

# SAURASHTRA UNIVERSITY RAJKOT.

## Syllabus of B.Sc. Semester-1 According to Choice Based Credit System Effective from June – 2010

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Program:** **B.Sc.**
- **Semester:** **1**
- **Subject:** **Mathematics**
- **Course code:** **BSMT-101 (A) - Theory**
- **Section-wise  
Distribution of Marks  
for External  
Examination:**

Section-A (MCQ test)	→ 20 Marks
Section-B (Descriptive type)	→ 50 Marks
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<b>Total Marks</b>	<b>→ 70 Marks</b>
- **Segment-wise  
Distribution of Marks  
for Internal  
Examination:**

Assignments	→ 10 Marks
QUIZ test	→ 10 Marks
Internal exam.	→ 10 Marks
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<b>Total Marks</b>	<b>→ 30 Marks</b>
- **Credit Of The Course** **4 Credits**

**B.Sc. SEMESTER -1**  
**MATHEMATICS PAPER BSMT-101 (A) - Theory**  
**GEOMETRY & CALCULUS**

**UNIT 1:**

[ 25 MARKS + 10 MARKS MCQ ]

**(a) Polar, spherical & cylindrical co-ordinates:**

Polar Co-ordinates in  $R^2$ , distance between two points in polar Co-ordinates. Polar equations of a straight line, polar equations of circle. Relation between Cartesian and polar coordinates, Relation between Cartesian and spherical coordinates, Relation between Cartesian and cylindrical coordinates.

**(b) Sphere:**

General equation of sphere with center  $(\alpha, \beta, \gamma)$  and radius  $a$ . Plane section of a sphere, intersection of two spheres, inertia of sphere and a line.

**(c) Successive differentiation:**

Successive differentiation, Calculation of  $n^{\text{th}}$  derivative, Some standard results for  $n^{\text{th}}$  derivatives of  $e^{ax}$ ,  $a^{mx}$ ,  $\sin(ax+b)$ ,  $\cos(ax+b)$ ,  $(ax+b)^m$ ,  $(ax+b)^{-1}$ ,  $\log(ax+b)$ ,  $e^{ax} \sin(bx+c)$ ,  $e^{ax} \cos(bx+c)$ . Leibnitz's Theorem and its examples.

**(d) 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.

**(e) 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.

**(f) Indeterminate Forms:**

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

- (a) **Differential Equations of First Order and First Degree:**  
 Definition and method of solving of **Linear differential equations** of first order and first degree , Definition and method of solving of **Bernoulli's** differential equation and Definition and methods of solving of **Exact** differential equation.
- (b) **Differential equations of first order and higher degree:**  
 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.
- (c) **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  $X = e^{ax}$ ,  $X = \sin(ax+b)$ ,  $X = \cos(ax+b)$ ,  $X = x^m$ ,  $X = e^{ax} \cdot V$
- (e) **Reduction Formulae:**  
 Integration of  $\sin^m x$  and  $\cos^n x$ :  
 Reduction Formulae for  $\int \sin^m x dx$ ,  $\int \cos^n x dx$ ,  
 Integration of  $\sin^m x \cdot \cos^n x$ :  
 Reduction Formulae for  $\int \sin^m x \cdot \cos^n x dx$ ,  $\int \tan^m x dx$  and  $\int \cot^m x dx$  where  $m, n \in N ; m, n \geq 2$   
 Reduction formulae for,  $\int_0^{\frac{\pi}{2}} \sin^m x dx$ ,  $\int_0^{\frac{\pi}{2}} \cos^n x dx$ ,  $\int_0^{\frac{\pi}{2}} \sin^m x \cdot \cos^n x dx$ , where  $m, n \in N ; m, n \geq 2$

Notes:

- There shall be **SIX** periods of 55 minutes per week for Mathematics- **BSMT-101(A)-Theory**.
- There shall be one question paper of 70 marks &  $2\frac{1}{2}$  hours for Mathematics- **BSMT-101(A)-Theory**

**Format of Question Paper**

- There shall be TWO sections in this paper i.e. Section- A and Section -B.

**Section – A**

Section- A is of 20 Marks with 20 MCQ type questions (multiple choice questions) covering the whole syllabus in equal weight-age.

**Section – B**

Section B is of 50 Marks with the following type of TWO questions covering the whole syllabus in equal weight-age, each of twenty five marks

Question 1 and 2 will cover unit 1 and 2 respectively.

Question no.	(A)	Answer any three out of six	6 Marks
	(B)	Answer any three out of six	9 Marks
	(C)	Answer any two out of five	10 Marks
		<b>TOTAL</b>	<b>25 MARKS</b>

**Reference Books :**

- The Elements of Co-ordinate Geometry by S.L. Loney  
Mac Millan & Co.
- Elementary Treatise on Co-ordinate geometry of three dimensions by R.J.T. Bell Mac  
Millan & Co.
- A Text book of Analytical Geometry of three dimensions by P.K. Jain & Khalid Ahmad
- Differential Calculus by Shanti Narayan
- Differential Calculus by Gorakh Prasad
- Integral Calculus by Shanti Narayan
- Integral Calculus by Gorakh Prasad
- Differential Equations by D. A. Murray
- Three Dimension Geometry, Krishna Prakashan Mandir, Meerut.
- A Text book of Calculus, S. C. Arora and Ramesh Kumar,  
Pitamber Publishing Company Ltd. Delhi.

# SAURASHTRA UNIVERSITY RAJKOT.

## Syllabus of B.Sc. Semester-1 According to Choice Based Credit System Effective from June – 2010

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Programme:** B.Sc.
  - **Semester:** 1
  - **Subject:** Mathematics
  - **Course code:** BSMT-101(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- BSMT-101(B) (Practical)**  
**Mathematics Practical**

[ 50 Marks / 3Hours]

- Practical No . (1) Draw the graph of  $y = \sin x$       or  $y = \cos x$       or  $y = \tan x$   
 Practical No . (2) Draw the graph of  $y = \sec x$       or  $y = \operatorname{cosec} x$       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  $y = \operatorname{cosec}^{-1} x$       or  $y = \cot^{-1} x$ .  
 Practical No . (5) Draw the graph of parabola  $y^2 = 4ax$  for  $a < 0$  or  $a > 0$   
 Practical No . (6) Draw the graph of ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

or hyperbola  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

Practical No. (7) To solve given example of successive differentiation.

- (a) Find the  $n^{\text{th}}$  derivative of  $y = \frac{x}{x^2 + a^2}$   
 (b) Show that the  $n^{\text{th}}$  derivative of  $y = \tan^{-1} x$  is  

$$y_n = (-1)^{(n-1)} \cdot (n-1)! [\sin\{n(\frac{\pi}{2} - y)\} \sin^n(\frac{\pi}{2} - y)]$$
  
 (c) If  $y = x \log \frac{x-1}{x+1}$  then prove that  

$$y_n = (-1)^n \cdot (n-2)! \left\{ \frac{(x-n)}{(x-1)^n} - \frac{(x+n)}{(x+1)^n} \right\}$$
  
 (d) If  $y = \sin mx + \cos mx$  then show that  

$$y_n = m^n \sqrt{1 + (-1)^n \sin 2mx}$$

Practical No. (8) To solve given example of Mean value Theorem.

- (a) Using Lagrange's mean value theorem show that  

$$\frac{x}{1+x} < \log(1+x) < x$$
 for  $x > 0$  and hence  

$$0 < \frac{1}{\log(1+x)} - \frac{1}{x} < 1$$
 for  $x > 0$   
 (b) Using Lagrange's mean value theorem show that

$$x - \frac{x^3}{6} \leq \sin x \leq x$$
 for  $x \geq 0$

- (c) Using Cauchy's mean value theorem show that  
 $e^b - e^a = ce^c \log(b/a)$  where  $0 < a < c < b$ ,  $ab > 0$
- (d) Using Cauchy's mean value theorem show that  
 $b^b - a^a = c^c \{b \log(b) - a \log(a)\}$  where  $a < c < b$

Practical No. (9) To solve given example of reduction formula.

(a)  $\int_0^{2a} x^2 \sqrt{2ax - x^2} dx$       (b)  $\int_0^{2a} x^{9/2} (2a - x)^{-1/2} dx$

(b)  $\int_0^{\pi/4} \cos^3 2x \cdot \sin^4 4x dx$       (d)  $\int_0^{\infty} \frac{x^3}{(1+x^2)^{9/2}} dx$

Ans: (a)  $\frac{5\pi}{8} a^4$       (b)  $\frac{63\pi}{8} a^5$       (c)  $\frac{128}{1155}$       (d)  $\frac{2}{35}$

Practical No.(10) To solve given example of Bernoulli's Differential Equation.

