limits, Intermediate value property and higher order derivatives.
CLO-03	Apply	Apply the intermediate value theorems and Archimedean property
CLO-04	Analyze	Analyze the density of rationals , Derivative of inverse functions, Implicit differentiation

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Syllabus for First Year of Bachelor of Science in Mathematics

(With effect from the academic year 2023-2024)

SEMESTER-I   **Paper No.– Mathematics Paper – I**

Course Title: CALCULUS I   **No. of Credits - 02**

Type of Vertical: Major and Minor   **COURSE CODE: S101MTT**

Module No.	Content	No. of Lectures
1 **Real Number System**	1. Real number system $\mathbb{R}$ and order properties of $\mathbb{R}$, absolute value and its properties. 2. AM-GM inequality, Cauchy-Schwarz inequality, Intervals and neighbourhoods, Hausdorff property. 3. Bounded sets, statements of l.u.b. axiom and its consequences, Supremum and infimum, Maximum and minimum, Archimedean property and its applications, density of rationals.	10
2 **Limit and continuity of functions of one variable**	1. Definition of Limit $\lim_{x \to a} f(x)$ of a function $f(x)$ evaluation of limit of simple functions using the $\varepsilon - \delta$ definition, uniqueness of limit if it exists, algebra of limits, limit of composite function, sandwich theorem, left-hand-limit $\lim_{x \to a^{-1}} f(x)$ right hand limit $\lim_{x \to a^{+1}} f(x)$ non existence of limits , $\lim_{x \to -\infty} f(x)$, $\lim_{x \to \infty} f(x)$ and $\lim_{x \to a} f(x) = \infty$. 2. Continuous functions: Continuity of real valued function on a set in terms of limits, examples, continuity of a real valued function at end points of domain, Algebra of continuous functions, Discontinuous functions, examples of removable and essential discontinuity. Intermediate value theorem and it's applications, Bolzano-Weierstrass theorem (statement only): A continuous function on a closed and bounded interval is bounded and attains its bounds.	10
3 **Differentiability of functions of one variable**	1. Differentiation of real valued function of one variable: Definition of differentiation at a point of an open interval, examples of differentiable and non-differentiable, first principal of derivative, algebra of derivative. 2. Differentiable functions are continuous but not conversely, chain rule ,Higher order derivatives, Leibnitz rule, Derivative	10

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	of inverse functions, Implicit differentiation (only examples)		
		Total	30

Required Previous Knowledge

Basic Knowledge Mathematics is necessary before starting to learn the course

Access to the Course

The course is available for all the students admitted for Bachelor of Arts as a Major or a minor. The students seeking admission in other disciplines may select the course as a minor considering the terms and conditions laid down by the University of Mumbai, the Government of Maharashtra, and the college, from time to time.

Forms of Assessment

The assessment of the course will be of Diagnostic, Formative and Summative type. At the beginning of the course diagnostic assessment will be carried out. The formative assessment will be used for the Continuous Internal Evaluation whereas the summative assessment will be conducted at the end of the term. The weightage for formative and summative assessment will be 60:40. The detailed pattern is as given below.

Term End Evaluation (30 Marks)
Question Paper Pattern
Time: 1 hour

Question No.	Question Pattern	Marks
Q.1	Short Answer Questions (based on Unit I)	10
Q.2	Long Answer Questions (based on Unit II)	10
Q.3	Long Answer Questions (based on Unit III)	10
	Total	30

Internal evaluation (20 Marks)

Sr. No.	Description	Marks
1	Mid Term Examination	10
2	Active Participation in teaching learning Process	05
3	Subject related activities as assigned by the teacher	05
	Total	**20**

Grading Scale

The grading scale used is O to F. Grade O is the highest passing grade on the grading scale, and grade F is a fail. The Board of Examinations of the college reserves the right to change the grading scale.

References:

1. R.R.Goldberg, Methods of Real Analysis, Oxford and IBH, 1964.

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2. James Stewart, Calculus, Third Edition, Brooks/ Cole Publishing company, 1994.

3. T.M.Apostol, Calculus, Vol I, Wiley And Sons (Asia) Pte. Ltd.

4. Richard Courant- Fritz John, A Introduction to Calculus and Analysis, Volume-I, Springer.

5. Ajit Kumar- S.Kumaresan, A Basic course in Real Analysis, CRC Press, 2014.

6. Ghorpade, Sudhir R, -Limaye, Balmohan V, A course in Calculus and Real Analysis, Springer International Ltd, 2000.

7. K.G. Binmore, Mathematical Analysis, Cambridge University Press, 1982.

8. G.B.Thomas, Calculus, 12 th Edition 2009

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