

Shiv Chhatrapati Shikshan Sanstha's
Rajarshi Shahu Mahavidyalaya, Latur
Empowered Autonomous Institution



**Structure and Curriculum of Four-Year Multidisciplinary
Degree (Honors/Research) Programme with Multiple
Entry and Exit option**

**Undergraduate Programme of Mathematics
Faculty of Science and Technology**

**Board of Studies
in
Mathematics**

Rajarshi Shahu Mahavidyalaya, Latur
Empowered Autonomous Institution

[UG I Year]

w.e.f. June, 2026

(In Accordance with NEP-2020)

Rajarshi Shahu Mahavidyalaya,
Latur (Autonomous)

Review Statement

The NEP Cell reviewed the Curriculum of **B.Sc.-I** to be effective from the **Academic Year 2026-27**. It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: 11/04/2026

Place: Latur

NEP CELL

Rajarshi Shahu Mahavidyalaya, Latur

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CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the Curriculum of **B.Sc. I** to be effective from the **Academic Year 2026-27**.

Date: 04/05/2026

Place: Latur

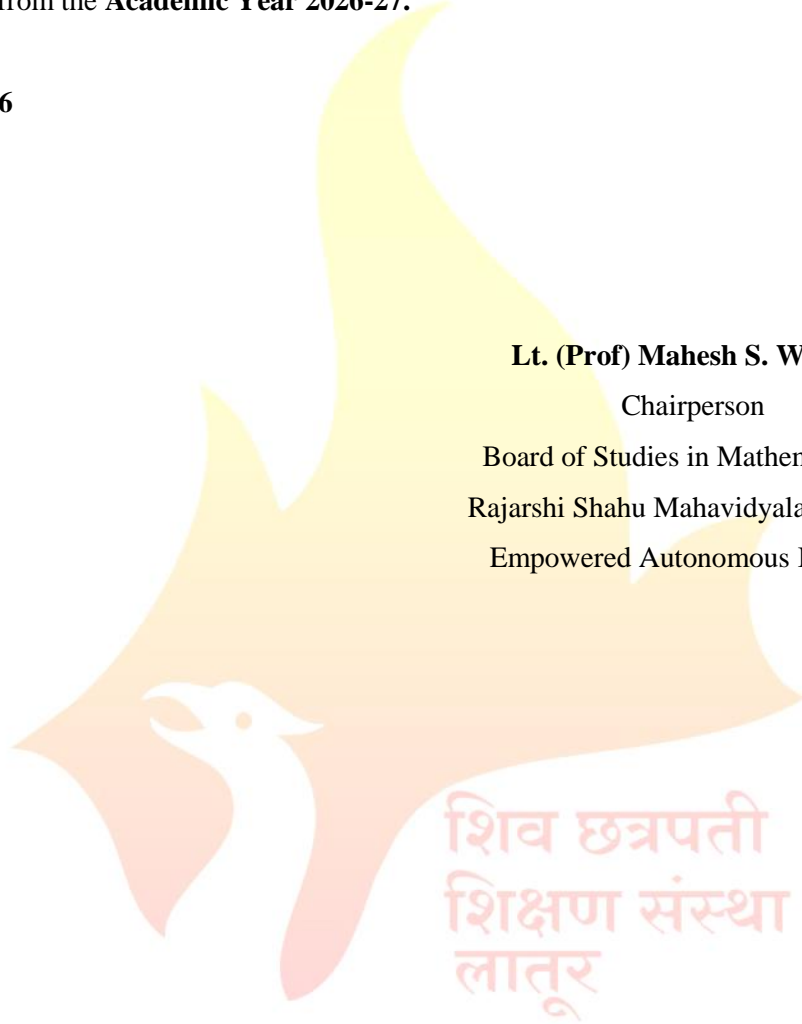
Lt. (Prof) Mahesh S. Wavare

Chairperson

Board of Studies in Mathematics

Rajarshi Shahu Mahavidyalaya, Latur

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Members of Board of Studies in Mathematics

Under the Faculty of Science and Technology

Sr. No.	Name	Designation	In position
1	Lt. (Prof) Mahesh S Wavare HoD, Department of Mathematics, Rajarshi Shahu Mahavidyalaya, Latur	Chairperson	HoD
2	Prof. V. C. Borkar Professor, Department of Mathematics, Yeshwant College, Nanded.	Member	V.C. Nominee
3	Prof. M. T. Gophane Professor and Head Department of Mathematics, Shivaji University, Kolhapur .	Member	Academic Council Nominee
4	Prof. Anil Khairnar Vice-Principal and HoD Department of Mathematics, Aabasaheb Garware College, Pune	Member	Expert from outside for Special Course
5	Dr. Nitin S Darkunde Associate Professor, School of Mathematical Sciences, S R T M U Nanded	Member	Expert from outside for Special Course
6	Mr. S S Ranmal L & T Technology Services, 7th Floor Amar Madhuban Tech Park Baner, Pune (MS)	Member	Expert from Industry
7	Mr. Ajit Vyankatrao Gavhane Michelin India Pvt Ltd, Pune	Member	Alumni Member
8	Prof. Nishank S Pimple	Member	Faculty Member
9	Mrs. Aakanksha S Mitkari	Member	Faculty Member
10	Miss. Shraddha L Chidrewar	Member	Faculty Member

From the Desk of the Chairperson...

It gives me great pleasure to present the revised syllabus of B.Sc. I Mathematics under the National Education Policy (NEP-2020), implemented at Rajarshi Shahu Mahavidyalaya, Latur, from the academic year 2026–27. This syllabus marks a significant milestone as it represents the first comprehensive revision aligned with the multidisciplinary and flexible framework of NEP-2020.

The curriculum has been thoughtfully designed in accordance with the Learning Outcomes-based Curriculum Framework (LOCF) to ensure a student-centric, skill-oriented, and outcome-driven learning process. It provides a strong foundation in core mathematical areas such as Algebra, Calculus, and Analytical Geometry, along with practical exposure through modern computational tools like R, Python, LaTeX, MATLAB etc.

Objectives of the Programme

- To develop a strong conceptual understanding of fundamental principles and theories in mathematics.
- To enhance analytical thinking, logical reasoning, and problem-solving abilities among students.
- To equip learners with computational and digital skills using modern mathematical software.
- To promote interdisciplinary learning and connect mathematics with real-world applications.
- To prepare students for higher education, research, and competitive examinations.
- To foster independent learning, creativity, and scientific temperament.

The syllabus emphasizes the development of essential skills required in academia and industry, including critical thinking, data interpretation, and quantitative analysis. The inclusion of skill enhancement courses, interdisciplinary electives, and practical components ensures a balanced integration of theory and application.

The flexible structure with multiple entry and exit options reflects the spirit of NEP-2020 and caters to diverse learning needs. This programme will open avenues for students in higher studies as well as in various professional fields such as education, research, IT, banking, and data science.

I express my sincere gratitude to all the esteemed members of the Board of Studies, subject experts, and faculty members for their valuable contributions in designing this progressive curriculum. I am confident that this revised syllabus will significantly enhance the quality of mathematics education and inspire students to achieve academic excellence.

