

KRANTIGURU SHYAMJI KRISHNA VERMA

KACHCHH UNIVERSITY

Mundra Road

BHUJ : 370 001



**SYLLABUS (CBCS)
B. Sc. Semester I & 2**

MATHEMATICS

Semester-I

Code: MAT- 101 & MAT-101-P (4 credits, Major+Minor)

MAT – 102 & MAT -102-P (4 credits, Major)

Semester-II

Code: MAT- 201& MAT -201-P (4 credits, Major+Minor)

MAT - 202& MAT -202-P (4 credits, Major)

With effect from June 2023

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KSKV Kachchh University: BHUJ
B.Sc.: Semester: I (ONE) SUBJECT: MATHEMATICS
PAPER: Calculus & Theory of Matrices – I (MAT 101)
(For Major & Minor)(3 Credits)

Unit 1

Successive Differentiation: Successive derivatives, standard results (without proof) for n^{th} derivatives.

Method of finding n^{th} derivative of an Algebraic Rational Function.

Leibnitz's rule (statement) and its examples.

Unit 2

Theory of Matrices: Symmetric and skew-symmetric matrices, Orthogonal, Periodic, Idempotent, nilpotent and involuntary matrices.

Elementary row Operations on Matrices, Row-reduced echelon form of a matrix.

Inverse of a matrix by Adjoint method and row-reduced echelon form method.

Rank of a matrix.

Unit 3

Convergence and Divergence of Series of real numbers: Definitions of Convergence and divergence of real infinite series, Five Tests (Integral test, Comparison Test, Practical Comparison test, Ratio Test and Root Test – only examples for these tests).

Convergence of power series and radius of convergence, Absolute Convergence, Leibniz test for convergence of alternating series.

❖ **Reference Books:**

1. Differential Calculus – Shantinakaran
2. Matrix and Linear Algebra – K. B. Dutta
3. Calculus – T. M. Apostol
4. Theory of Matrices – Vatssa
5. Calculus – James Stewart- sixth edition

KSKV Kachchh University: BHUJ
B.Sc.: Semester: I (ONE) SUBJECT: MATHEMATICS
PAPER: Practical (MAT 101-P)
(For Major & Minor)(1 Credit)

Practical No.	Description
1	Perform Mathematical operations like Addition, Subtraction, Multiplication, Division and Power of natural numbers in MATLAB / SCILAB.
2	Perform Log_e , Log_{10} , Exponential, Trigonometric, Factorial in MATLAB / SCILAB.
3	Evaluate the value of given expression using MATLAB / SCILAB.
4	Evaluate the derivative of given function using MATLAB / SCILAB.
5	Evaluate $A+B$, $2A-3B$, $A^T + B^T$, A^{-1} for given Matrices using MATLAB / SCILAB.
6	Check given matrix is idempotent, nilpotent using MATLAB / SCILAB.
7	Draw the graph of given polynomial function in MATLAB / SCILAB.
8	Draw graph of $y = \log(ax+b)$ and $y = e^{(ax+b)}$ in MATLAB / SCILAB.

Note: The preferable and recommended software for above practical is MATLAB because it offers wide applications.

❖ **Reference books:**

1. An Introduction to Scilab-Satish Annigeri, December 2009
2. Scilab for very beginners-Scilab enterprises.

Note: This list is demonstrative and institute can apply necessary changes in content and design of practical as per the availability of infrastructure and need of the students and requirement of skills in the region.

Preferable Infrastructure Requirement: A well-equipped computer lab with MATLAB or equivalent.

Human resource requirement: A lab in-charge with good computer knowledge preferably PGDCA, BCA required for computer lab.

INTERNAL EVALUATION SCHEME:❖ **Theory:**

1.	Internal Continuous and Comprehensive Evaluation (CCE) will be conducted by the department.
2.	<p>CCE Marking Scheme for Theory:</p> <p>For each paper, CCE may be further distributed as under. This list is not exhaustive and new parameters can be added :</p> <ul style="list-style-type: none"> a) Unit Test / Internal Examination (MCQ or Descriptive) b) Seminar c) Assignments d) Attendance <p>The Department Head will be final authority for finalizing the distribution of internal evaluation marks in every semester.</p>

❖ **Practical:**

CCE Marking Scheme for Practical : Any one or more of the parameters from Lab Performance/ Lab attendance / Internal practical Test / Journal / Viva etc. can be used.

➤ **EXTERNAL (UNIVERSITY) EVALUATION SCHEME:**❖ **Theory Examination:**

There will be a written test of total 40 marks, having total 4 questions.

The Demonstrative Structure of the External Examination Question Paper

Question No.	Question type	Marks
1 (Unit 1)	Descriptive Questions (2 out of 3)	10
2 (Unit 2)	Descriptive Questions (2 out of 3)	10
3 (Unit 3)	Descriptive Questions (2 out of 3)	10
4 (Unit 1,2,3)	Descriptive question / Short questions	10

- The above paper scheme is demonstrative but not exhaustive. An examiner may apply necessary changes if felt necessary.
- Types of questions may be varied: like: one descriptive question/one line answers / two line answers / definitions / reasoning / derivations of equations / derivations of sums / drawing small figures etc.

❖ **Practical Examination:**

There will be a practical test of total 15 marks, having total 4 exercises.

The Demonstrative Structure of the External Examination Practical Paper

Exercises No.	Exercises	Marks
1	Based on Mathematical Exercise in SCILAB / MATLAB	4
2	Based on Graphical Exercise in SCILAB / MATLAB	4
3	Viva Voice/MCQ Exercise	4
4	Journal	3

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KSKV Kachchh University: BHUJ
B.Sc.: Semester: I (ONE) SUBJECT: MATHEMATICS
PAPER: Calculus & Theory of Matrices - II (MAT 102)
(Only for Major)(3 Credits)

Unit 1

Expansion of function using Taylor and Maclaurin Series, Expansion of e^x , $\sin x$, $\cos x$, $\log(1+x)$, $\log(1-x)$ and $(1+x)^n$.

Maxima and minima of a function of one variable using 1st derivative and 2nd derivative test.

Unit 2

Continuity and discontinuity of a function of one variable and Examples.

Indeterminate Forms: Examples using L' Hospital's rules for various indeterminate forms like $\frac{0}{0}$ form, $\frac{\infty}{\infty}$ form, $0 \cdot \infty$ form, $\infty - \infty$ form etc.

Unit 3

Complex matrix, Hermitian, Skew - Hermitian and Unitary matrices.

Solution of Linear equations and consistency: Gauss Elimination and Gauss Jordan Elimination. Solution of n linear equations in n unknown.

Solution of m linear equations in n unknowns with $m < n$ and $m > n$.

Homogeneous linear equations.

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2. Matrix and Linear Algebra – K. B. Dutta
3. Calculus – T. M. Apostol
4. Theory of Matrices – Vatssa
5. Calculus – James Stewart- sixth edition

KSKV Kachchh University: BHUJ
B.Sc.: Semester: I (ONE) SUBJECT: MATHEMATICS
PAPER: Practical (MAT 101-P)
(For Major & Minor)(1 Credit)

Practical No.	Description
1	Draw graph of $y = \sin(ax+b)$ and $\cos(ax+b)$ in MATLAB / SCILAB.
2	Draw graph of $y = \tan(ax+b)$ and $\cot(ax+b)$ in MATLAB / SCILAB.
3	Draw graph of $y = \operatorname{cosec}(ax+b)$ and $y = \sec(ax+b)$ in MATLAB / SCILAB.
4	Solve the system of equations in three and four variables in MATLAB / SCILAB.
5	Solve the system of equations in five variables in MATLAB / SCILAB.
6	If-elseif -else condition: To determine whether a number is +ve or -ve or zero
7	For loop and While loop: To find factorial of given number
8	Multiple plots of functions

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KSKV Kachchh University: BHUJ
B.Sc.: Semester: II (TWO) SUBJECT: MATHEMATICS
PAPER: Calculus & Differential Equations (MAT 201)
(For Major & Minor)(3 Credits)

Unit 1

Integrals: Reduction formula for definite integration of $\sin^n x$, $\cos^n x$, finite integration of $\sin^n x$, $\cos^n x$, $\sin^m x \cos^n x$ for non-negative integers m and n .