(a) Solve :  $\frac{dy}{dx} + y \tan x = y^3 \sec x$  ,

Ans.  $Y = \frac{\cos x}{\sqrt{c - 2 \sin x}}$

(b) Solve :  $\frac{dy}{dx} + y \tan x = \frac{\cos x}{y}$  ,

Ans.  $Y^2 \sec^2 x = 2 \log(\sec x + \tan x) + c$

(c) Solve :  $\frac{dy}{dx} + y \cos x = y^3 \sin 2x$ ,

Ans.  $y^{-2} = (1 + 2 \sin x) + c e^{2 \sin x}$

(d) Solve :  $(x^3 y^3 + xy) dx = dy$  ,

Ans.  $y^{-2} e^{x^2} = e^{x^2} (1 - x^2) + c$

**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
	<b>TOTAL</b>	[	<b>50 Marks</b>



# SAURASHTRA UNIVERSITY RAJKOT.

## Syllabus of B.Sc. Semester-2 According to Choice Based Credit System Effective from June – 2010

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Program:** **B.Sc.**
- **Semester:** **2**
- **Subject:** **Mathematics**
- **Course code:** **BSMT-201 (A) - Theory**
- **Title of Course:** **Geometry, Trigonometry  
And Matrix Algebra**
  
- **Section-wise  
Distribution of Marks  
for External  
Examination:**

Section-A (MCQ test)	→ 20 Marks
Section-B (Descriptive type)	→ 50 Marks
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<b>Total Marks</b>	<b>→ 70 Marks</b>
  
- **Segment-wise  
Distribution of Marks  
for Internal  
Examination:**

Assignments	→ 10 Marks
QUIZ test	→ 10 Marks
Internal exam.	→ 10 Marks
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<b>Total Marks</b>	<b>→ 30 Marks</b>
  
- **Credit Of The Course** **4 Credits**

**B.Sc. SEMESTER -2**  
**MATHEMATICS PAPER BSMT – 201 (A) Theory**  
**GEOMETRY, TRIGONOMETRY AND MATRIX ALGEBRA**

**UNIT 1:**

[ 25 MARKS + 10 MARKS MCQ ]

**[a] 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.

**[b] 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

**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.

**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.

**[c] Sequences:**

Definition of a sequence, bounded sequences. Convergence of a sequence, subsequences, Monotonic sequences, Cauchy's sequence, General principle of convergence of sequence

(without proof). Some important sequences.  $\{\sqrt[n]{n}\}$ ;  $\left\{\frac{a_1 + a_2 + \dots + a_n}{n}\right\}$

**UNIT 2:**

[ 25 MARKS + 10 MARKS MCQ ]

**[a] De'Moivre's theorem:**De'Moivre's theorem and its applications, Value of  $a^z$ ,  $z \in \mathbf{C}$  or  $\mathbf{R}$ .**Expansions of  $\cos n\theta$ ,  $\sin n\theta$ ,  $\tan n\theta$  :**Expansions of  $\cos n\theta$ ,  $\sin n\theta$ ,  $\tan n\theta$  in terms of  $\cos \theta$ ,  $\sin \theta$ ,  $\tan \theta$  respectively.(n being positive integer) Expansions of  $\cos^n \theta$ ,  $\sin^n \theta$  in a series of cosines or sines of multiples of  $\theta$  (n being positive integer). Expansion of trigonometric functions. i.e. expansions of  $\sin \alpha$ ,  $\cos \alpha$ ,  $\tan \alpha$  in terms of  $\alpha$ .**[b] Exponential, circular and hyperbolic functions:**

Exponential, circular and hyperbolic functions.

**Logarithmic & inverse functions:**

Logarithmic functions for complex and real numbers

Inverse circular and hyperbolic functions for complex and real numbers.

Notes:

- There shall be **SIX** periods of 55 minutes per week for Mathematics- **BSMT-201(A)-Theory**.
- There shall be one question paper of 70 marks &  $2\frac{1}{2}$  hours for Mathematics- **BSMT-201(A)-Theory**

**Format of Question Paper**

- There shall be TWO sections in this paper i.e. Section- A and Section -B.

**Section – A**

Section- A is of 20 Marks with 20 MCQ type questions (multiple choice questions) covering the whole syllabus in equal weight-age.

**Section – B**

Section B is of 50 Marks with the following type of TWO questions covering the whole syllabus in equal weight-age, each of twenty five marks .

Question 1 and 2 will cover unit 1 and 2 respectively.

Question no.	(A)	Answer any three out of six	6 Marks
	(B)	Answer any three out of six	9 Marks
	(C)	Answer any two out of five	10 Marks

<b>TOTAL</b>	<b>25 MARKS</b>
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### **Reference Books:**

- The Elements of Co-ordinate Geometry by S.L. Loney Mac Millan & Co.
- Elementary Treatise on Co-ordinate geometry of three dimensions by R.J.T. Bell Mac Millan & Co.
- A Text book of Analytical Geometry of three dimensions by P.K. Jain & Khalid Ahmad
- Theory of matrices by Shanti Narayan
- Plane Trigonometry Part -2 by S.L.Loney Mac Millan & Co.
- A Course of Mathematical Analysis by Shanti Narayan
- Mathematical Analysis by S.C. Malik
- Mathematical Analysis by T.M. Apostol
- Real Analysis by R.R. Goldberg
- Three Dimension Geometry by Krishna Prakashan Mandir, Meerut.

# SAURASHTRA UNIVERSITY RAJKOT.

**Syllabus of B.Sc. Semester-2**  
**According to Choice Based Credit System**  
**Effective from June - 2010**

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Programme:** B.Sc.
  - **Semester:** 2
  - **Subject:** Mathematics
  - **Course code:** BSMT-201(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- BSMT-201(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  $y = \operatorname{sech} x$  or  $y = \operatorname{cosech} x$

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

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

**Practical (7)**

To find inverse of a matrix using Cayley- Hamilton theorem

**Practical No(7) (a)**

$$a = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

**Answer:-**  $b = \operatorname{inv}(a)$

$$b = \begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

**Practical No(7) (b)**

$$a = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

**Answer:-**  $b = \operatorname{inv}(a)$

$$b = \begin{pmatrix} 0.7500 & 0.2500 & -0.2500 \\ 0.2500 & 0.7500 & 0.2500 \\ -0.2500 & 0.2500 & 0.7500 \end{pmatrix}$$

**Practical No(7) (c)**

$$a = \begin{pmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{pmatrix}$$

**Answer:-**  $b = \text{inv}(a)$

$$b = \begin{pmatrix} 8 & -1 & -3 \\ -5 & 1 & 2 \\ 10 & -1 & -4 \end{pmatrix}$$

**Practical No(7) (d)**

$$a = \begin{pmatrix} 1 & 0 & 2 \\ 2 & -1 & 3 \\ 4 & 1 & 8 \end{pmatrix}$$

**Answer:-**  $b = \text{inv}(a)$

$$b = \begin{pmatrix} -11 & 2 & 2 \\ -4 & 0 & 1 \\ 6 & -1 & -1 \end{pmatrix}$$

**Practical No(8)**

To find inverse of a matrix using Gauss-Elimination Method

**Practical No(8) (a)**

$$a = \begin{pmatrix} 7 & -3 & -3 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{pmatrix}$$

**Answer:-**  $b = \text{inv}(a)$

$$b = \begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}$$

**Practical No(8) (b)**

$$a = \begin{pmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{pmatrix}$$

**Answer:-**  $b = \text{inv}(a)$

$$b = \begin{pmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{pmatrix}$$

**Practical No(8) (c)**

$$a = \begin{matrix} 1 & -8 & 10 \\ 0 & 2 & -3 \\ 0 & -1 & 2 \end{matrix}$$

**Answer:-**  $b = \text{inv}(a)$

$$b = \begin{matrix} 1 & 6 & 4 \\ 0 & 2 & 3 \\ 0 & 1 & 2 \end{matrix}$$

**Practical No(8) (d)**

$$a = \begin{matrix} 5 & 8 & 4 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{matrix}$$

**Answer:-**  $b = \text{inv}(a)$

$$b = \begin{matrix} 1 & 0 & -4 \\ 0 & -1 & 2 \\ -1 & 2 & 1 \end{matrix}$$

**Practical No(9)**

To solve the system of simultaneous linear algebraic equations using Gauss Elimination Method.

**Practical No(9) (a)**

$$\begin{aligned} 3x + y - z &= 3 \\ 2x - 8y + z &= -5 \\ x - 2y + 9z &= 8 \end{aligned}$$

**Answer:** -  $x = 1, y = 1, z = 1$

**Practical No(9) (b)**

$$\begin{aligned} 28x + 4y - z &= 32 \\ x + 3y + 10z &= 24 \\ 2x + 17y + 4z &= 35 \end{aligned}$$

**Answer:** -  $x = 0.9936, y = 1.5070, z = 1.8485$

**Practical No(9) (c)**

$$\begin{aligned} 3x + 4y - z &= 8 \\ -2x + y + z &= 3 \\ x + 2y - z &= 2 \end{aligned}$$

**Answer:** -  $x = 1, y = 2, z = 3$

**Practical No(9) (d)**

$$\begin{aligned} 10x + y + z &= 12 \\ 2x + 10y + z &= 13 \\ 2x + 2y + 10z &= 14 \end{aligned}$$

**Answer:** -  $x = 1, y = 1, z = 1$



**Practical No(10)**

To solve the given system of simultaneous linear algebraic equations using Gauss-Jordan Method.