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Lt (Prof) Mahesh S Wavare

Chairperson

Board of Studies in Mathematics

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Index

Sr. No.	Content	Page No.
1	Structure for UG-I Programme	1
2	Abbreviations	2
3	Courses and Credits	3
4	UG Program Outcomes	4
5	UG Programme Specific Outcomes	5
6	Curriculum: Semester-I	6
	DSC I : Topics in Algebra	7
	DSC II : Calculus	12
	VSC I : Introduction to MATLAB	15
7	Curriculum: Semester-II	20
	DSC III : Analytical Geometry	21
	DSC IV : Integral Calculus	26
	VSC II : Programming With MATLAB	31
8	Basket I: Open Elective (OE)	-
9	Basket II: Skill Enhancement Courses (SEC)	-
10	Basket III: Ability Enhancement Courses (AEC)	-
11	Extra Credit Activities	35
12	Examination Framework	37

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Faculty of Science and Technology

Structure for Four Year Multidisciplinary Undergraduate Degree Programme in Mathematics

Multiple Entry and Exit (In accordance with NEP-2020)

Year & Level	Sem	Major		Minor	OE	VSC/ SEC (VSEC)	AEC/ VEC	OJT,FP,CEP, RP	Credit per Sem.	Cum./ Cr. per exit
		DSC	DSE							
1	2	3		4	5	6	7	8	9	10
I 4.5	I	DSC I: 04 Cr. DSC II: 04 Cr.	NA	NA	OE-I: 04 Cr.	VSC-I: 02 Cr. SEC-I: 02 Cr.	AEC-I MIL: 02 Cr. VEC-I: 02 Cr.	CC-I: 02 Cr. (NSS, NCC, Sports, Cultural)/ CEP-I: 02 Cr. (SES-I)/ OJT: 02 Cr. / Mini Project: 02 Cr.	22	44 Cr. UG Certifi cate
	II	DSC III: 04 Cr. DSC IV: 04 Cr.	NA	NA	OE-II: 04 Cr.	VSC-II: 02 Cr. SEC-II: 02 Cr.	AEC- II MIL: 02 Cr. VEC- II: 02 Cr.	Generic IKS: 02 Cr.	22	
	Cum. Cr.	16	-	-	08	04+04= 08	04+02 +02=0 8	04	44	
<p>Exit Option: Award of UG Certificate in Major with 44 Credits and Additional 04 Credits Core NSQF Course / Internship or continue with Major and Minor</p>										

Abbreviations:

1. DSC : Discipline Specific Core (Major)
2. DSE : Discipline Specific Elective (Major)
3. DSM : Discipline Specific Minor
4. OE : Open Elective
5. VSEC : Vocational Skill and Skill Enhancement Course
6. VSC : Vocational Skill Course
7. SEC : Skill Enhancement Course
8. AEC : Ability Enhancement Course
9. MIL : Modern Indian Languages
10. IKS : Indian Knowledge System
11. FSRCE : Fostering Social Responsibility & Community Engagement
12. VEC : Value Education Course
13. OJT : On Job Training
14. FP : Field Project
15. CEP : Community Engagement Programme
16. CC : Co-Curricular Course
17. RP : Research Project/Dissertation
18. SES : Shahu Extension Services

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Faculty of Science and Technology

B.Sc. (Mathematics) Program [UG I Year]

Year & Level	Semester	Course Code	Course Title	Credits	No. of Hrs.	
I 4.5	I	101MAT1101 (DSC-I)	Topics in Algebra	03	45	
		101MAT1103	Lab Course-I	01	30	
		101MAT1102 (DSC-II)	Calculus	03	45	
		101MAT1104	Lab Course-II	01	30	
		OE-I	From Basket	04	60	
		101MAT1501 (VSC-I)	Introduction to MATLAB	02	30	
		(SEC-I)	From Basket	02	30	
		(AEC-I)	From Basket	02	30	
		(VEC-I)	Constitution of India	02	30	
		AIPC/OJT-I	Mini Project – I	02	60	
	Total Credits				22	
	II	101MAT2101 (DSC-III)	Analytical Geometry	03	45	
		101MAT2103	Lab Course-III	01	30	
		101MAT2102 (DSC-IV)	Integral Calculus	03	45	
		101MAT2104	Lab Course-IV	01	30	
		OE-II	From Basket	04	60	
		101MAT2501 (VSC-II)	Programing with MATLAB	02	30	
		(SEC-II)	From Basket	02	30	
		(AEC-II)	From Basket	02	30	
		CC	CC – I	02	30	
		Generic IKS	Introduction to Indian Knowledge System	02	30	
	Total Credits				22	
Total Credits (Semester I & II)				44		



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Name of the Programme : B.Sc.(Mathematics)

Programme Outcomes (POs) for B.Sc.(Mathematics)	
PO 1	Explain fundamental principles in algebra, calculus, and geometry to interpret complex mathematical structures.
PO 2	Utilize mathematical theories to solve problems in physical, biological, and social sciences.
PO 3	Examine mathematical proofs and statements to identify logical consistencies and identify potential fallacies.
PO 4	Implement software like MATLAB and LaTeX to execute numerical computations and generate technical documentation.
PO 5	Critique mathematical models for real-world scenarios to determine their accuracy and limitations.
PO 6	Develop structured code and logical sequences to automate decision-making and data processing tasks.
PO 7	Present mathematical findings through oral seminars and written reports using appropriate academic terminology.
PO 8	Follow ethical guidelines in research and data interpretation, maintaining academic integrity in all professional actions.
PO 9	Contribute effectively to group projects and lab activities by coordinating with peers from diverse academic backgrounds.
PO 10	Appraise new mathematical developments and technologies independently to adapt to the evolving demands of industry and academia.



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Programme Specific Outcomes (PSOs) for B.Sc.(Mathematics)	
PSO No.	After completion of this programme the students will be able to -
PSO 1	Differentiate between various types of functions, relations, and conic sections to interpret their properties in two and three dimensions.
PSO 2	Construct solutions for complex limits, derivatives, and multiple integrals by applying specialized theorems and computational techniques.
PSO 3	Perform matrix operations, including eigenvalues and row-echelon reductions, to analyze properties of linear systems and data structures.
PSO 4	Produce professional-grade plots and surface meshes using MATLAB to visualize mathematical behavior and function trends.
PSO 5	Implement L'Hôpital's Rule, Mean Value Theorems, and integral calculus fundamental theorems to address advanced mathematical inquiries.

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Semester - I

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Faculty of Science and Technology

Department of Mathematics

UG I Sem I

Course Type: DSC-I

Course Title: Topics in Algebra

Course Code: 101MAT1101

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To know Set, Relations, and types of function
- LO 2. To know geometrically representation of Complex Numbers, Conjugates, and Roots using De-Moivre's Theorem
- LO 3. To determine Determinants, Co factor, Minor Adjoint of square Matrix.
- LO 4. To find Solutions to linear systems and to know Applications of Caley Hamilton theorem.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Sort out one-one, onto, into, many one types of functions
- CO 2. Represent complex numbers and perform algebraic operations.
- CO 3. Find and visualize the roots of a complex number
- CO 4. Execute elementary row and column operations to transform matrices into Row-Echelon form for analyzing the properties of linear systems.

