SAURASHTRA UNIVERSITY
RAJKOT.

Syllabus of B.Sc. Semester-1
According to Choice Based Credit System
Effective from June – 2019

(Updated on date:- 06-04-2019
and updation implemented from June - 2019)

• Program:	**B.Sc.**
• Semester:	**1**
• Subject:	**Mathematics**
• Paper No:	**01 (A) - Theory**
• Title of the course	**Calculus.**
• Marks for External Examination:	**(Short Questions) → 20 Marks** **(Descriptive type) → 50 Marks** **Total Marks → 70 Marks**
• Marks for Internal Examination:	**Assignments → 30 Marks or Test**
• Credit Of The Course	**4 Credits**

B.Sc. SEMESTER -1
MATHEMATICS PAPER 01 (A) - Theory
CALCULUS

UNIT 1: **[14 MARKS]**

(a) Mean value theorems:

Roll's theorem and problems related to it, Lagrange's mean value theorem and problems related to it, Cauchy's mean value theorem and problems related to it.Geometric representation of Roll's theorem,Lagrange's theorem and Cauchy's theorem

(b) Taylor's theorem, expansions and indeterminate forms:

Taylor's theorem (Without proof), Maclaurin's theorem (Without proof), Taylor's and Maclaurin's infinite series expansions, expansions of e^x, $\sin x$, $\cos x$, $(1+x)^n$, $\log(1+x)$ under proper conditions.

Course is roughly covered by the reference book no (1) chapter 6 and chapter no 8 Sections 8.1 to 8.5.

UNIT 2: **[14 MARKS]**

(a) Indeterminate Forms:

La' hospital's rules for various indeterminate forms (Without proof).Various indeterminate forms like $\frac{0}{0}$ form, $\frac{\infty}{\infty}$ form, $0.\infty$ form, $\infty-\infty$ form, 0^0 form, ∞^0 form.

(b) **Differential Equations of First Order and First Degree:**

Definition and method of solving of Differential Equation of the form Variable separable, Homogeneous Differential Equation and **Linear differential equations** of first order and first degree.

Course is roughly covered by the reference book no (1) chapter 10.
Course is roughly covered by the reference book no (3) chapter 11 section 11.1 to 11.4 and section 11.6 and section 11.7.

UNIT 3: **[14 MARKS]**

(a) Differential Equations of First Order and First Degree(continue):

Definition and method of solving of **Bernoulli's** differential equation and Definition and methods of solving of **Exact** differential equation.

Differential equations of first order and higher degree:

(b) Differential equations of first order and first degree solvable for x, solvable for y, solvable for p. Clairaut's form of differential equation and Lagrange's form of differential equations.

Course is roughly covered by the reference book no (3) chapter 11 section 11.5, 11.8 and 11.9 Chapter 12 section 12.1 to 12.5

UNIT 4: **[14 MARKS]**

Linear differential equations of higher order

Linear differential equations of higher order **with constant coefficients.** Operator D, Meaning of auxiliary equation, Roots of auxiliary equation and solution of auxiliary equation f(D)y = 0 for real roots and complex roots, Operator $^1/_D$. Solution of differential equations of the type f(D)y = X. Meaning of complimentary function(C.F.) and Particular integral(P.I.). Methods to obtain Particular integral (P.I.) when X = e^{ax}, X = sin(ax+b), X = cos(ax+b), X = x^m , X = $e^{ax}\cdot V$

Course is roughly covered by the reference book no (3) chapter 14 section 14.1 to , 14.91.

UNIT 5: **[14 MARKS]**

Linear Differential Equations with Variable Coefficients.

The homogeneous linear equation First method of solution, Second method of solution, method to find complementary function, method to find the particular integral, The symbolic function $f(\theta)$ and $\frac{1}{f(\theta)}$ Integral corresponding to a term of the form x^{α} in the second member.

Course is roughly covered by the reference book no (5) chapter 7 section 65 to 69.