**Practical No(10) (a)**

$$10x + y + z = 12$$

$$2x + 10y + z = 13$$

$$x + y + 5z = 7$$

**Answer:** -  $x = 1, y = 1, z = 1$

**Practical No(10) (b)**

$$10x + y + z = 12$$

$$x + 10y - z = 10$$

$$x - 2y + 10z = 9$$

**Answer:** -  $x = 1, y = 1, z = 1$

**Practical No(10) (c)**

$$10x + y + z = 12$$

$$x + 10y + z = 12$$

$$x + y + 10z = 12$$

**Answer:** -  $x = 1, y = 1, z = 1$

**Practical No(10) (d)**

$$x + 2y + z = 8$$

$$2x + 3y + 4z = 20$$

$$x + 3y + 2z = 16$$

**Answer:** -  $x = 1, y = 2, z = 3$

**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
	<b>TOTAL</b>	[	<b>50 Marks</b>

# SAURASHTRA UNIVERSITY RAJKOT.

## Syllabus of B.Sc. Semester-3 According to Choice Based Credit System Effective from June - 2011

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Program:** B.Sc.
- **Semester:** 3
- **Subject:** Mathematics
- **Course code:** BSMT-301(A)-Theory
- **Title of Course:** Linear Algebra & Calculus
- **Section-wise Distribution of Marks for External Examination:**

Section-A (MCQ test)	→ 20 Marks
Section-B (Descriptive type)	→ 50 Marks
<hr/>	
<b>Total Marks</b>	<b>→ 70 Marks</b>
- **Segment-wise Distribution of Marks for Internal Examination:**

Assignments	→ 10 Marks
QUIZ test	→ 10 Marks
Internal exam.	→ 10 Marks
<hr/>	
<b>Total Marks</b>	<b>→ 30 Marks</b>
- **Credit Of The Course** 4 Credits

# SAURASHTRA UNIVERSITY, RAJKOT

B.Sc. SEMESTER -3 (CBCS)

MATHEMATICS PAPER- BSMT-301(A)

Linear Algebra, Calculus & Theory of Equations (Theory)

[70 Marks/3Hours]

## UNIT 1:

[ 25 MARKS + 10 MARKS MCQ ]

[A] **Vector Space:**

Definition and examples, Linear dependence, independence and their properties, Linear span, Subspace, Sum and direct sum of subspaces, Basis and finite dimension of vector space, Existence theorem for basis, Invariance of the number of the elements of a basis set, Existence of complementary subspace of subspace of finite dimensional vector space, Dimension of sum of subspaces.

[B] **Linear Transformations:**

Linear transformations and their representation as matrices, The algebra of linear transformations, Rank and Nullity theorem, Ad joint of a linear transformation, Eigen values and eigen vectors of linear transformations, Singular and non-singular transformations, Diagonalization, Inverse linear transformations.

[C] **Series:**

Series of non-negative terms, p-test, Comparison test, Ratio test, Raabe's test, Alternative series, Absolute and conditional convergence, Convergence of power series. (All the tests without proof ).

## UNIT 2:

[ 25 MARKS + 10 MARKS MCQ ]

[A] **Numerical Methods for solving an equation:**

Graphical method, Bisection method, False position method, Iteration method, Newton-Raphson's method. Applications of Newton-Raphson's method, Derivatives of polynomials by synthetic division method and Roots of polynomial equation by Horner's method.

[B] **Curvature:**

Various formulae for curvature(formulae for Cartesian coordinates, parametric equations and Polar coordinates only), Newton's method for curvature at origin, Concavity, Convexity and point of inflexion

[C] **Asymptotes and multiple points:**

Asymptotes parallel to co-ordinate axes, oblique type and algebraic methods, Rules for finding asymptotes. Multiple points, Types of double points.

Notes:

- There shall be **SIX** periods of 55 minutes per week for Mathematics- **BSMT-301(A)-Theory**.
- There shall be one question paper of 70 marks &  $2\frac{1}{2}$  hours for Mathematics- **BSMT-301(A)-Theory**

**Format of Question Paper**

- There shall be TWO sections in this paper i.e. Section- A and Section -B.

**Section – A**

Section- A is of 20 Marks with 20 MCQ type questions (multiple choice questions) covering the whole syllabus in equal weightage.

**Section – B**

Section B is of 50 Marks with the following type of TWO questions covering the whole syllabus in equal weightage, each of twenty five marks.

Question 1 and 2 will cover unit 1 and 2 respectively.

Question no.	(A)	Answer any three out of six	6 Marks
	(B)	Answer any three out of six	9 Marks
	(C)	Answer any two out of five	10 Marks
		<b>TOTAL</b>	<b>25 MARKS</b>

Reference Books:

- Numerical Methods by V.N. Vadamurthy and N.Ch.S.N.Iyengar, Vikas Publishing House Pvt. Ltd.
- Numerical Mathematical Analysis by J.B. Scarborough, Oxford and I.B.H. Publishing Co. Pvt. Ltd.
- Introduction to Numerical Analysis by C.E. Froberg, Addison- Wesley 1979
- Numerical Analysis by G. Shankar Rao
- Linear Algebra by J.N. Sharma and A.R. Vasishtha, Krishna Prakashan Mandir, Meerut
- An Introduction to Linear Algebra by Krishnamurthy, Mainra and Arora
- Matrix and Linear Algebra by K.B. Datta, Prentice Hall of India Pvt. Ltd. New Delhi
- Linear Algebra by K.Hoffman and R. Kunza
- A text book of Modern Abstract Algebra by Shanti Narayan, S.Chand & Co., New Delhi
- Basic Linear Algebra with Matlab by S.K.Jain, A.Gunawardena & P.B. Bhattacharya
- Differential Calculus by Shanti Narayan, S.Chand & co., New Delhi
- Differential Calculus by Gorakhprasad, Pothishala Pvt. Ltd., Allahabad
- Real Analysis by R.R. Goldberg, Oxford and I.B.H. Publishing Co. Pvt. Ltd.
- Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi
- Higher Algebra by Barnard & Child

# SAURASHTRA UNIVERSITY RAJKOT.

## Syllabus of B.Sc. Semester-3 According to Choice Based Credit System Effective from June - 2011

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Programme:** B.Sc.
  - **Semester:** 3
  - **Subject:** Mathematics
  - **Course code:** BSMT-301(B) (Practical)
  - **Title of Course:** Numerical Methods
  - **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 -3 (CBCS)**  
**MATHEMATICS PAPER- BSMT-301(B) (Practical)**  
**Numerical Methods**

[ 50 Marks / 3Hours]

- Pr. No. (1) Solution of algebraic and transcendental equation by Graphical method
- Pr. No. (2) Solution of algebraic and transcendental equation by Bisection method
- Pr. No. (3) Solution of algebraic and transcendental equation by False position method (Regula Falsi Method)
- Pr. No. (4) Solution of algebraic and transcendental equation by Secant method (Secant Method)
- Pr. No. (5) Solution of algebraic and transcendental equation by Iteration method
- Pr. No. (6) Solution of algebraic and transcendental equation by Newton-Raphson's method
- Pr. No. (7) Applications of Newton-Raphson's method
- Pr. No. (8) Transformation of equation
- Pr. No. (9) Derivatives of a polynomial by synthetic division method
- Pr. No. (10) Horner's method for solving polynomial equation.  
Journal and viva

**Notes :**

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-3.
- 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
	<b>TOTAL</b>	[	<b>50 Marks</b>

# SAURASHTRA UNIVERSITY RAJKOT

**Syllabus of B.Sc. Semester-4**  
**According to Choice Based Credit System**  
**Effective from June - 2011**

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Programme:** B.Sc.
- **Semester:** 4
- **Subject:** Mathematics
- **Course code:** BSMT-401(A)-Theory
- **Title of Course:** Advanced Calculus & Linear Algebra
  
- **Section-wise Distribution of Marks for External Examination:**

Section-A (MCQ test)	→ 20 Marks
Section-B (Descriptive type)	→50 Marks
<hr/>	
<b>Total Marks</b>	<b>→70 Marks</b>
  
- **Segment-wise Distribution of Marks for Internal Examination:**

Assignments	→ 10 Marks
QUIZ test	→10 Marks
Internal exam.	→ 10 Marks
<hr/>	
<b>Total Marks</b>	<b>→30 Marks</b>
  
- **Credit Of The Course** 4 Credits

# SAURASHTRA UNIVERSITY, RAJKOT

B.Sc. SEMESTER - 4 (CBCS)

MATHEMATICS PAPER- BSMT-401(A)

Advanced Calculus & Linear Algebra (Theory)

[70 Marks / 3Hours]

## UNIT 1:

[ 25 MARKS + 10 MARKS MCQ ]

### [a] 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, Young's and Schwartz's theorem (without proof).

### [b] 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.

### [c] Vector Differentiation:-

Vector point functions and Scalar point functions, Vector Differentiation, Laplace operator, Laplace equation, Gradient, Divergence and Curl.

## UNIT 2:

[ 25 MARKS + 10 MARKS MCQ ]

### [a] Multiple Integral:-

Double and triple integrals, Application of double and triple integration as area and volume, Change of variable by Jacobian, Change of variables from Cartesian to polar co-ordinates and triple integration in spherical co-ordinates and cylindrical co-ordinates.

### [b] Vector Integration

Line integral and Green's theorem., Surface integral, Volume Integral, Divergence theorem(Gauss) and Stoke's theorem.

### [c] Beta & Gamma Functions: -

Beta and Gamma functions and relation between them. Value of  $\int_{-\infty}^{\infty} e^{-x^2} dx$  as gamma function,

Duplication formula. Legendre's Formula(without proof).

### [d] Inner Product Spaces: -

Inner product spaces, Cauchy-Schwartz inequality, Triangular inequality, Orthogonal vectors, Orthonormal vectors, Orthogonal sets and bases, Orthonormal bases, Gram- Schmidt orthogonalization process.



Notes:

- There shall be **SIX** periods of **55** minutes per week for Mathematics- **BSMT-401(A)-Theory**.
- There shall be one question paper of **70** marks &  $2\frac{1}{2}$  hours for Mathematics- **BSMT-401(A)-Theory**

**Format of Question Paper**

- There shall be **TWO** sections in this paper i.e. Section- **A** and Section- **B**.

**Section – A**

Section- A is of 20 Marks with 20 MCQ type questions (multiple choice questions) covering the whole syllabus in equal weightage.