Unit No.	Title of Unit & Contents	Hrs.
I	Sets Relations and Functions	12
	1. Sets, Relations, Equivalence relations 2. Equivalence classes and partitions of sets 3. Functions, Basic terminology, Types of Functions, Inverse of a Function, Composition of Functions.	
	Unit Outcomes: UO 1. Acquaint with the basic concepts of mathematics such as Set and partitions of set. UO 2. Able to differentiate different types of relations and functions.	

II	Complex Number	12
	<p>1. Standard form of a complex number, Geometrical representation, Product and quotient of Complex numbers,</p> <p>2. Geometrical representation of Sum and difference, Results concerning conjugate, Modulus and Amplitude</p> <p>3. De-Moivre's theorem and Its Application</p> <p>4. Roots of Complex number, all values of $(\cos\theta + i \sin\theta)^{\frac{p}{q}}$ where p, q being relatively prime numbers and some standard Result</p> <p>5. Solutions of equations, Expansion of $\cos(n\theta)$, $\sin(n\theta)$, n being positive integer</p> <p>6. Expansion of $\tan n\theta$, Finding equation whose roots are given</p> <p>7. Expansion of $\cos(n\theta)$, in terms of cosine of multiple angles, expansion of $\sin(n\theta)$ in terms of cosine or sines of multiple angles of θ according as n is even or odd integer</p>	
	<p>Unit Outcomes:</p> <p>UO 1. Illustrate complex numbers and their roots on the complex plane by applying De Moivre's Theorem and algebraic properties.</p> <p>UO 2. Convert between powers and multiple angles of sine and cosine to simplify expressions and solve equations</p>	
III	Rank of Matrix	10
	<p>1. Minor of order k, Rank of Matrix, Elementary Rows, Column Operations</p> <p>2. Elementary Operations, Inverse of elementary operations.</p> <p>3. Equivalent Matrices, Row – Echelon Matrix row rank and column rank of a matrix.</p>	
	<p>Unit Outcomes:</p> <p>UO 1. Investigate the properties of matrices by calculating minors and performing elementary row or column operations to identify equivalent matrix structures.</p> <p>UO 2. Execute the reduction of matrices to Row-Echelon form to compute the specific row and column rank of a given matrix.</p>	
IV	System of Linear Equations	11
	<p>1. Linear equations, equivalent system,</p> <p>2. System of homogeneous and non-homogeneous equations</p> <p>3. Characteristic Roots, Caley Hamilton theorem, and applications.</p>	
	<p>Unit Outcomes:</p> <p>UO 1. Differentiate between system of homogeneous and non- homogeneous equations.</p> <p>UO2. Finding Characteristics Roots and verification of Caley Hamilton Theorem</p>	

Learning Resources:

1. A Foundation Course in Mathematics, Ajit Kumar, S. Kumeresan and Bhaba Kumar Sarma, Reprint , Narosa Publication House 2018.
2. A text books of matrices , Shanti Narayan , Reprint , (S. Chand & Company Ltd) Ram Nagar, New Delhi (2010).
3. An Introduction to theory of numbers, I. Niven, H. Zuckerman, V.H.L. Montgomery, Fifth Edition, John Wiley & Sons(1991).
4. Elementary Number Theory, David M. Burton, Sixth Edition, Tata McGraw – Hill Publishing Company Limited(2007).
5. Matrix & Linear Algebra , K.B. Datta, Prentice Hall India Pvt., Limited, 2004.
6. Theory and Problems of linear Algebra , Seymour Lipschutz, Third Edition , (Tata McGraw Hill) (2004).
7. Topics in Algebra , Om. P. Chug, K. Prakash, A.D. Gupta , First Edition , Anmol Pub. Pvt Ltd. New Delhi (2008).

Internal Examination Pattern:

CAT – I Written Theory Test (Based on Unit -I)

CAT – II Assignments PYQ's on IIT-JAM/NET/SET/GATE/NBHM/ Related Competitive

Examinations and Seminar by Student on it (Based on Unit-I, II)

Mapping of POs, PSOs and COs:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	2	0	1	2	1	0	0	1
CO2	3	2	1	1	1	1	1	0	0	1
CO3	3	2	1	2	1	1	2	0	0	1
CO4	3	2	2	3	2	3	1	0	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	0	0	1
CO2	1	1	0	0	2
CO3	1	1	0	3	2
CO4	0	1	3	2	1

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation



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Faculty of Science and Technology

Department of Mathematics

Course Type: DSC-I

Course Title: Lab Course I (Based on DSC-I)

Course Code: 101MAT1103

Credits: 01

Max. Marks: 50

Lectures: 30Hrs.

Learning Objectives:

- LO 1. To know Set, Relations, and types of function
- LO 2. To know geometrically representation of Complex Numbers, Conjugates, and Roots using De-Moivre's Theorem
- LO 3. To determine Determinants, Co factor, Minor Adjoint of square Matrix.
- LO 4. To find Solutions to linear systems and to know Applications of Caley Hamilton theorem.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Sort out one-one, onto, into, many one types of functions
- CO 2. Represent complex numbers and perform algebraic operations.
- CO 3. Find and visualize the roots of a complex number
- CO 4. Execute elementary row and column operations to transform matrices into Row-Echelon form for analyzing the properties of linear systems.

Practical No.	List of Practical's	No. of Examples
1	Compute various equivalence classes for given relation	2
2	Find number of relations, functions, and their types.	2
3	Find inverse and composition of the functions.	2
4	Find Roots Using De Moivre's Theorem	2
5	Finding equation whose roots are given	2
6	Compute rank, row rank and column rank of matrix	2
7	Compute row Echelon form and reduced Echelon form of given matrix	2
8	Solve system of linear equations (Homogeneous and non-homogeneous).	2
9	Find eigen values and eigen vectors of given matrix.	2
10	Apply Caley Hamilton theorem	2

Learning Resources:

1. A Foundation Course in Mathematics, Ajit Kumar, S. Kumeresan and Bhaba Kumar Sarma, Reprint, Narosa Publication House 2018.
2. A text books of matrices , Shanti Narayan , Reprint , (S. Chand & Company Ltd) Ram Nagar, New Delhi (2010).
3. An Introduction to theory of numbers, I. Niven, H. Zuckerman, V.H.L. Montgomery, Fifth Edition, John Wiley & Sons(1991).
4. Elementary Number Theory, David M. Burton, Sixth Edition, Tata McGraw – Hill Publishing
Matrix & Linear Algebra , K.B. Datta, Prentice Hall India Pvt., Limited, 2004.
5. Theory and Problems of linear Algebra, Seymour Lipschutz, Third Edition , (Tata McGraw Hill) (2004).
6. Topics in Algebra , Om. P. Chug, K. Prakash, A.D. Gupta , First Edition , Anmol Pub. Pvt Ltd. New Delhi (2008).