Notes:

- There shall be **SIX** periods of 55 minutes per week for Mathematics- **01 (A)-Theory.**
- There shall be one question paper of 70 marks & $2\frac{1}{2}$ hours for Mathematics- **01(A)-Theory**

Format of Question Paper

- There shall be FIVE questions from each unit of 14 marks each.
- Each Question will be of the following form.

Question	(A)	Answer any four out of four (Short answer type question)	4 Marks
	(B)	Answer any one out of two	2 Marks
	(C)	Answer any one out of two	3 Marks
	(D)	Answer any one out of two	5 Marks
		TOTAL	**14 MARKS**

Reference Books :

(1) Differential Calculus by Shanti Narayan and P K Mittal
(2) Differential Calculus by Gorakh Prasad
(3) Integral Calculus by Shanti Narayan
(4) Integral Calculus by Gorakh Prasad
(5) Differential Equations by D. A. Murray
(6) A Text book of Calculus, S. C. Arora and Ramesh Kumar, Pitamber Publishing Company Ltd. Delhi.
(7) Calculus: Concept and Context, Second edition, By James Stewart Pitamber Publishing Company Ltd. Delhi.
(8) Calculus, By G. B. Thomas and R. L. Finney, Pearson Education, 2007.

B.Sc. SEMESTER -1
MATHEMATICS PAPER 01 (A) - Theory
CALCULUS

OBJECTIVES:

Students will

- understand mean value theorems and indeterminate forms.
- acquire knowledge of linear differential equations.
- solve problems of mean value theorems, indeterminate forms, linear differential equations.

COURSE OUTCOMES:

Students will be able to-

- prove the mean value theorems.
- solve problem of based on mean value theorem.
- recall Taylor's theorem, Maclaurin's theorem without proof for expansion.
- expand e^x, $sinx$, $cosx$, $(1+x)^n$, $log(1+x)$ under proper condition.
- understand and use La' Hospital's rules for various indeterminate forms
- use the definition and method of solving of differential equation of the form Variable
- separable, homogeneous differential equation and Linear differential equations of
- first order and first degree.
- solve differential equations of first order and first degree solvable for x, solvable for y, solvable for p. Clairaut's form of differential equation and Lagrange's form of differential equations.
- solve linear differential equations of higher order with constant coefficients and variable coefficients.

SAURASHTRA UNIVERSITY
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Syllabus of B.Sc. Semester-1
According to Choice Based Credit System
Effective from June – 2019

(Updated on date:- 06-04-2019
and updation implemented from June - 2019)

• Programme:	**B.Sc.**
• Semester:	**1**
• Subject:	**Mathematics**
• Paper No:	**01(B) (Practical)**
• Title of Course:	**Mathematics Practical**
• Total Marks of External Practical Examination:	**35 Marks**
• Total Marks of Internal Practical Examination:	**15 Marks** **Continuous internal assessment of practical work**
• Total Marks of Practical Examination:	**External → 35 Marks** **Internal → 15 Marks** **Total → 50 Marks**
• Credit Of The Course	**3 Credits**

SAURASHTRA UNIVERSITY, RAJKOT.

B.Sc. SEMESTER - 1 (CBCS)

MATHEMATICS PAPER- 01(B) (Practical)

Mathematics Practical

[50 Marks / 3Hours]

Practical No . (1) Draw the graph of y =sinx or y = cosx or y =tanx.

Practical No . (2) Draw the graph of y =secx or y = cosecx or y =cot x.

Practical No . (3) Draw the graph of $y = \sin^{-1}x$ or $y = \cos^{-1}x$ or $y = \tan^{-1}x$.

Practical No . (4) Draw the graph of $y = \sec^{-1}x$ or $y = \text{cosec}^{-1}x$ or $y = \cot^{-1}x$.

Practical No . (5) Successive differentiation

Find n^{th} derivative of $y = \frac{x}{x^2 + a^2}$ or similar type of example.

Practical No . (6) Show that the n^{th} derivative of $y = \tan^{-1} x$ is

$$y_n = (-1)^{n-1} .(n - 1)![\sin\{n(\frac{\pi}{2} - y)\} sin^n(\frac{\pi}{2} - y)]$$

or similar type of example.

Practical No . (7) If $y = \sin mx + \cos mx$ then show that $y_n = m^n \sqrt{1 + (-1)^n \sin 2mx}$

or similar type of example.

Practical No. (8) Use reduction formula to evaluate following

(1) $\int \sin^6 x dx$, (2) $\int \cos^7 x dx$ and (3) $\int \sin^4 x \cos^4 x dx$

or similar type of example.

Practical No . (9) Use reduction formula to evaluate following

(1) $\int_0^{2a} x^2\sqrt{2ax - x^2}\,dx$, (2) $\int_0^{\infty} \frac{x^2}{(1+x^2)^{9/2}}\,dx$, (3) $\int_0^{a} x^4(a^2 - x^2)^{3/2}\,dx$

or similar type of example..

Practical No . (10) Use reduction formula to evaluate following

(1) $\int_0^{\infty} \frac{1}{(1+x^2)^3}\,dx$, (2) $\int_0^{2} \frac{x^4}{\sqrt{4-x^2}}\,dx$, (3) $\int_0^{\infty} \frac{1}{(a^2+x^2)^4}dx$

or similar type of example.

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-**1.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be 15 marks for Internal Practical Examination
  (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

SAURASHTRA UNIVERSITY, RAJKOT.

B.Sc. SEMESTER - 1 (CBCS)

MATHEMATICS PAPER- 01(B) (Practical)

OBJECTIVES:

Students will

- acquire skills to draw graphs trigonometric functions.
- apply understanding of n^{th} derivative of some functions to solve problems.
- solve problems with punctuality.

COURSE OUTCOMES:

Students will be able to-

- draw graphs of trigonometric functions.
- find n^{th} derivative of some functions.
- find integral using reduction formulae.

SAURASHTRA UNIVERSITY
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Syllabus of B.Sc. Semester-2
According to Choice Based Credit System
Effective from June – 2019

(Updated on date:- 06-04-2019
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• Program:	**B.Sc.**
• Semester:	**2**
• Subject:	**Mathematics**
• Paper No:	**02 (A) - Theory**
• Title of Course:	**Geometry, Calculus and Matrix Algebra.**
• Marks for External Examination:	**(Short Questions) → 20 Marks** **(Descriptive type) → 50 Marks** **Total Marks → 70 Marks**
• Marks for Internal Examination:	**Assignments → 30 Marks or Test**
• Credit Of The Course	**4 Credits**

B.Sc. SEMESTER -2
MATHEMATICS PAPER BSMT – 02 (A) Theory
GEOMETRY, CALCULUS AND MATRIX ALGEBRA

UNIT 1: **[14 MARKS]**

[a] Sphere:

Equation of a sphere in different forms:

Standard form, Central form, Vector form,

General equation of sphere with center (α, β, γ) and radius a. Plane section of a sphere, intersection of two spheres, Sphere with a given diameter, Sphere through a given circle, Intersection of a sphere and a line, Power of a point, Equation of a tangent plane, Equation of normal to the sphere, Condition for the plane lx + my + nz = p touches the sphere $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$.

[b] Cylinder:

Definition of a cylinder, equation of a cylinder with given

Generating parallel to the line $\frac{x}{l} = \frac{y}{m} = \frac{z}{n}$ and guiding curve $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, $z = 0$. The equation of right circular cylinder with axis $\frac{x-\alpha}{l} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$ and radius r.

Course is roughly covered by the reference book no (12) chapter 6 section 6.1 to 6.6 And chapter 7 section 7.7 and 7.7.1 and 7.8.

UNIT 2: **[14 MARKS]**

Partial Differentiation: -

Limit and continuity of function of several variables.

Partial derivatives, Partial derivatives of higher order, Partial differentiation of composite function , Homogeneous function, Euler's theorem on homogeneous function of two and three variables, Total differential and chain rule, Change of variables, Partial differentiation of implicit function ,Total differential Young's and Schwartz's theorem (without proof).

Course is roughly covered by the reference book no (1) chapter 11.

UNIT 3: **[14 MARKS]**

Applications of Partial Derivatives:

Errors and approximate values, Jacobians, Taylor's theorem of function of two variables, Maxima, Minima, Saddle points of function of several variables, Lagrange's method of undetermined multipliers.

Course is roughly covered by the reference book no (1) chapter 9 .

UNIT 4: **[14 MARKS]**

[a] Concept of a matrix:

Some special matrices, adjoint of a matrix, Non-singular and singular matrices, inverse of a matrix, Symmetric and skew symmetric matrices, Hermitian and skew Hermitian matrices.

[b] Rank of a matrix:

Elementary row and column operations on a matrix, row and column vectors, linear independence of row and column matrices, rank of a matrix, row and column rank of a matrix, equivalence of row and column ranks.

Course is roughly covered by the reference book no (10) chapter 1 section 1.4 to , 1.9, Chapter 4 section 4.1 to 4.3.1.

UNIT 5: **[14 MARKS]**

Eigen values of a matrix:

Characteristic equation of a matrix, eigen values and eigen vectors of a matrix, Cayley-Hamilton theorem and its use in finding inverse of a matrix. Application of a matrices to solve a system of linear (homogeneous and non-homogeneous both) equations. Theorems on consistency of a system of linear equations.

Course is roughly covered by the reference book no (10) chapter 11 section 11.1 to 11.1.2, Chapter 2 section 2.19.

Notes:

- There shall be **SIX** periods of 55 minutes per week for Mathematics- **01 (A)-Theory.**
- There shall be one question paper of 70 marks & $2\frac{1}{2}$ hours for Mathematics- **01(A)-Theory**

Format of Question Paper

- There shall be FIVE questions from each unit of 14 marks each.
- Each Question will be of the following form.

Question.	(A)	Answer any four out of four (Short answer type question)	4 Marks
	(B)	Answer any one out of two	2 Marks
	(C)	Answer any one out of two	3 Marks
	(D)	Answer any one out of two	5 Marks
		TOTAL	**14 MARKS**

Reference Books:

1) Differential Calculus by Shanti Narayan. 15th Edition (2004)
2) Differential Calculus by Gorakh Prasad
3) Integral Calculus by Shanti Narayan
4) Differential Equations by D. A. Murray
    a. A Text book of Calculus, S. C. Arora and Ramesh Kumar, Pitamber Publishing
    b. Company Ltd. Delhi.
5) Calculus: Concept and Context, Second edition, By James Stewart
    a. Pitamber Publishing Company Ltd. Delhi.
6) Calculus, By G. B. Thomas and R. L. Finney, Pearson Education, 2007.
7) The Elements of Co-ordinate Geometry by S.L. Loney Mac Millan & Co.
8) Elementary Treatise on Co-ordinate geometry of three dimensions by R.J.T. Bell Mac Millan & Co.
9) A Text book of Analytical Geometry of three dimensions by P.K. Jain & Khalid Ahmad
10) A textbook of matrices by Shanti Narayan.
11) A Course of Mathematical Analysis by Shanti Narayan
12) Analytical Solid Geometry by Shanti Narayan and P.K.Mittal, S.Chand & Co.

B.Sc. SEMESTER -2
MATHEMATICS PAPER BSMT – 02 (A) Theory
GEOMETRY, CALCULUS AND MATRIX ALGEBRA

OBJECTIVES:

Students will

- acquire knowledge and understanding of equations of sphere, cylinders.
- apply the knowledge of sphere and cylinders to solve problems.
- acquire knowledge partial differentiation and its applications.
- apply the knowledge of partial differentiation
- acquire knowledge of matrix, rank of matrix, Eigen values of matrix and simultaneous linear equations using theorems.
- apply the knowledge of matrix to solve problems.

COURSE OUTCOMES:

Students will be able to-

- derive equation of sphere in different forms
- solve problems related to sphere, intersection with a line and plane and tangent plane.
- derive equation of cylinder.
- solve problems related to cylinder.
- recall and understand limit and continuity of functions of several variables.

- recall Young's and Schwartz's theorem without proof.
- understand partial differentiation.
- solve problems related to partial differentiation.
- recall basic concept of matrix.
- find rank and Eigen values of a matrix.
- solve a system of linear (homogeneous and non-homogeneous both) equations
- determine consistency of system of linear equations.

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Syllabus of B.Sc. Semester-2
According to Choice Based Credit System
Effective from June - 2019

(Updated on date:- 06-04-2019
and updation implemented from June - 2019)

• Programme:	**B.Sc.**
• Semester:	**2**
• Subject:	**Mathematics**
• Paper No:	**02 (B) (Practical)**
• Title of Course:	**Mathematics Practical.**
• Total Marks of External Practical Examination:	**35 Marks**
• Total Marks of Internal Practical Examination:	**15 Marks** **Continuous internal assessment of practical work**
• Total Marks of Practical Examination:	**External →35 Marks** **Internal →15 Marks** **Total → 50 Marks**
• Credit Of The Course	**3 Credits**

SAURASHTRA UNIVERSITY, RAJKOT.

B.Sc. SEMESTER -2 (CBCS)

MATHEMATICS PAPER- 02 (B) (Practical)

Mathematics Practical

[50 Marks / 3Hours]

Practical No. (1) Draw the graph of $y = e^x$ or $y = 2^x$ or $y = 3^x$.

Practical No. (2) Draw the graph of $y = \log_e x$ or $y = \log_{10} x$.

Practical No. (3) Draw the graph of $y = \sinh x$ or $y = \cosh x$.

Practical No. (4) Draw the graph of $y = \text{sech } x$ or $y = \text{cosech } x$

Practical No. (5) Draw the graph of $y = \tanh x$ or $y = \coth x$.

Practical No. (6) Draw the graph of cycloid.

Practical No. (7) To find inverse of a matrix using Cayley- Hamilton theorem.
(At least four examples to be written in journal)

Practical No. (8) To find inverse of a matrix using Gauss-Elimination Method.
(At least four examples to be written in journal)

Practical No. (9) To solve the system of simultaneous linear algebraic equations using Gauss Elimination Method. (At least four examples to be written in journal)

Practical No. (10) To solve the given system of simultaneous linear algebraic equations using Gauss-Jordan Method. (At least four examples to be written in journal)

Notes :

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-2**.**
- At the time of examination candidate must bring his/her own practical journal duly certified and signed by **H.O.D.**
- There shall be one question paper of **35 Marks** and **3 Hours** for practical examination
- There shall be 15 marks for Internal Practical Examination
  (i.e. Continuous internal assessment of performance of each student during the practical work.)

Format of Question Paper for Practical Examination

Question 1	Answer any THREE out of FIVE	[9+9+9=	27 Marks
Question 2	Journal and Viva:	[	8 Marks
Question 3:	Internal Practical Examination	[	15 Marks
	TOTAL	**[**	**50 Marks**

SAURASHTRA UNIVERSITY, RAJKOT.

B.Sc. SEMESTER -2 (CBCS)

MATHEMATICS PAPER- 02 (B) (Practical)

Mathematics Practical

OBJECTIVES:

Students will

- acquire skill to draw graphs of hyperbolic, logarithmic and exponential functions.
- obtain inverse matrix using Gauss-elimination and Cayley-Hamilton method.
- solve simultaneous linear algebraic equations using Gauss-elimination and Gauss-Jordan method.
- solve problems with punctuality.

COURSE OUTCOMES:

Students will be able to-

- draw graphs of hyperbolic, logarithmic and exponential functions.
- find inverse matrix using Cayley-Hamilton Theorem, Gauss-Elimination Method
- solve a system of simultaneous linear equations using Gauss-Elimination Method and Gauss Jordan Method.