**Section – B**

Section- B is of 50 Marks with the following type of **TWO** questions covering the whole syllabus in equal weightage, each of twenty five marks.

Question 1 and 2 will cover unit 1 and 2 respectively.

Question no.	(A) Answer any <b>THREE</b> out of <b>SIX</b>	6 Marks
	(B) Answer any <b>THREE</b> out of <b>SIX</b>	9 Marks
	(C) Answer any <b>TWO</b> out of <b>FIVE</b>	<u>10 Marks</u>

**TOTAL 25 MARKS**

**Reference Books:**

- Real Analysis by R.R. Goldberg, Oxford and I.B.H. Publishing Co. Pvt. Ltd.
- Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi
- Mathematical Analysis by T.M. Apostol, Narosa Publishing House, New Delhi
- A course of mathematical Analysis by Shanti Narayan , S.Chand & Co., New Delhi
- Linear Algebra by J.N. Sharma and A.R. Vasishtha, Krishna Prakashan Mandir, Meerut
- An Introduction to Linear Algebra by Krishnamurthy, Mainra and Arora
- Matrix and Linear Algebra by K.B. Datta, Prentice Hall of India Pvt. Ltd. New Delhi
- Linear Algebra by K.Hoffman and R. Kunza
- A text book of Modern Abstract Algebra by Shanti Narayan, S.Chand & Co., New Delhi
- Basic Linear Algebra with Matlab by S. K. Jain, A. Gunawardena & P.B. Bhattacharya

# SAURASHTRA UNIVERSITY RAJKOT

## Syllabus of B.Sc. Semester-4 According to Choice Based Credit System Effective from June - 2011

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Programme:** B.Sc.
- **Semester:** 4
- **Subject:** Mathematics
- **Course code:** BSMT-401(B) (Practical)
- **Title of Course:** Introduction to SciLab
- **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  

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**Total → 50 Marks**
  
- **Credit Of The Course** 3 Credits

**B. Sc. SEMESTER -4 (CBCS)**  
**MATHEMATICS-BSMT -401(B) (Practical) [35 Marks / 3Hours]**  
**Introduction to SciLab**

Practical no.	Objective of Practical	MARKS
1.	(1) To input row vectors and column vectors. (2) To input square and rectangular matrices.	9 Marks
2.	(1) To obtain addition, subtraction and Multiplication, division of matrices and multiplication of matrix with scalar. (2) To obtain sub matrices of given matrix and to Delete rows and columns.	
3.	(1) To find minors, cofactors and adjoint of a matrix. (2) To find inverse of the matrix using adjoint of a matrix (3) To learn commands zeros, ones, eye, rand, det(), inv(), command for transpose.	
4.	(1) To draw the graph of a circle. (2) To draw the graph of a parabola	18 Marks
5.	(1) To draw the graph of an ellipse. (2) To draw the graph of a hyperbola.	
6.	(1) To draw graph of $y = \sin(x)$ (2) To draw graph of $y = \cos(x)$ . (3) To draw graph of $y = \sec(x)$	
7.	(1) To draw graph of $y = \operatorname{cosec}(x)$ . (2) To draw graph of $y = \tan(x)$ (3) To draw graph of $y = \cot(x)$ .	
8	(1) To draw graph of $y = \sin^{-1}(x)$ (2) To draw graph of $y = \cos^{-1}(x)$ . (3) To draw graph of $y = \sec^{-1}(x)$	
9.	(1) To draw graph of $y = \operatorname{cosec}^{-1}(x)$ . (2) To draw graph of $y = \tan^{-1}(x)$ . (3) To draw graph of $y = \cot^{-1}(x)$ .	
10	(1) To draw graph of $y = \exp(x)$ . (2) To draw graph of $y = \log_e(x)$ (3) To draw graph of $y = \log_{10}(x)$ .	
11	(1) To draw graph of $y = \cosh(x)$ (2) To draw graph of $y = \tanh(x)$	
12	(1) To draw graph of $y = \operatorname{sech}(x)$ (2) To draw graph of $y = \operatorname{csch}(x)$ .	
	Journal and Viva	
<b>Total Marks</b>		<b>35 Marks</b>

**Notes :**

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **At least 10** practical should be done during the semester.
- 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**

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

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***SAURASHTRA UNIVERSITY  
RAJKOT***

**MATHEMATICS**

**Syllabus of B.Sc. Semester-5 & 6**

**According to Choice Based Credit System**

**Effective from June – 2012**

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

**Syllabus of B.Sc. Semester-5**  
**According to Choice Based Credit System**  
**Effective from June – 2012**

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Program:** **B.Sc.**
- **Semester:** **5**
- **Subject:** **Mathematics**
- **Course codes:** **BSMT-501(A) -Theory**  
**BSMT-502(A) -Theory**  
**BSMT-503(A) -Theory**  
**BSMT-501(B) - Practical**  
**BSMT-502(B) - Practical**  
**BSMT-503(B) - Practical**  
**1 Project**
- **Total Credit Of The Semester 5:** **24 Credit**

**B. Sc. MATHEMATICS SEMESTER: V**

- The Course Design of B. Sc. Sem.- V (Mathematics) according to choice based credit system (CBCS) comprising of Paper Number, Paper Name, No. of theory lectures per week, No. of practical lectures per week , total marks of the each paper are as follows :

SR.NO	SUBJECT	NO. OF THEORY LECTURE PER WEEK	NO. OF PRACTICAL LECTURE PER WEEK	TOTAL MARKS	Credit Of Each Paper.
1	<b>PAPER BSMT-501 (A)</b> (Theory) <b>Mathematical Analysis-1 &amp; Group Theory</b>	6	-	70(External)+ 30 (Internal) = 100 Marks	4
2	<b>PAPER BSMT-502 (A)</b> (Theory) <b>Programming in C &amp; Numerical Analysis-1</b>	6	-	70(External)+ 30 (Internal) = 100 Marks	4
3	<b>PAPER BSMT-503 (A)</b> (Theory) <b>Discrete Mathematics &amp; Complex Analysis-1</b>	6	-	70(External)+ 30 (Internal) = 100 Marks	4
4	<b>PAPER BSMT-501 (B)</b> (Practical) <b><u>Numerical Analysis – I</u></b>	-	6	35(External)+ 15(Internal) = 50 Marks	3
5	<b>PAPER BSMT-502 (B)</b> (Practical) <b><u>Programming in C language</u></b>	-	6	35(External)+ 15(Internal) = 50 Marks	3
6	<b>PAPER BSMT-503 (B)</b> (Practical) <b><u>Programming with SCILAB</u></b>		6	35(External)+ 15(Internal) = 50 Marks	3
7	<b>Project Work &amp; Viva</b>	<ul style="list-style-type: none"> <li>1 Guidance Lecture. for a group of 3 to 5 students / week.</li> <li>Evaluation of project will be in SIXTH semester</li> </ul>		The title of the project work to be decided and data will be collected in this semester	3
<b><u>Total credit of the semester V</u></b>					<b>24</b>

**Marks Distribution Of Each Paper  
for  
Theory and Practical ( for SEMESTER-V )**

- **Total Marks of Each Theory Paper [External Examination]**      **20 Marks (MCQ test)+  
50 Marks (Descri. type)=  
70 Total Marks.**
- **Total Marks of Each Theory Paper [Internal Examination]**      **10 Marks Assignments +  
10 Marks QUIZ test +  
10 Marks Internal exam. =  
30 Total Marks**
- **Total Marks of Each Practical Paper [External Examination]**      **35 Marks**
- **Total Marks of Each Practical Paper [Internal Examination]**      **15 Marks  
[Continuous internal assessment of  
practical work ]**

**Format of Question Paper**

- There shall be one question paper of **70 marks &  $2\frac{1}{2}$  hours** for each Mathematics Theory Paper.
- There shall be **TWO sections** in this paper i.e. **Section A** and **Section B**.

**Section – A**

**Section A** is of **20 Marks** with **20 MCQ** type questions (multiple choice questions) covering the whole syllabus in equal weightage.

**Section – B**

**Section B** is of **50 Marks** with the following type of TWO questions covering the whole syllabus in equal weightage, each of twenty five marks.

Question 1 and 2 will cover unit 1 and 2 respectively.

<b>Question no.</b>	(A) Answer any <b>three out of six</b>	6 Marks
	(B) Answer any <b>three out of six</b>	9 Marks
	(C) Answer any <b>two out of five</b>	10 Marks
	<b>TOTAL</b>	<b>25 MARKS</b>



**-: Project Work:-**

- There will be a project on any topic in Mathematics preferably not covered in the syllabus.
- The project will be assigned in the teams (groups) of at least one and at most five students.
- There will be one lecture per week to guide and motivate for each group of students.
- Topic of the project may be selected based on the following
  1. Demand of mathematics required to cater the need of industries and the society as a whole.
  2. New topic not taught up to final semester.
  3. The topic may be an extension of topic covered in any of the topics/subject taught up to sixth semester.
  4. Innovative teaching methodology of Mathematics may also be selected as a topic of the project work.
  5. Students may also construct innovative models based on mathematical concepts even those taught at secondary or higher secondary level.
  6. Every project or even model must be submitted with proper documentation about the concept and the model.
  
- **During the fifth semester students will be**
  1. Introduced and assigned title of the project,
  2. Teams will be formed for the same.
  3. Each group will study, search reference, collect data and work-out details for their topic of project-work.
  
- **During the sixth semester**
  1. Students will finalize, document, submit and get the project work certified in their names.
  2. The project work must be submitted by the student in the fourteenth week of the sixth semester.
  3. Only on the submission of project dissertation the student will be issued hall ticket for the end semester theory and practical examination.
  4. The dissertation may be typed or hand-written and be limited to 40 to 70 pages of A4 size.
  5. Project work shall be evaluated by an external and one internal examiner which will be followed by presentation of the work and viva-voce.
  6. Students will be required to undergo verification, evaluation and viva of the project-work they have done.
  7. Certified documentation of the project-work done by each group is mandatory. The certified documentation should be produced while appearing for viva and evaluation of project during final examination of sixth semester.
- The project work will be evaluated for 100 marks of which **60% marks** will be allotted for the **dissertation** and **40% for the presentation and viva-voce**
- **The Evaluation of the project work will be done at the end of the sixth semester. For the Evaluation of the project work there shall be three hours duration at the end of the sixth semester. There shall be batch of 15 students for project and viva.**

**B.Sc. Mathematics**  
**SEMESTER - 5**  
**Mathematics PAPER BSMT – 501 (A) (Theory)**  
**Mathematical Analysis and Group Theory**

**Mathematical Analysis-1**

**UNIT 1:** [ 25 MARKS + 10 MARKS MCQ ]

[a] **Riemann Integral:**

Partitions and Riemann sums, Upper and lower R-integrals, R-integrability, The integral as limit, Some classes of integrable functions, Properties of integrable function, Statement of **Darboux's theorem** (without proof)

[b] Continuity, Derivability of the integral functions, Fundamental theorem of integral calculus, Mean value theorem of integral calculus.

[c] **Metric Spaces:** Definition and examples of metric space, neighborhood, limit points, interior points, Open and closed sets, Closure, derived set and interior, boundary points. Continuity in metric space, Dense sets, Cantor sets [**include Cantor set is closed**] but [**OMIT: - cantor set is compact and complete.**]

**Group Theory**

**UNIT 2:** [ 25 MARKS + 10 MARKS MCQ ]

[a] Definition of Binary Operation, Properties of B.O. & Examples, Group & its Properties, Examples Of Group, Subgroup & Its Properties, Cosets & Its Properties, Lagrange's theorem.

[b] Permutation, Transposition, Even & Odd Permutation, Symmetric Group, Inverse of Permutation, Alternative Group & Its Universal Property.

[c] Cyclic Group & Cyclic Subgroup & Its Properties, Deduction Of Lagrange's Theorem. Definition of Isomorphism, Equivalence Relation.

[d] Cayley Theorem, Automorphism, Properties of isomorphism, Normal subgroup and quotient group.

**Text Book for MATHEMATICS PAPER BSMT - 501 Unit – 2 Group Theory**

**Abstract Algebra [ Third Printing, July 2005 ]**

**By : Dr. I. H. Sheth,**

**Prentice Hall Of India,**

**New Delhi.**

**Course of Mathematics PAPER BSMT – 501 Group Theory**

is covered by following Chapters/ Sections of the above mentioned book namely Abstract Algebra

**Chapter 4:** § 4.1, § 4.2, § 4.3, § 4.4, §4.5 [OMIT: Example 4.1.11]

**Chapter 6:**

- § 6.1, § 6.2[OMIT: Example 6.2.7], § 6.3,
- [ **Omit:-** § 6.4], § 6.5

[**Omit:-** Generalized associative law, Theorem: 6.5.2, Theorem: 6.5.3 ]

§ 6.6, § 6.7

**Chapter 7:** § 7.1, § 7.2, § 7.3

**Chapter 8:** § 8.1, § 8.2, § 8.3 [**Omit:-** Theorem: 8.2.2 ]

**Chapter 9:** § 9.1, § 9.2, § 9.3

**Chapter 10:** § 10.1, § 10.2

**Chapter 11**

- **Omit :-** Chapter 11 Cyclic Groups
- [The whole chapter is to be omitted]

**Chapter 12:**

- § 12.3, § 12.4 [**Omit:-** § 12.5 ]

[Remaining sections of this chapter will be covered in 6<sup>th</sup> semester ]

References: -

- (1) Topics in Algebra, 1. N. Herstein, Willey Eastern Ltd. New Delhi
- (2) A text Book of Modern Abstract Algebra, by Shantinakaran, S. Chand & Co., New Delhi.
- (3) Fundamentals of Abstract Algebra, D. S. Malik, J. N. Mordoson and M. K. Sen, McGraw Hill International Edition - 1997
- (4) University Algebra, M. S. Gopalakrishna, Wiley Eastern Ltd.
- (5) Abstract Algebra, By Bhattacharya, Yallo Publications.
- (6) Modern Algebra, By Kazi zamiudia & Sursit, Vikas Publication. Delhi.
- (7) Text Book: Abstract Algebra, Dr. 1. H. Sheth, Nirav Prakashan, Ahmedabad.
- (8) Mathematical Analysis (2nd edition) by S. C. Malik & Arora, New Age Inter. Pvt.'
- (9) Mathematical Analysis, by T. M. Apostol
- (10) Real Analysis, by R. R. Goldberg (Chapel' 4,5,6, 7,9 & 10.1)
- (11) A course of Mathematical Analysis, by Shantinakaran, S. Chand & Sons.
- (12) Metric space, by E. T. Capson
- (13) Metric space, P. K. Jain & Ahmad, Narora Publishing House
- (14) Real Analysis by Sharma and Vasishtha Krishna Prakashan, Meerut-2.
- (15) Mathematical Analysis, by Dr. Goyal and Gupta, Krishna Prakashan, Meerut-2.

**B.Sc. Mathematics**  
**SEMESTER -5**  
**MATHEMATICS PAPER BSMT-502(A)- (Theory)**  
**PROGRAMMING IN C and Numerical Analysis**

**PROGRAMMING IN C ( THEORY)**

**UNIT 1:** [ 25 MARKS + 10 MARKS MCQ ]

- [a] History of C, C character set, Constants, Variables, Keywords, Type Declaration, Type Conversion, Hierarchy of operators, printf & scanf functions, if statement, if-else statements, Nested if-else, Logical operators, Conditional operators,
- [b] While loop, for loop, do while loop, break statement, Continue statement goto statement, Introduction to User Defined Functions.[Omit:- switch case statement, Pointers and Recursion]
- [c] Data types in C Integers: long and short types, signed and unsigned characters, Signed and unsigned float and doubles, C processors, meaning , Only Macro Expansion, Macros with Arguments,  
**[OMIT:- File inclusion and various directives Conditional Compilation #if and #elif Directives Miscellaneous Directives #undef Directive #pragma Directive]**
- [d] Arrays, meaning: one dimensional and two dimensional, only initialization and use in simple programs **[OMIT:- no pointers and no three dimensional array, Arrays and functions.]**

**NUMERICAL ANALYSIS-1**

**UNIT 2:** [ 25 MARKS + 10 MARKS MCQ ]

- [a] **Simultaneous linear algebraic equation:**  
Direct methods: Gauss elimination method, Gauss Jordan method, Method of factorization ( L.U. Decomposition), Crout's method. Iterative methods: Jacobi's method, Gauss Seidal's method.
- [b] **Empirical laws and curve fitting.**  
The linear law, Laws reducible to linear laws, Principle of least square, Fitting a straight line, a parabola and exponential curve and the curve  $y = ax^b$
- [c] **Finite differences,**  
Finite differences(forward , backward and central),  
Differences of polynomials, Factorial polynomial, Reciprocal Factorial polynomial ,  
Polynomial factorial notation, Error propagation in difference table, Other difference operators(Shift, averaging, differential and unit ) and relation between them.
- [d] **Interpolation with equal intervals:**  
Gregory- Newton forward interpolation formula, Gregory- Newton backward interpolation formula, Equidistance terms with one or more missing values,

**Text Book for MATHEMATICS PAPER BSMT-502(A) (Theory)**

**PROGRAMMING IN C is as follows:**

**'LET US C' By : Yashvant Kanetker 5<sup>th</sup> Edition,  
BPB Publications, New Delhi.**

**Course of PROGRAMMING IN C (THEORY)**

i.e. UNIT 1 is covered by following Sections / Chapters of the book “LET US C”

**Unit 1:-**

- **Chapter 1**  
Getting Started  
[Omit:- the section of Associativity of Operator]
- **Chapter 2**  
The decision control Structure [Whole chapter]
- **Chapter 3**  
The loop control Structure [Whole chapter]  
For the topic of “User Defined Functions” refer to  
**any other standard book**
- **Chapter 4**  
The case control Structure  
[Omit: - Switch –Case Statement and related sections]  
Only The goto keyword and its usage.
- **Chapter 5 :-**  
[Omit:- The whole Chapter 5 – namely “Functions and Pointers” of the book “LET US C” ]
- **Chapter 6:-**  
Data Types Revisited  
[Omit:- Storage Classes like Automatic Storage Class Register Storage Class, Static Storage Class ,  
External Storage Class, Which to Use When...etc.]
- **Chapter 7:-**  
The C Preprocessor  
Features of C Preprocessor, Macro Expansion, Macros with Arguments, Macros versus Functions  
[OMIT:- File Inclusion Conditional Compilation, #if and #elif Directives,  
Miscellaneous Directives,  
#undef Directive, #pragma Directive]
- **CHAPTER 8:-**  
Arrays. What are Arrays, A Simple Program Using Array, More on Arrays, Array Initialization, Bounds Checking, Passing Array Elements to a Function, Two Dimensional Arrays, Initializing a 2-Dimensional Array  
[OMIT:-Pointers and Arrays, Passing an Entire Array to a Function, The Real Thing, Memory Map of a 2-Dimensional Array, Pointers and 2-Dimensional Arrays, Pointer to an Array, Passing 2-D array to a Function, array of pointers, three dimensional array, summary.]

The scope of the syllabus of UNIT 2 is roughly indicated as under:

"Numerical methods" by Dr. V. N. Vedamurthy & Dr. N. Ch. S. N. Iyengar, Vikas Publishing house.

Chap. 1. (Except 1.4,1.5,1.11,1.12), Chap. 4 (Except 4.4,4.7), Chap. 5. (Except 5.12), Chap. 6

**Reference Books: (for Unit 2)**

(1) Introduction to Numerical Analysis (2nd Edition) by C.E.Froberg Addison Wasley, 1979

(2) Numerical Mathematical Analysis, by J. B.Scarforough, Oxford & IBH Publi.Co. Pvt. Ltd., 1966

(3) Numerical method, Problems & Solutions, by M. K. Jain, S. R. K.Iyengar, R. K. Jain, New Age International Pvt. Ltd., 1996.

**B.Sc. Mathematics**  
**SEMESTER -5**  
**MATHEMATICS PAPER BSMT-503 (A)- (Theory)**  
**DISCRETE MATHEMATICS & COMPLEX ANALYSIS**

**DISCRETE MATHEMATICS**

**UNIT 1:** [ 25 MARKS + 10 MARKS MCQ ]

[a] **Relations** and different types of relations. Binary relations, Equivalence relations and partitions, partial order relations, Posets, Hasse diagram, Lattices as posets, Properties of lattices, Lattices as algebraic systems, Sub lattices, Direct product of two lattices, Homomorphism, order isomorphism of two posets, Isomorphic lattices, Complete lattices, Distributive lattices, Complemented lattices.

[b] **Boolean algebra:**

Definition, Examples BA, Direct product of two BA, homomorphism, Atoms of BA, Anti atoms, Stone's representation theorem, The set  $A(x)$  of all atoms of BA and its properties. Isomorphism of a finite of finite BA and  $(P(A), \subseteq)$ , Boolean functions / expressions, Minterms, Maxterms, Representation of a B. expression as a sum of product Canonical form. Karnaugh map. Minimization of a B. expression by cube array representation and by Karnaugh map.

**COMPLEX ANALYSIS-I**

**UNIT 2:** [ 25 MARKS + 10 MARKS MCQ ]

[a] **Analytic functions:**

Functions of complex variables, limits, Theorems on limits, Continuity and differentiability, of complex functions, harmonic functions, Entire functions and analytic functions, Cauchy Riemann conditions in Cartesian and polar form.

[b] Definite integral contours, line integrals Cauchy-Goursat theorem(**without proof**), Cauchy's integral formula, Higher order derivative of analytic function, Morera's theorem, Cauchy's inequality and Liouville's theorem, Fundamental theorem of algebra, Maximum modulus theorem.

**Text Book of Mathematics PAPER BSMT 503 (A) UNIT 2**  
**COMPLEX ANALYSIS-1**

**“Complex Variables and Applications”**

**Fifth Edition,**

**Rul V. Churchill and James Ward Brown.**

**Mc Graw Hill Publishing Company.**

**Chapter 2**

- Sections 9 to 21.

**Chapter 4**

- Sections 30 to 35.
- Sections 36 to 37.  
[Lemma and Cauchy-Goursat theorem (in sections) 36 **without proof**],
- Sections 39 to 43.

**References:**

- (1) Complex variables and applications, by R. V. Churchill and J. \ Brown
- (2) Theory of functions of a Complex variables, by Shantinakaran, Chand & Co.
- (3) Complex variables, Introduction and applications, by Mark Ablowitz and A. S. Fokas, Cambridge University Press.
- (4) Graph theory with application to engineering and computer science. by Narsingh Deo. 1993, Prentice Hall of India Pvt. Ltd.
- (5) Foundation of Discrete Mathematics, K. D. Joshi, New Age International Ltd. Publishers.
- (6) A first look at Graph theory, by Clark.
- (7) Discrete Mathematical Structures with applications to computer science, by Trembley 1.P. and Manohar R.
- (8) Elements of Discrete Mathematics (2nd edition) by L. Liu, Me. GrawHill, International edition, Computer Science series, 1986.
- (9) Discrete Mathematics, By Vatsa, Vikas Publications.
- (10) Introduction Graph Theory, By R. J. Willsons
- (11) Discrete Mathematics Structure, By. Dugragi, Narora Pub.

**B.Sc. Mathematics**  
**SEMESTER - 5**  
**Mathematics PAPER BSMT – 501 (B) (Practical)**  
**Numerical Analysis – I**

- **Total Marks:- 35 Marks (External) + 15 Marks (Internal) = 50 Marks / 3 hours**

Pr. No.(1)	Fitting (1) a straight line and (2) $y = e^{ax}$
Pr. No.(2)	Fitting (1) a parabola and (2) $y = ax^b$
Pr. No.(3)	Gauss elimination
Pr. No.(4)	Gauss Jordan method [OMIT : Triangularisation method and Crout's method.]
Pr. No.(5)	Jacobi's method
Pr. No.(6)	Gauss Seidel's method [OMIT: Relaxation method]
Pr. No.(7)	Finite differences.
Pr. No.(8)	Gregory-Newton's forward interpolation formula.
Pr. No.(9)	Gregory-Newton's backward interpolation formula.
Pr. No.(10)	Equidistance terms with one or more missing values

**Notes :**

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5.
- 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
	<b>TOTAL</b>	[	<b>50 Marks</b>



**B.Sc. Mathematics**  
**SEMESTER - 5**  
**Mathematics PAPER BSMT – 502 (B) (Practical)**  
**Programming in C language**

- **Total Marks:- 35 Marks (External)+ 15 Marks (Internal) = 50 Marks / 3 hours**

Pr. No.(1)	To write a program to reverse a number,
Pr. No.(2)	To write a program to find sum of the digits,
Pr. No.(3)	To write a program to find prime number between two numbers,
Pr. No.(4)	To write a program to find nPr and nCr.
Pr. No.(5)	To write a program to print Armstrong numbers,
Pr. No.(6)	To write a program to generate arithmetic and geometric progressions.
Pr. No.(7)	To write a program to find compound interest for given years,
Pr. No.(8)	To write a program to find net salary of the employee.
Pr. No.(9)	To write a program to solve the quadratic equation,
Pr. No.(10)	To write a program to find number of odd number and even numbers.
Pr. No.(11)	To write a program to add and multiply two matrices.
Pr. No.(12)	To write a program to solve the equation by Bisection method or
Pr. No.(13)	To write a program to solve the equation by N-R method.
Pr. No.(14)	To write a program to verify a number whether it is palindrome or not.

**Notes :**

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5.
- 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
	<b>TOTAL</b>	[	<b>50 Marks</b>

**B.Sc. Mathematics**  
**SEMESTER - 5**  
**Mathematics PAPER BSMT – 503 (B) (Practical)**  
**Programming with SCILAB**

- **Total Marks:- 35 Marks (External)+ 15 Marks (Internal)= 50 Marks / 3 hours**

- Pr. No.(1) To find the inverse of a matrix using **GAUSS-ELIMINATION** method..
- Pr. No.(2) To find inverse of given matrix using **GAUSS-JORDAN** method
- Pr. No.(3) To find **Eigen values** and **Eigen vectors** of given matrix
- Pr. No.(4) To find inverse of given matrix using **CAYLEY-HAMILTON** theorem
- Pr. No.(5) To solve given system of simultaneous linear algebraic equations using **GAUSS-JORDAN** method.
- Pr. No.(6) To solve given system of simultaneous linear algebraic equations using **GAUSS-JACOBI** method.
- Pr. No.(7) To solve given system of simultaneous linear algebraic equations using **GAUSS-SEIDAL'S** method.
- Pr. No.(8) To draw graphs of **Cycloid**
- Pr. No.(9) To draw graphs of **Catenaries**
- Pr. No.(10) To draw graphs of **spiral  $r = \exp(-\theta/10)$** .

**Notes :**

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-5.
- 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
	<b>TOTAL</b>	[	<b>50 Marks</b>

**Syllabus of B.Sc. Semester-6**  
**According to Choice Based Credit System**  
**Effective from June – 2012**

*(Updated on date:- 01-02-2013  
and updation implemented from June - 2013)*

- **Program:** **B.Sc.**
- **Semester:** **6**
- **Subject:** **Mathematics**
- **Course codes:** **BSMT-601(A) -Theory**  
**BSMT-602(A) -Theory**  
**BSMT-603(A) -Theory**  
**BSMT-601(B) - Practical**  
**BSMT-602(B) - Practical**  
**BSMT-603(B) - Practical**  
**1 Project**
- **Total Credit Of The Semester** **24 Credit**

**B. Sc. MATHEMATICS SEMESTER : VI**

- The Course Design of B. Sc. Sem.- VI (Mathematics) according to choice based credit system (CBCS) comprising of Paper Number, Name, No. of theory lectures per week, No. of practical lectures per week , total marks of the course are as follows :

SR.NO	SUBJECT	NO. OF THEORY LECTURE PER WEEK	NO. OF PRACTICAL LECTURE PER WEEK	TOTAL MARKS	Credit Of Each Paper.
1	<b>PAPER BSMT-601 (A)</b> (Theory) <b>Graph Theory &amp; Complex Analysis-2</b>	6	-	70(External)+ 30 (Internal) = 100 Marks	4
2	<b>PAPER BSMT-602 (A)</b> (Theory) <b>Analysis-2 &amp; Abstract Algebra-2</b>	6	-	70(External)+ 30 (Internal) = 100 Marks	4
3	<b>PAPER BSMT-603 (A)</b> (Theory) <b>Optimization &amp; Numerical Analysis-II</b>	6	-	70(External)+ 30 (Internal) = 100 Marks	4
4	<b>PAPER BSMT-601 (B)</b> (Practical) <b>Introduction to SAGE</b>	-	6	35(External)+ 15(Internal) = 50 Marks	3
5	<b>PAPER BSMT-602 (B)</b> (Practical) <b>Numerical Analysis-II</b>	-	6	35(External)+ 15(Internal) = 50 Marks	3
6	<b>PAPER BSMT-603 (B)</b> (Practical) <b>Optimization</b>	-	6	35(External)+ 15(Internal) = 50 Marks	3
7	<b>Project Work &amp; Viva</b>	1 Guidance Lect. For a group of 2 to 5 students / week	Project work to be finalized and certified and evaluated.	<b>60Marks</b> <b>(Dissertation) +</b> <b>40 Marks</b> <b>( Viva ) =</b> <b>100 Marks</b>	3
<b>Total credit of the semester five</b>					<b>24</b>

**Marks Distribution Of Each Paper  
for  
Theory and Practical ( for SEMESTER-VI )**

- **Total Marks of Each Theory Paper [External Examination]**      **20 Marks (MCQ test)+  
50 Marks (Descr. type)=  
70 Total Marks.**
- **Total Marks of Each Theory Paper [Internal Examination]**      **10 Marks Assignments +  
10 Marks QUIZ test +  
10 Internal exam. =  
30 Total Marks**
- **Total Marks of Each Practical Paper [External Examination]**      **35 Marks**
- **Total Marks of Each Practical Paper [Internal Examination]**      **15 Marks  
[Continuous internal assessment of  
practical work ]**

**Format of Question Paper**

- There shall be one question paper of **70 marks &  $2\frac{1}{2}$  hours** for each Mathematics **Theory Paper.**
- There shall be **TWO** sections in this paper i.e. **Section A** and **Section B.**

**Section – A**

**Section A is of 20 Marks** with **20 MCQ** type questions (multiple choice questions) covering the whole syllabus in equal weightage.

**Section – B**

**Section B is of 50 Marks** with the following type of **TWO** questions covering the whole syllabus in equal weightage, each of twenty five marks.

**Question 1 and 2** will cover unit 1 and 2 respectively.

<b>Question no.</b>	<b>(A)</b>	Answer any <b>three out of six</b>	<b>6 Marks</b>
	<b>(B)</b>	Answer any <b>three out of six</b>	<b>9 Marks</b>
	<b>(C)</b>	Answer any <b>two out of five</b>	<b>10 Marks</b>
	<b>TOTAL</b>		<b>25 MARKS</b>

**B.Sc. Mathematics**  
**SEMESTER - 6**  
**MATHEMATICS PAPER BSMT – 601 (A) (Theory)**  
**GRAPH THEORY and COMPLEX ANALYSIS**

**GRAPH THEORY**

**UNIT 1:** [ 25 MARKS + 10 MARKS MCQ ]

[a] **Graph theory:**

Basic definitions and simple examples, Directed, Undirected, multi-graph, mixed graph. Incidence relation and degree of the graph. Empty, complete, regular graphs. Sub graph, connected and disconnected graphs.

Walk and unilateral components, Euler graphs, Unicursal graph, Operation of graph circuit & tree. Hamiltonian path and cycles, tree, Binary and Spanning trees.

[b] **Cut-set, connectivity and separability**

**[OMIT:-1-isomorphism, 2-isomorphism]**

planner graphs and their different representation, Dual of a planner graph, Euler's formula, Kuratowski's first and second non-planner graph, vector space associated with a graph, Circuit subspace and cut sets subspace, Orthogonal space.

Vertex coloring, Chromatic number, Index number and partition, Cyclic graph and demyelization of cyclic graphs, Matrix representation of a graph, Adjacency matrix, Incidence matrix, Path matrix,

**[OMIT :- Circuit matrix, Fundamental circuit matrix and cut set matrix, Relationship of these matrices]**

**Rank of the adjacency matrix.**

**COMPLEX ANALYSIS-2**

**UNIT 2:** [ 25 MARKS + 10 MARKS MCQ ]

[a] **Mapping and Conformal mapping:**

Elementary functions, mapping by elementary functions, Mobious mapping, linear function

Bilinear mapping  $w=(az+b)/(cz+d)$ ,  $w = z^2$ ,  $w = \frac{1}{z}$ ,

$w = e^{px}$ ,

**[OMIT:  $w = \sin z$ ,  $w = \cos z$ ,  $w = \cosh z$ ,  $w = \sinh z$**

**Transformations, Conformal mappings and their examples.]**

[b] **Power series:**

Definition of complex sequence, Complex series and power series Expansion of a complex function in Taylor's series and Laurent's series.

[c] **Residues and poles:**

Definition of a singular point, Isolated singular points, Zeros of complex functions, Poles and residues of complex function, Cauchy's residue's theorem, Evaluation of improper real integrals by residue theorem and evolution of definite integral of trigonometric functions by residue theorem.

**Text book for Mathematics PAPER BSMT – 601**

**Graph theory**

**Graph theory with application to engineering and computer science**

**By: - Narsingh Deo,**

**Prentice Hall of India Private Limited, New Delhi.**

**Chapter: 1**

- § 1.1, § 1.3, § 1.4, § 1.5
- [OMIT : - § 1.2 and § 1.6]

**Chapter: 2**

- § 2.1, § 2.2, § 2.3, § 2.4, § 2.5, § 2.6, § 2.7, § 2.8, § 2.9
- [OMIT: - § 2.10]

**Chapter: 3**

- § 3.1, § 3.2, § 3.3, § 3.5, § 3.6, § 3.7, § 3.8
- [OMIT: - § 3.4, § 3.9, § 3.10]

**Chapter: 4**

- § 4.1, § 4.2, § 4.3, § 4.4, § 4.5,
- [OMIT: - § 4.6, § 4.7, § 4.8 ]

**Chapter: 5**

- § 5.2, § 5.3, § 5.4, § 5.5, § 5.6
- [OMIT: - § 5.1, § 5.7, § 5.8, § 5.9]

**Chapter: 6**

- § 6.1, § 6.5, § 6.7, § 6.9
- [OMIT: - § 6.2, § 6.3, § 6.4, § 6.8]

**Chapter: 7**

- § 7.1, § 7.8, § 7.9
- [OMIT: - § 7.2, § 7.3, § 7.4, § 7.5, § 7.6, § 7.7]

**Chapter: 8**

- § 8.1, § 8.2, § 8.5
- [OMIT: - § 8.3, § 8.4, § 8.6]

**Chapter: 9**

- § 9.1, § 9.11
- [OMIT: - § 9.2 to § 9.10]

**Text Book of Mathematics PAPER BSMT 601**  
**COMPLEX ANALYSIS-2**

**“Complex Variables and Applications”**  
**Fifth Edition,**  
**Ruel V. Churchill and James Ward Brown.**  
**Mc Graw – Hill Publishing Company**

**Chapter 5**

- Sections 44, 45, 46, 47, 48 [Omit Sections: -49, 50, 51],

**Chapter 6**

- Sections 53 to 58, 60 [OMIT:- Sections 59]

**Chapter 7**

- Sections 64, 65, 66, 67, 68, 70  
[OMIT Sections: - 63, 71, 72]  
[OMIT: - Chapter 8]

**References:**

- (1) Complex variables and applications, by R. V. Churchill and J. \ Brown
- (2) Theory of functions of a Complex variables, by Shantinakaran, Chand & Co.
- (3) Complex variables, Introduction and applications, by Mark Ablowitz and A. S. Fokas, Cambridge University Press.
- (4) Graph theory with application to engineering and computer science.by Narsingh Deo. 1993,Prentice Hall of India Pvt. Ltd.
- (5) Foundation of Discrete Mathematics, K. D. Joshi, New Age International Ltd. Publishers.
- (6) A first look at Graph theory, by Clark.
- (7) Discrete Mathematical Structures with applications to computer science, by Trembley 1.P. and Manohar R.
- (8) Elements of Discrete Mathematics (2nd edition) by L. Liu, Me. GrawHill, International edition, Computer Science series, 1986.
- (9) Discrete Mathematics, By Vatsa, Vikas Publications.
- (10) Introduction Graph Theory, By R. J. Willsons
- (11) Discrete Mathematics Structure, By. Dugragi, N



**B.Sc. Mathematics**  
**SEMESTER - 6**  
**MATHEMATICS PAPER BSMT – 602 (A) (Theory)**

**ANALYSIS and ABSTRACT ALGEBRA**

**ANALYSIS-2**

**UNIT 1:** [ 25 MARKS + 10 MARKS MCQ ]

- [a] Cover, Open cover, Finite sub cover, Compact set, Properties of compact sets  
**Connected sets, Separated sets, Bolzano-Weirstrass theorem, Countable set.**
- [b] Homeomorphism of two metrics, Sequential compactness, totally bounded space.
- [c] **Laplace Transforms**  
Definition of Laplace Transforms, Laplace Transforms of elementary Function  
Inverse Laplace Transforms, Laplace Transforms of Derivative and Integrals,  
Laplace Transforms Differentiation and integration of Laplace Transforms,  
Convolution theorem. [Omit: - Application to Differential Equations.]

**ABSTRACT ALGEBRA-2**

**UNIT 2:** [ 25 MARKS + 10 MARKS MCQ ]

- [a] Homomorphism of groups, Kernel of homomorphism, First fundamental theorem of homomorphism of groups. Ring and its properties, Subring, [OMIT:- Boolean ring, Euclidean ring]
- [b] Field, Zero divisor, Integral domain, Characteristics of ring, Cancellation law, Ideals, Principal ideal, Polynomial ring, [OMIT:- Quotient ring. Maximal ideal] Polynomial, Degree of polynomial, Factor and remainder theorem of polynomial, Product, sum and division of polynomials.
- [c] Reducible and irreducible polynomials, Factorization of polynomials( unique Factorization theorem (without proof), [OMIT:- Eisenstein's criterion] Division algorithm theorem of polynomial
- [d] G.C.D. of polynomials, Quaternion [OMIT:- Ring homomorphism, Euler and Fermat's theorem]

**Text book for Mathematics PAPER BSMT – 602**

**ANALYSIS-2**

**For Laplace Transforms**

**'Advanced Mathematics for Pharmacy' By: - Mahajan Publishing House, Ahmedabad**

**Chapter: - 17 Laplace Transforms**

§ 17.1, § 17.2, § 17.3, § 17.4, § 17.5, § 17.6

[OMIT :- Application to Differential Equations]

**Text Book for MATHEMATICS PAPER BSMT-602(A)**

**“Abstract Algebra” ( Third Printing July 2005 )**  
**By: Dr. I. H. Sheth, Prentice Hall Of India, New Delhi.**

**Course of Mathematics PAPER BSMT – 602 (Abstract Algebra-2)** are covered by following Chapters/ Sections of the above mentioned book Abstract Algebra

**Chapter 12:** § 12.1, § 12.2, § 12.6  
**Chapter 13:** § 13.1, § 13.2, § 13.3, § 13.4  
**Chapter 14:** § 14.1, § 14.2, § 14.3, § 14.4  
**Chapter 15:** § 15.1, § 15.2, § 15.4 [OMIT:- § 15.3]  
**Chapter 18:** § 18.1, § 18.2, § 18.3,  
§ 18.4 [Omit: Theorem: 18.4.8  
i. e. unique Factorization theorem (**without proof**)],  
§ 18.5[OMIT: - § 18.6 - Eisenstein’s criterion ]  
§ 18.7.

**References :**

- (1) Topics in Algebra, I. N. Herstein, Willey Eastern Ltd. New Delhi
- (2) A text Book of Modern Abstract Algebra, by Shantinakaran, S. Chand & Co., New Delhi.
- (3) Fundamentals of Abstract Algebra, D. S. Malik, J. N. Mordoson  
and M. K. Sen, McGraw Hill International Edition - 1997
- (4) University Algebra, M. S. Gopalakrishna, Wiley Eastern Ltd.
- (5) Abstract Algebra, By Bhattacharya, Yallo Publications.
- (6) Modern Algera, By Kazi zamiudia & Sursit, Vikas Publication. Delhi.
- (7) Text Book: Abstract Algebra, Dr. I. H. Sheth, Nirav Prakashan, Ahmedabad.
- (8) Mathematical Analysis (2nd edition) by S. C. Malik & Arora, New Age Inter. Pvt.'
- (9) Mathematical Analysis, by T. M. Apostol
- (10) Real Analysis, by R. R. Goldberg (Chapel' 4,5,6, 7,9 & 10.1)
- (11) A course of Mathematical Analysis, by Shantinakaran, S. Chand & Sons.
- (12) Metric space, by E. T. Capson
- (13) Metric space, P. K. Jain & Ahmad, Narora Publishing House
- (14) Real Analysis by Sharma and Vasishta Krishna Prakashan, Meerut-2.
- (15) Mathematical Analysis, by Dr. Goyal and Gupta, Krishna Prakashan, Meerut-2.

**B.Sc. Mathematics**

**SEMESTER - 6**

**MATHEMATICS PAPER BSMT – 603 (A) (Theory)**  
**OPTIMIZATION and NUMERICAL ANALYSIS**

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**OPTIMIZATION**

**UNIT 1: [ 25 MARKS + 10 MARKS MCQ ]**

- [a] The linear programming problems, Formulation of LPP, Matrix form of the LPP, general form, Canonical form, Standard form of the LPP, Graphical method to solve LPP, Some definitions and basic properties of convex sets convex functions and concave function. Basic definitions to use Simplex method, Simplex method, Big-M method (Penalty method), Two phase method to solve LPP( without alternative solution and unbounded solution)
- [b] Principle of duality in LPP, Primal LPP and method to find its dual LPP (Simple problems of above articles). The transportation problems: Mathematical and matrix form of TP. Initial solution of TP by NWCM, LCM and VAM, Optimum solution of TP by Modi method ( u-v method ) (except degenerate solution), Balanced and unbalanced TP(Simple problem ), Assignment problem: Mathematical and matrix form of AP, Hungarian method to solve method(simple method).

**NUMERICAL ANALYSIS -2**

**UNIT 2: [ 25 MARKS + 10 MARKS MCQ ]**

- [a] **Central difference interpolation formulae:**  
Gauss's forward, Gauss's backward, Sterling's, Bessel's and Laplace- Everett's interpolation formulae.
- [b] **Interpolation with unequal intervals:**  
Divided differences, Properties of divided difference, Relation between divided differences and forward difference, Newton's divided difference formula, Lagrange's interpolation formula, Inverse interpolation, Lagrange's inverse interpolation formula,
- [c] **Numerical Differentiation:**  
Numerical Differentiation, Derivatives using Gregory-Newton's forward difference formula, Derivatives using Gregory-Newton's backward difference formula, Derivative using Sterling's formula.
- [d] **Numerical Integration:**  
Numerical Integration, General quadrature formula, Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.
- [e] **Numerical solution of ordinary differential equations**  
Solution by Taylor's series method, Taylor's series method for simultaneous first order differential equations, Picard's method, Picard's method for simultaneous first order differential equations, Euler's method, Improved Euler's method, Modified Euler's method.
- [f] Runge's method, Runge-Kutta methods, Higher order Runge-Kutta methods, Runge-Kutta methods for simultaneous first order differential equations, R-K methods for simultaneous first order differential equations, Predictor-Connector methods, Milne's method.

**Text Book for Mathematics PAPER BSMT – 603(A) (Theory)**

**OPTIMIZATION**

**Operation Research Theory and Applications’,  
J. K. Sharma, Second Edition,  
MACMILLAN INDIA LTD**

**Course of Mathematics PAPER BSMT – 603(A) OPTIMIZATION**  
is covered by following Chapters/ Sections of the above mentioned book

**Chapter 2:-**

- § 2.6 [Only]

**Chapter 3:-**

- § 3.1, § 3.2, § 3.3 [Omit:- § 3.4]

**Chapter 4**

- § 4.1, § 4.2, § 4.3, § 4.4 [Omit:- § 4.5 and § 4.6]

**Chapter 5**

- § 5.1, § 5.2, § 5.3 [Omit:- § 5.4, § 5.5 ]

**Chapter 9**

- § 9.1 to § 9.5 § 9.6
- [Only § 9.6.1 Unbalanced Supply and Demand]
- [Omit: - § 9.6.2, § 9.6.3, § 9.6.4... etc in § 9.6]
- [Omit: - § 9.7, § 9.8]

**Chapter 10** § 10.1 to § 10.3

- Appendix A A.10 and A.12
- [Omit: - § 10.4 to § 10.6]
- [Omit: - the rest]

The scope of the syllabus of **UNIT – 2** is roughly indicated as under:

"Numerical methods" by Dr. V. . Vedamurthy & Dr. N. Ch. S. N. Iyengar, Vikas Publishing house.

Chap.7 (Except 7.7,7.8), Chap. 8. (Except 8.8), Chap. 9. (Except 9.5, 9.13), Chap. 11. (Except 11.1, 11.2,11.3, 11.6, 11.9, 11.17, 11.20)

**Reference Books:**

(1) Introduction to Numerical Analysis (2nd Edition) by C.E.Froberg Addison Wasley, 1979

(2) Numerical Mathematical Analysis, by J. B.Scarforough, Oxford & IBH Publi.Co. Pvt. Ltd., 1966

(3) Numerical method, Problems & Solutions, by M. K. Jain, S. R. K.Iyengar, R. K. Jain, New Age International Pvt. Ltd., 1996

**B.Sc. Mathematics**  
**SEMESTER -6**  
**MATHEMATICS PAPER BSMT – 601(B) (PRACTICAL)**  
**Introduction to SAGE**

**Pr no: (1) Introduction to Sage:**

i.e. Introduction to variables, constants, data types, some inbuilt (library) constants & functions, how to enter a matrix, how to enter a vector, operators, how to get help etc.

**Pr no: (2) Operations on expressions:**

- (a) Solve  $f(x) = g(x), x$
- (b) Solve  $[f(x,y) = 0, g(x,y) = 0], x, y$
- (c) Find a root of  $f(x)$  in the given interval  $[a, b]$  such that  $f(x) \approx 0$  (approximate root)
- (d) Finding sum and product of the given series from 1 to  $n$  terms. (using `sum()` and `prod()` functions)

**Pr no: (3) Calculus :**

- (a) Find limit of a given function.
- (b) Find left and right hand side limits of a given function.
- (c) Find derivative of a given function.
- (d) Finding maxima and minima of a given function  $f(x)$  in the given interval  $(a, b)$ .
- (e) Find partial derivative of a given bi-variate function.
- (f) Find indefinite integral of a given function.
- (g) