



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

COURSE TITLE: CALCULUS II SEMESTER-II, W.E.F. 2022-2023

**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

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-II
Course Code	:	S103MTT
Name of the Vertical in adherence to NEP 2020	:	Major and Minor
Eligibility for Admission	:	Any 12 th 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)		

Syllabus for First Year of Bachelor of Science in Mathematics

(With effect from the academic year 2023-2024)

SEMESTER-II

Paper No.– Mathematics Paper – I

Course Title: Calculus-II

No. of Credits - 02

Type of Vertical: Major and Minor

COURSE CODE: S103MTT

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 concepts of sequence, series and maxima and minima of a function.
CLO-02	Understand	Understand convergence and divergence of a sequence and series, and mean value theorems
CLO-03	Apply	Apply tests for maxima and minima to find extreme values and L'Hospital rule.
CLO-04	Analyze	Analyze convex and concave functions and graphing of a functions

Syllabus for First Year of Bachelor of Science in Mathematics

(With effect from the academic year 2023-2024)

SEMESTER-II

Paper No.– Mathematics Paper – I

Course Title: CALCULUS II

No. of Credits - 02

Type of Vertical: Major and Minor

COURSE CODE: S103MTT

Module No.	Content	No. of Lectures
Unit I Applications of differentiation	<ol style="list-style-type: none"> 1. Definition of local maximum and local minimum, necessary condition, stationary points, second derivative test, examples, Graphing of functions using first and second derivatives, concave , convex , concave functions, points of inflection. 2. Rolle’s theorem, Lagrange’s and Cauchy’s mean value theorems, applications and examples, Monotone increasing and decreasing function, examples, 3. L-Hospital rule without proof, examples of intermediate forms, Taylor’s theorem with Lagrange’s form of remainder with proof. Taylor’s polynomial and applications 	10
Unit II Sequences	<ol style="list-style-type: none"> 1. Definition of a sequence and examples, Convergence of sequences, every nvergent sequences is bounded. Limit of a convergent sequence and uniqueness of limit, Divergent sequences. 2. Convergence of standard sequences like $\left(\frac{1}{1+na}\right)$ $\forall a > 0, (b)^n \forall 0 < b < 1, \left(c^{\frac{1}{n}}\right) \forall c > 0$ and $\left(n^{\frac{1}{n}}\right)$, 3. Algebra of convergent sequences, sandwich theorem, monotone sequences, monotone convergence theorem and consequences as convergence of $\left(1 + \frac{1}{n}\right)^n$ 4. Definition of subsequence, subsequence of a convergent sequence is convergent and converges to the same limit, definition of a Cauchy sequences, every convergent sequences s a Cauchy sequence and converse. 	10
Unit III Series	<ol style="list-style-type: none"> 1. Series $\sum_{n=1}^{\infty} a_n$ pf real numbers, simple examples of series, Sequence of partial sums of a series, convergent series, divergent series. Necessary condition : $\sum_{n=1}^{\infty} a_n$ converges $\Rightarrow a_n \rightarrow 0$, but converse is not true, algebra of convergent series, 2. Cauchy criterion, divergence of harmonic series, 	10

	convergence of $\sum_{n=1}^{\infty} \frac{1}{n^p}$ ($P > 1$), comparison test, limit comparison test, alternating series, Leibnitz's theorem (alternating series test) and convergence of $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$, absolute convergence, conditional convergence, absolute convergence implies convergence but not conversely, Ratio test (without proof), root test (without proof) and examples.	
	Total	30

Required Previous Knowledge

Basic Mathematics Knowledge is necessary before starting to learn the course.

Access to the Course

The course is available for all the students admitted for Bachelor of Science 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

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

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.
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