Beta and Gamma functions.

Unit 2

Differential Equations of first order and first degree : Only Examples of Separable variables, Homogeneous Differential Equations, Exact differential Equations, Linear Differential Equations, Bernoulli's Differential Equations, orthogonal trajectories.

Unit 3

Linear Differential Equations of higher order and degree one with constant coefficients (Only examples), Operator D , right of side of a differential equation having e^{ax} , $\sin ax$, $\cos ax$ and x^r for natural number r only), Method of variation of parameters.

❖ **Reference Books:**

1. Differential Calculus – Shantinakaran
2. Integral Calculus – Shanti Narayan
3. Calculus – T. M. Apostol
4. Higher Algebra – Bernard & Child.
5. Calculus – James Stewart- sixth edition

KSKV Kachchh University: BHUJ
B.Sc.: Semester: II (TWO) SUBJECT: MATHEMATICS
PAPER: Practical (MAT 201-P)
(For Major & Minor)(1 Credit)

Practical No.	Description
1	Draw the graph of circle with centre origin and also with centre (h,k) and radius r in MATLAB / SCILAB.
2	Draw the graph of parabola in MATLAB / SCILAB.
3	Solve the first order ordinary differential equation in MATLAB / SCILAB.
4	Solve the first order ordinary differential equation in MATLAB / SCILAB.
5	Draw the trajectory in MATLAB / SCILAB.
6	Draw the orthogonal trajectory in MATLAB / SCILAB.
7	Evaluate the value of integration in in MATLAB / SCILAB.
8	Evaluate the value of double integration in in MATLAB / SCILAB.

Note: The preferable and recommended software for above practical is MATLAB because it offers wide applications.

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2. Scilab for very beginners-Scilab enterprises.

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KSKV Kachchh University: BHUJ
B.Sc.: Semester: II (TWO) SUBJECT: MATHEMATICS
PAPER: Calculus & Theory of Equations (MAT 102)
(Only for Major)(3 Credits)

Unit 1

Introduction to Mean value theorems, Rolle's mean value theorem, Lagrange's mean value theorem, Cauchy's mean value theorem (Only statements of theorems) and its examples.

Unit 2

Introduction of Double integrals, Evaluation of double integrals, Properties of double integrals.

Introduction of Triple integrals, Evaluation of triple integrals, Properties of triple integrals.

Unit 3

Theory of Equations: Relations between the roots and the coefficients of a polynomial equation in one variable.

Transformation of equations.

Solutions of cubic equation, Cardan's Method.

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2. Integral Calculus – Shanti Narayan
3. Calculus – T. M. Apostol
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KSKV Kachchh University: BHUJ
B.Sc.: Semester: II (TWO) SUBJECT: MATHEMATICS
PAPER: Practical (MAT 201-P)
(Only for Major)(1 Credit)

Practical No.	Description
1	Evaluate roots from given polynomial and evaluate polynomial from given roots in MATLAB / SCILAB.
2	Evaluate the value of triple integration in in MATLAB / SCILAB.
3	Evaluate the value of triple integration in in MATLAB / SCILAB.
4	Draw the graph of Ellipse in MATLAB / SCILAB.
5	Draw the graph of Hyperbola in MATLAB / SCILAB.
6	Draw 2D graph form given function.
7	Draw 3D graph form given function.
8	Draw 3D graph form given function.

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