Mapping of POs, PSOs and COs:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	2	0	1	2	1	0	0	1
CO2	3	2	1	1	1	1	1	2	0	1
CO3	3	2	1	2	1	1	2	0	0	1
CO4	3	2	2	3	2	3	1	0	2	2

Rajarshi Shahu Mahavidyalaya,

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	0	0	1
CO2	1	1	0	0	2
CO3	1	1	0	3	2
CO4	0	1	3	2	1

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation



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Faculty of Science and Technology

Department of Mathematics

UG I Sem I

Course Type: DSC-II

Course Title: Calculus

Course Code: 101MAT1102

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO1. To identify and explain the fundamental concepts of continuity, differentiability, and the conditions required for various Mean Value Theorems
- LO2. To calculate derivatives for complex functions (logarithmic, parametric) and evaluate limits of indeterminate forms using L'Hôpital's Rule
- LO3. To examine the behavior of functions by determining critical points, intervals of increase/decrease, and the nature of hyperbolic curves
- LO4. To justify the existence of specific points on a curve using Rolle's and Lagrange's theorems and discriminate between local maxima and minima

Course Outcomes:

After completion of the course, students will be able to-

- CO1. Apply logarithmic and parametric differentiation techniques to solve advanced rate-of-change problems.
- CO2. Analyze the properties of real-valued functions to prove they are "well-behaved" (continuous and smooth).
- CO3. Evaluate the validity of Mean Value Theorems for specific functions and find the extreme values (maxima/minima) of polynomial functions.
- CO4. Construct solutions for "impossible" indeterminate limits and trace the geometric expansion of functions using Taylor's and Maclaurin's theorems.

Unit No.	Title of Unit & Contents	Hrs.
I	Continuity and Differentiability	12
	1. Introduction 2. Continuity 3. Differentiability 4. Exponential and Logarithmic Functions 5. Logarithmic Differentiation 6. Derivatives of Functions in Parametric Forms	
	Unit Outcomes: UO 1. Determine the continuity and differentiability of complex functions to identify "well-behaved" properties across parametric and logarithmic forms.	

Unit No.	Title of Unit & Contents	Hrs.
	UO 2. Calculate the rate of change for functions involving exponential, logarithmic, and parametric variables using advanced differentiation techniques.	
II	Mean Value Theorems	10
	1. Rolle's Theorem, Lagrange's mean value theorem, 2. Meaning of sign of derivative, Graphs of hyperbolic functions. 3. Cauchy's mean value theorem. 4. Generalized mean value theorems, Examples on mean value theorems. Unit Outcomes: UO 1. Validate the existence of specific points where the instantaneous rate of change matches the average rate of change using Rolle's, Lagrange's, and Cauchy's Theorems. UO 2. Interpret the sign of derivatives to establish the increasing or decreasing behavior of hyperbolic functions for accurate graphical representation.	
III	Maxima and Minima	10
	1. Critical point of the function, Maximum value of a function; minimum value of a function 2. A necessary condition for extreme values, Sufficient condition for extreme value 3. Use of second order derivatives, Application to problems. Unit Outcomes: UO 1. Distinguish between the maximum and minimum values of a function by examining critical points and applying necessary and sufficient conditions. UO 2. Employ second-order derivatives to categorize extreme values and optimize mathematical models in practical applications.	
IV	Indeterminate Forms	10
	1. The indeterminate form $\frac{0}{0}$, The indeterminate form $\frac{\infty}{\infty}$ 2. The indeterminate form $0 \cdot \infty$, The indeterminate form $\infty - \infty$ 3. The indeterminate form $0^0, 1^\infty, \infty^0$ Unit Outcomes: UO 1. Evaluate limits of "impossible" fractions and expressions, such as $0/0$ and ∞/∞ , by applying L'Hôpital's Rule or algebraic transformations. UO 2. Predict the convergence or divergence of complex expressions to determine if they stabilize at a constant, collapse to zero, or reach infinity.	

Learning Resources:

1. Calculus, Schaum's outline series, Ayres F, Sixth Edition, Mc Graw Hill, (2013).
2. Differential Calculus, Shanti Narayan, Tenth Edition, S. Chand and Co. Ltd.(1962).
3. Differential Calculus, Shanti Narayan and Dr. P. K. Mittal, Revised Edition, S. Chand and Co. Ltd.2012 (Reprint 2014)
4. Differential calculus for beginners, Joseph Edwards, Arihant publication India limited (2023).
5. Golden Differential Calculus, N. Bali, Laxmi Publication Pvt Ltd.(2012).
6. Text book on Differential Calculus, Gorakh Prasad, Nineteenth Edition , Pothishala Private limited Allahabad(2022).
7. Theory and Problems on Advance Calculus, Murray and R Spiegel. Second Edition, Schaum Pub. Co. New York (1963).

Internal Examination Pattern:

CAT – I: Written Theory Test (Based on Unit -I)

CAT – II Assignments PYQ's on IIT-JAM/NET/SET/GATE/NBHM/ Related Competitive Examinations and Seminar by Student on it (Based on Unit-I, II)

Mapping of POs, PSOs and COs:

COs / POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	1	1	2	1	1	0	2	1
CO2	3	1	3	0	1	1	1	1	0	1
CO3	3	2	3	2	2	1	1	0	1	1
CO4	3	2	2	2	2	2	1	2	0	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	0	1	2
CO2	3	2	1	1	2
CO3	2	3	0	1	3
CO4	2	3	2	2	3

Scale : 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.



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Empowered Autonomous Institution

Faculty of Science and Technology

Department of Mathematics

UG I Sem I

Course Type: DSC-II

Course Title: Lab Course – II (Based on DSC-II)

Course Code: 101MAT1104

Credits: 01

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives:

- LO 1. To identify and explain the fundamental concepts of continuity, differentiability, and the conditions required for various Mean Value Theorems
- LO 2. To calculate derivatives for complex functions (logarithmic, parametric) and evaluate limits of indeterminate forms using L'Hôpital's Rule
- LO 3. To examine the behavior of functions by determining critical points, intervals of increase/decrease, and the nature of hyperbolic curves
- LO 4. To justify the existence of specific points on a curve using Rolle's and Lagrange's theorems and discriminate between local maxima and minima

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Apply logarithmic and parametric differentiation techniques to solve advanced rate-of-change problems.
- CO 2. Analyze the properties of real-valued functions to prove they are "well-behaved" (continuous and smooth).
- CO 3. Evaluate the validity of Mean Value Theorems for specific functions and find the extreme values (maxima/minima) of polynomial functions.
- CO 4. Construct solutions for "impossible" indeterminate limits and trace the geometric expansion of functions using Taylor's and Maclaurin's theorems.

Practical No.	List of Practicals	No. of Examples
1	To solve the problems based on Continuity	2
2	To solve the problems based on Differentiability	2
3	To solve problems on Exponential and Logarithmic Functions	2
4	To discuss the applicability of Rolle's Theorem	2
5	To Discuss the applicability Lagrange's Theorem	2
6	To Discuss the applicability Cauchy's mean value theorem	2

7	To Discuss the applicability Generalized mean value theorems.	2
8	To find extreme values of polynomial functions	2
9	To solve problems based on computation of extreme values of areas and volumes.	2
10	To apply L' Hospital's Rule to various indeterminate forms.	2

Learning Resources:

1. Calculus, Schaum's outline series, Ayres F, Sixth Edition, Mc Graw Hill, (2013).
2. Differential Calculus , Shanti Narayan , Tenth Edition, S. Chand and Co. Ltd.(1962).
3. Differential Calculus , Shanti Narayan and Dr. P. K. Mittal , Revised Edition , S. Chand and Co. Ltd.2012 (Reprint 2014)
4. Differential calculus for beginners, Joseph Edwards, Arihant publication India limited(2023).
5. Golden Differential Calculus, N. Bali , Laxmi Publication Pvt Ltd.(2012).
6. Text book on Differential Calculus, Gorakh Prasad, Nineteenth Edition , Pothishala Private limited Allahabad(2022).
7. Theory and Problems on Advance Calculus, Murray and R Spiegel. Second Edition, Schaum Pub. Co. New York (1963).

Mapping of POs, PSOs and COs:

COs / POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	1	1	2	1	1	0	0	1
CO2	3	1	3	0	1	1	1	2	1	1
CO3	3	2	3	2	2	1	1	0	2	1
CO4	3	2	2	2	2	2	1	1	0	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	0	1	2
CO2	3	2	1	1	2
CO3	2	3	0	1	3
CO4	2	3	2	2	3

Scale: 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.



Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science and Technology

Department of Mathematics

UG I Sem I

Course Type: VSC-I

Course Title: Introduction to MATLAB

Course Code: 101MAT1501

Credits: 02

Max. Marks: 50

Lectures: 30 Hrs.

Learning Objectives

- LO1. To know MATLAB programming language.
- LO2. To assign and manage variables.
- LO3. To create function input validation.
- LO4. To generate linearly spaced vectors.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Describe the MATLAB Environment and Programming Fundamentals
- CO 2. Construct Script and Function Files for Mathematical Tasks
- CO 3. Execute Matrix and Array Operations for Data Processing
- CO 4. Compute Linear Algebra Parameters using Built-in Functions

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to MATLAB	08
	1. MATLAB Programming language 2. Built-in Functions 3. Graphics, computations, External interface, and Tool boxes 4. MATLAB windows, desktop, command window, workspace, Figure and Editor Windows 5. Input-output 6. File types. 7. Platform dependence. 8. Printing	

	<p>Unit Outcomes:</p> <p>UO 1. Apply MATLAB for elementary number theory problems.</p> <p>UO 2. Able to differentiate function file and structure of function file.</p>	
II	Programming in MATLAB	07
	<ol style="list-style-type: none"> 1. Scripts and functions 2. Script files, function files 3. Executing of function 4. Writing good functions 5. Sub functions 6. Compiled functions 	
	<p>Unit Outcome:</p> <p>UO 1. Recognize different types of functions.</p>	
III	Matrix as array	07
	<ol style="list-style-type: none"> 1. Matrices and Vectors 2. Input, indexing, matrix manipulation 3. Creating vectors 4. Matrix and Array operations 5. Arithmetic operations 6. Relational operations 7. Logical operations 	
	<p>Unit Outcome:</p> <p>UO 1. Recognize vectors operations and solve problems based on matrix.</p>	
IV	Linear Algebra and MATLAB	08
	<ol style="list-style-type: none"> 1. Elementary math functions, 2. Matrix functions, 3. Character string. 4. Finding the determinant, rank, inverse of matrix. 5. Solving Linear system of equations and computation of row reduced echelon form 6. Finding eigenvalues and eigenvectors. 	
	<p>Unit Outcome:</p> <p>UO 1. Perform matrix based operations such as rank, eigen value, eigen function and system of linear equations.</p>	

Learning Resources:

1. Getting Started with MATLAB 7 by Rudra Pratap, Oxford University Press (For MATLAB User)(2005).
2. <https://nptel.ac.in/courses/103106118>
3. https://spoken-tutorial.org/tutorialsearch/?search_foss=Scilab&search_language=Englis
4. MATLAB An introduction with applications by Amos Gilat , Fourth Edition , Wiley publication (2012).
5. Suggested digital platform: NPTEL/SWAYAM/MOOCs
6. Understanding Matlab A Textbook For Beginners by , S S Alam , S N Alam, Zeroth Edition , I K International Publishing House (2007).

Internal Examination Pattern:

CAT – I: MATLAB command based Poster/Project application oriented.

CAT – II Written Practical Test (Based on Unit-I, II)

Practical No.	List of Practical's based on VSC-I	No. of Practical's
1	Environment Exploration: Introduction to MATLAB Desktop, Command Window, Workspace, and basic I/O operations.	2
2	Number Theory Applications: Implementation of basic MATLAB commands to solve elementary number theory problems.	2
3	Built-in Functions: Working with elementary built-in math functions and managing different file types (.m, .mat).	2
4	Script Development: Creating and executing script files for automated mathematical computations.	2
5	Function Engineering: Writing user-defined function files with single and multiple input/output variables.	2
6	Advanced Functions: Implementation of sub-functions and understanding variable scope within MATLAB programs.	2
7	Vector Operations: Creating linearly spaced vectors and performing basic indexing and manipulation.	2
8	Matrix Arithmetic: Execution of addition, subtraction, and multiplication (element-wise vs. matrix-wise).	2
9	Relational & Logical Testing: Using relational and logical operators to filter and manipulate array data.	2
10	Matrix Properties: Finding the determinant, rank, and inverse of square and rectangular matrices.	2
11	System of Equations: Solving linear systems using the Row Reduced Echelon Form (RREF) method.	2
12	Spectral Analysis: Computing Eigenvalues and Eigenvectors for various matrix transformations.	2



Semester - II

॥ आरुह तडसु ऑऑतलः ॥

Rajarshi Shahu Mahavidyalaya,
Latur (Autonomous)



Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science and Technology

Department of Mathematics

UG I Sem II

Course Type: DSC-III

Course Title: Analytical Geometry

Course Code: 101MAT2101

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To explain the concepts of coordinate transformations and equations of geometrical entities in two and three dimensions.
- LO 2. To illustrate the geometrical representation of lines, planes, and conic sections using standard forms.
- LO 3. To classify various geometrical structures such as conics, spheres, cones, and cylinders based on their properties and equations.
- LO 4. To demonstrate the interrelationship between different geometrical entities through graphical and algebraic representation.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Explain concepts of analytical geometry in two and three dimensions.
- CO 2. Illustrate geometrical interpretations of lines, planes, and conic sections.
- CO 3. Classify different geometrical forms such as conics, spheres, cones, and cylinders based on their equations.
- CO 4. Demonstrate relationships between geometrical entities using standard equations and transformations.

Unit No.	Title of Unit & Contents	Hrs.
I	Analytical Geometry of Two Dimensions	11
	1. Change of axes: translation and rotation. 2. Conic Sections: General equation of second degree in two variables. 3. Reduction to standard form. Centre of conic. 4. Nature of conic.	

	<p>Unit Outcomes:</p> <p>UO1: Explain the transformation of axes including translation and rotation.</p> <p>UO2: Identify the nature and standard forms of conic sections.</p>	
II	The Plane	11
	<ol style="list-style-type: none"> 1. The plane: First degree equation, converse. 2. Transformation to normal form. 3. Plane under given condition. 4. System of planes, length of perpendicular from a point 	
	<p>Unit Outcomes:</p> <p>UO1: Describe the different forms of the equation of a plane.</p> <p>UO2: Illustrate conditions related to planes such as normal form and system of planes.</p>	
III	The Right Line	11
	<ol style="list-style-type: none"> 1. Right line: equation of line, line through a point and given direction. 2. Line through two points, Angle between line and plane 3. Conditions to lie in plane, coplanar lines. 4. Number of constants in equation of line, shortest distance 	
	<p>Unit Outcomes:</p> <p>UO1: Explain various forms of equations of a line in space.</p> <p>UO2: Describe relationships between lines and planes including positional conditions.</p>	
IV	Sphere, Cones and Cylinder	12
	<ol style="list-style-type: none"> 1. The sphere: Equation of a sphere, general equation. 2. Plane section of sphere, intersection of two sphere. 3. Sphere with given diameter, equations of a circle. Sphere through given circle, intersection of a sphere and a line, equation of tangent plane. 4. Angle between two spheres, conditions of orthogonality 5. Cones and Cylinders: Cone, equation of cone, right circular cone and equation, Cylinder, and its equation. 	
	<p>Unit Outcomes:</p> <p>UO1: Explain equations and properties of spheres and their intersections.</p> <p>UO2: Classify cones and cylinders based on their standard equations.</p>	

Learning Resources:

1. A text book of Analytical Geometry of three dimensions, By P. K Jain and Khalil Ahmed, (Wiley Eastern Ltd, 1999.)
2. Analytical Geometry of Two and Three Dimensions, Qazi Zameeruddin;(Narosa Publ.)
3. Analytical Solid Geometry by Shantinakaran.
4. Analytical Solid Geometry, By Shanti Narayan, S. Chand and Co.
5. Lectures on Vector Analysis and Geometry, By T.M. Karade and M.S. Bendre.
6. Text Book on Coordinate Geometry, By Gorakh Prasad, H.C. Gupta. Pothishala Pvt. Ltd.

Internal Examination Pattern:

CAT – I Written Theory Test (Based on Unit -I)

CAT – II Assignments PYQ's on IIT-JAM/NET/SET/GATE/NBHM/ Related Competitive Examinations and Seminar by Student on it (Based on Unit-I, II)

Mapping of POs, PSOs and COs:

COs / POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	0	1	0	1	2	0	1
CO2	3	2	2	1	2	1	2	0	0	1
CO3	1	2	0	1	1	1	0	1	1	1
CO4	3	2	2	1	2	1	1	0	0	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	1	0	2	0
CO2	3	0	1	2	1
CO3	3	2	0	1	2
CO4	3	0	2	2	0

Scale : 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.



Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science and Technology

Department of Mathematics

UG I Sem II

Course Type: DSC-III

Course Title: Lab Course III

Course Code: 101MAT2103

Credits: 01

Max. Marks: 50

Lectures: 30Hrs.

Learning Objectives:

- LO 1. To explain the concepts of coordinate transformations and equations of geometrical entities in two and three dimensions.
- LO 2. To illustrate the geometrical representation of lines, planes, and conic sections using standard forms.
- LO 3. To classify various geometrical structures such as conics, spheres, cones, and cylinders based on their properties and equations.
- LO 4. To demonstrate the interrelationship between different geometrical entities through graphical and algebraic representation.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Explain concepts of analytical geometry in two and three dimensions.
- CO 2. Illustrate geometrical interpretations of lines, planes, and conic sections.
- CO 3. Classify different geometrical forms such as conics, spheres, cones, and cylinders based on their equations.
- CO 4. Demonstrate relationships between geometrical entities using standard equations and transformations.

Practical No.	List of Practical's based on DSC-III	No. of Examples
1	To solve Examples on Shifting of origin	2
2	To Solve examples on rotation of Axis.	2
3	To Discuss nature of Conics in two variables of degree 2	2
4	To compute center of Conics	2
5	To find normal form of Plane	2

6	To find Length of perpendicular from point to a plane	2
7	To Compute angle between line and Plane.	2
8	To Find Equation of line joining two points	2
9	To study general equation Sphere and its intersections with planes and Sphere.	2
10	To compute angle between two Sphere	2

Learning Resources:

1. A text book of Analytical Geometry of three dimensions, By P. K Jain and Khalil Ahmed, (Wiley Eastern Ltd, 1999.)
2. Analytical Geometry of Two and Three Dimensions, Qazi Zameeruddin;(Narosa Publ.)
3. Analytical Solid Geometry by Shantinayakan
4. Analytical Solid Geometry, By Shanti Narayan, S. Chand and Co.
5. Lectures on Vector Analysis and Geometry, By T.M. Karade and M.S. Bendre.
6. Text Book on Coordinate Geometry, By Gorakh Prasad, H.C. Gupta. Pothishala Pvt. Ltd.

Mapping of POs, PSOs and COs:

COs / POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	1	0	1	0	1	1	0	1
CO2	3	2	2	1	2	1	2	2	2	1
CO3	1	2	0	1	1	1	0	0	1	1
CO4	3	2	2	1	2	1	1	0	0	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	0	0	2	2
CO2	3	0	1	2	1
CO3	3	1	0	1	0
CO4	3	2	2	2	0

Scale : 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.



Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science and Technology

Department of Mathematics

UG I Sem II

Course Type: DSC-IV

Course Title: Integral Calculus

Course Code: 101MAT2102

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives

- LO 1. To explain the concept of integral as a limit of sum and the fundamental theorems of integral calculus.
- LO 2. To illustrate the properties and interrelationship of Beta and Gamma functions.
- LO 3. To demonstrate methods of evaluating multiple integrals and transformation of variables.
- LO 4. To apply integration concepts in determining geometrical quantities such as area, length, and volume.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Explain the concept of integral as a limit of sum and describe fundamental theorems of integral calculus.
- CO 2. Illustrate the properties and relationships of Beta and Gamma functions.
- CO 3. Demonstrate methods of multiple integrals and change of variables in different coordinate systems.
- CO 4. Apply concepts of integration to determine geometrical quantities such as area, length, and volume.

Unit No.	Title of Unit & Contents	Hrs.
I	Integral as limit of Sum:	12
	1. Integral as a limit of sum. 2. Properties of Definite integrals. 3. Fundamental theorem of integral calculus. 4. Summation of series by integration. 5. Infinite integrals. 6. Differentiation and integration under the integral sign.	

	<p>Unit Outcomes:</p> <p>UO1: Explain the concept of definite integral as a limit of sum and its properties.</p> <p>UO2: Describe fundamental theorem of integral calculus and related concepts such as infinite integrals and differentiation under the integral sign.</p>	
II	Beta and Gamma Functions:	11
	<ol style="list-style-type: none"> Beta function, Properties and various forms. Gamma function, Recurrence formula and other relations. Relation between Beta and Gamma function Evaluation of integrals using Beta and Gamma functions. 	
	<p>Unit Outcomes:</p> <p>UO1: Explain Beta function and its various forms and properties.</p> <p>UO2: Describe Gamma function and illustrate its relationship with Beta function.</p>	
III	Multiple Integral:	11
	<ol style="list-style-type: none"> Double integrals, Repeated integrals. Evaluation of Double integrals. Double integral in polar coordinates Change of variables, Change of order of integration in Double integrals Triple integrals, Evaluation of Triple integrals, Dirichlet's theorem 	
	<p>Unit Outcomes:</p> <p>UO1: Explain the concept of double and triple integrals in different coordinate systems.</p> <p>UO2: Demonstrate change of order and change of variables in multiple integrals.</p>	
IV	Applications of Multiple Integral:	11
	<ol style="list-style-type: none"> Area bounded by curves (quadrature). Rectification (length of curves) Volumes and Surfaces of Solids of revolution. 	
	<p>Unit Outcomes:</p> <p>UO1: Apply integration concepts to determine area and length of curves.</p> <p>UO2: Apply integration techniques to determine volumes and surfaces of solids of revolution.</p>	

Learning Resources:

- G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010
- Gorakh Prasad, Chandrika Prasad, Text Book on Integral Calculus 2002

3. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc. 2007
4. Shanti Narayan, P.K. Mittal, Integral Calculus, S.Chand 2005
5. Suggested digital platform: NPTEL/SWAYAM/MOOCs
6. T.M. Apostol, Calculus Vol. I, John Wiley & Sons Inc., 1974

Internal Examination Pattern:

CAT – I Written Theory Test (Based on Unit -I)

CAT – II Assignments PYQ’s on IIT-JAM/NET/SET/GATE/NBHM/ Related

Competitive Examinations and Seminar by Student on it (Based on Unit-I, II)

Mapping of POs, PSOs and COs:

COs / POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	0	1	1	1	1	0	1
CO2	3	2	2	0	1	1	1	0	2	1
CO3	3	2	2	2	2	2	1	2	0	1
CO4	3	3	2	1	3	1	1	0	1	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	0	1	3
CO2	1	3	0	1	2
CO3	2	3	2	2	3
CO4	3	3	0	3	3

Scale : 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.



Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science and Technology

Department of Mathematics

UG I Sem II

Course Type: DSC-IV

Course Title: Lab Course IV

Course Code: 101MAT2102

Credits: 01

Max. Marks: 50

Lectures: 30Hrs.

Learning Objectives

- LO 1. To explain the concept of integral as a limit of sum and the fundamental theorems of integral calculus.
- LO 2. To illustrate the properties and interrelationship of Beta and Gamma functions.
- LO 3. To demonstrate methods of evaluating multiple integrals and transformation of variables.
- LO 4. To apply integration concepts in determining geometrical quantities such as area, length, and volume.

Course Outcomes:

After completion of the course, students will be able to:

- CO 1. Explain the concept of integral as a limit of sum and describe fundamental theorems of integral calculus.
- CO 2. Illustrate the properties and relationships of Beta and Gamma functions.
- CO 3. Demonstrate methods of multiple integrals and change of variables in different coordinate systems.
- CO 4. Apply concepts of integration to determine geometrical quantities such as area, length, and volume.

Practical No.	List of Practical's based on DSC-IV	No. of Examples
1	To solve integration as limit of sum.	2
2	To Apply Fundamental theorem of integral calculus	2
3	To solve examples on various forms of Beta function	2
4	To Evaluate integrals using Beta and Gamma Functions	2

5	To evaluate double integrals when limits given.	2
6	To evaluate double integral using change of coordinates.	2
7	To evaluate triple integral	2
8	To apply Dirichlet's theorem.	2
9	To compute area bounded by curve and find length of curves.	2
10	To calculate Volumes and Surfaces areas of solids of revolution	2

Learning Resources:

- 1) G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010
- 2) Gorakh Prasad, Chandrika Prasad, Text Book on Integral Calculus 2002
- 3) H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc. 2007
- 4) Shanti Narayan, P.K. Mittal, Integral Calculus, S.Chand 2005
- 5) Suggested digital platform: NPTEL/SWAYAM/MOOCs
- 6) T.M. Apostol, Calculus Vol. I, John Wiley & Sons Inc., 1974

Mapping of POs, PSOs and COs:

COs / POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	1	3	0	1	1	1	1	0	1
CO2	3	2	2	0	1	1	1	0	2	1
CO3	3	2	2	2	2	2	1	2	1	1
CO4	3	3	2	1	3	1	1	0	0	1

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	0	1	3
CO2	1	3	0	1	2
CO3	2	3	2	2	3
CO4	3	3	0	3	3

Scale : 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation.



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Faculty of Science and Technology

Department of Mathematics

UG I Sem II

Course Type: VSC-II

Course Title: Programming with MATLAB

Course Code: 101MAT2501

Credits: 02

Max. Marks: 50

Lectures: 30Hrs.

Learning Objectives:

- LO1. To know MATLAB programming language.
- LO2. To define user defined functions.
- LO3. To plot 2-D, 3-D plots.
- LO4. To apply software for problem solving in Calculus

Course Outcomes:

After completion of the course, students will be able to-

- CO1. Employ relational and logical operators alongside conditional statements—including if-else and switch-case—and looping structures to control the execution flow of programs.
- CO2. Formulate custom function files by utilizing local and global variables to create reusable, structured, and efficient code for complex programming tasks.
- CO3. Construct 2-D and 3-D plots, including histograms, polar plots, and surface meshes, while applying appropriate labels and legends to interpret data visually.
- CO4. Compute limits, derivatives, and integrals through software-based function declarations to perform symbolic and numerical mathematical analysis.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to MATLAB	08
	1. MATLAB Programming language	
	2. Built-in Functions	
	3. Graphics, computations, External interface, and Tool boxes	
	4. MATLAB windows, desktop, command window, workspace, Figure and Editor Windows	
	5. Input-output	
	6. File types.	
	7. Platform dependence.	
	8. Printing	

	<p>Unit Outcomes:</p> <p>UO 1. Develop logical algorithms by implementing conditional structures (if-else, switch-case) and iterative loops (for, while) to automate decision-making processes.</p> <p>UO 2. Demonstrate the use of relational and logical operators to control the execution flow and data filtering within a MATLAB script.</p>	
II	Programming in MATLAB	07
	<ol style="list-style-type: none"> 1. Scripts and functions 2. Script files, function files 3. Executing of function 4. Writing good functions 5. Sub functions 6. Compiled functions 	
	<p>Unit Outcome:</p> <p>UO 1. Construct modular user-defined functions (UDFs) by organizing local and global variables to ensure efficient memory management and code reusability.</p> <p>UO 2. Compare the performance and scope of script files versus function files to determine the most effective structure for specific computational tasks.</p>	
III	Matrix as array	07
	<ol style="list-style-type: none"> 1. Matrices and Vectors 2. Input, indexing, matrix manipulation 3. Creating vectors 4. Matrix and Array operations 5. Arithmetic operations 6. Relational operations 7. Logical operations 	
	<p>Unit Outcome:</p> <p>UO 1. Generate multi-dimensional visualizations, including surface meshes and polar plots, to interpret and analyze the behavior of complex mathematical datasets.</p> <p>UO 2. Customize graphical outputs using labeling, legends, and the view command to produce professional-grade representations of function behavior.</p>	
IV	Linear Algebra and MATLAB	08

	<ol style="list-style-type: none"> 1. Elementary math functions, 2. Matrix functions, 3. Character string. 4. Finding the determinant, rank, inverse of matrix. 5. Solving Linear system of equations and computation of row reduced echelon form 6. Finding eigenvalues and eigenvectors. 	
	<p>Unit Outcome: UO 1. Compute symbolic and numerical limits, derivatives, and integrals through software declarations to evaluate the properties of continuous functions.</p>	

Learning Resources:

1. Amos Gilat ,MATLAB An introduction with applications Wiley India Edition 4th 2012(MATLAB User)
2. Getting Started with MATLAB 7 by Rudra Pratap, Oxford University Press (For MATLAB User)(2005).
3. MATLAB An introduction with applications by Amos Gilat , Fourth Edition , Wiley publication (2012).
4. Suggested digital platform:NPTEL/SWAYAM/MOOCs
<https://nptel.ac.in/courses/103106118>
5. Understanding Matlab A Textbook For Beginners by , S S Alam , S N Alam, Zeroth Edition , I K International Publishing House (2007).

CAT I: Short tests focusing on conceptual clarity (e.g., explaining the difference between a Script and a Function) based on Unit I.

CAT II: A "hands-on" exam where students are given a new mathematical problem (e.g., a specific integration or a 3D surface plot) and must write the code from scratch based on Unit I and

Practical No.	List of Practical's based on VSC-II	No. of Practical's
1	Logical Operations: Implementation of relational and logical operators for mathematical inequalities.	2
2	Decision Making: Programming with if-else-end and switch-case structures to solve conditional problems.	2
3	Looping Structures: Using for and while loops to generate sequences (e.g., Fibonacci) or series summations.	2

4	Function Files: Creating and calling basic User-Defined Functions (UDFs) for formula evaluation.	2
5	Variable Scope: Demonstration and comparison of Local vs. Global variables within function files.	2
6	Advanced UDFs: Developing multi-input/multi-output function files for geometric calculations.	2
7	Basic 2-D Visualization: Using plot and fplot commands with custom labels, legends, and line styles.	2
8	Statistical & Special Plots: Generating Histograms and Polar Plots for data representation.	2
9	3-D Surface Modeling: Creating Mesh and Surface plots with the view command for spatial visualization.	2
10	Limit Analysis: Evaluating general, left-hand, and right-hand limits of continuous and discontinuous functions.	2
11	Differential Calculus: Application of MATLAB commands to find derivatives of complex algebraic and trigonometric functions.	2
12	Integral Calculus: Solving problems involving definite and indefinite integrals using software tools.	2



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Extra Credit Activities

Sr. No.	Course Title	Credits	Hours T/P
1	MOOCs	Min. of 02 credits	Min. of 30 Hrs.
2	Certificate Courses	Min. of 02 credits	Min. of 30 Hrs.
3	IIT Spoken English Courses	Min. of 02 credits	Min. of 30 Hrs.

Guidelines:

Extra -academic activities

1. All extra credits claimed under this heading will require sufficient academic input/ contribution from the students concerned.
2. Maximum 04 extra credits in each academic year will be allotted.
3. These extra academic activity credits will not be considered for calculation of SGPA/CGPA but will be indicated on the grade card.

Additional Credits for Online Courses:

1. Courses only from SWAYAM and NPTEL platform are eligible for claiming credits.
2. Students should get the consent from the concerned subject Teacher/Mentor/Vice Principal and Principal prior to starting of the course.
3. Students who complete such online courses for additional credits will be examined/verified by the concerned mentor/internal faculty member before awarding credits.
4. Credit allotted to the course by SWAYAM and NPTEL platform will be considered as it is.

Additional Credits for Other Academic Activities:

1. One credit for presentation and publication of paper in International/National/State level seminars/workshops.
2. One credit for measurable research work undertaken and field trips amounting to 30 hours of recorded work.
3. One credit for creating models in sponsored exhibitions/other exhibits, which are approved by the concerned department.
4. One credit for any voluntary social service/Nation building exercise which is in collaboration with the outreach center, equivalent to 30 hours
5. All these credits must be approved by the College Committee.

Additional Credits for Certificate Courses:

1. Students can get additional credits (number of credits will depend on the course duration) from certificate courses offered by the college.
2. The student must successfully complete the course. These credits must be approved by the Course Coordinators.
3. Students who undertake summer projects/ internships/ training in institutions of repute through a national selection process, will get 2 credits for each such activity. This must be done under the supervision of the concerned faculty/mentor.

Note:

1. The respective documents should be submitted within 10 days after completion of Semester End Examination.
2. No credits can be granted for organizing or for serving as office bearers/ volunteers for Inter-Class / Associations / Sports / Social Service activities.
3. The office bearers and volunteers may be given a letter of appreciation by the respective staff coordinators. Besides, no credits can be claimed for any services/ activities conducted or attended within the college.
4. All claims for the credits by the students should be made and approved by the mentor in the same academic year of completing the activity.
5. Any grievances of denial/rejection of credits should be addressed to Additional Credits Coordinator in the same academic year.
6. Students having a shortage of additional credits at the end of the third year can meet the Additional Credits Coordinator, who will provide the right advice on the activities that can help them earn credits required for graduation.



Shiv Chhatrapati Shikshan Sanstha's
Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Examination Framework

Theory:

40% Continuous Assessment Tests (CATs) and 60% Semester End Examination (SEE)

Practical:

50% Continuous Assessment Tests (CATs) and 50% Semester End Examination (SEE)

Course	Marks	CAT & Mid Term Theory				CAT Practical		Best Scored CAT & Mid Term	SEE	Total
		Att.	CAT I	Mid Term	CAT II	Att.	CAT			
1	2	3				4		5	6	5 + 6
DSC/DSE/GE/OE/Minor	100	10	10	20	10	-	-	40	60	100
DSC	75	05	10	15	10	-	-	30	45	75
Lab Course/AIPC/OJT/FP/SEC (Science & Technology)	50	-	-	-	-	05	20	-	25	50
VSC/SEC/AEC/VEC/CC	50	05	05	10	05	-	-	20	30	50

Note:

1. All Internal Exams are compulsory
2. Out of 02 CATs best score will be considered
3. CAT-III Exam will be conducted by the Exam Section
4. CAT-III Exam is of Objective nature (MCQ)
5. Semester End Exam is of descriptive in nature (Long & Short Answer)
6. CAT Practical (20 Marks): Lab Journal (Record Book) 10 Marks, Overall Performance including attendance 10 Marks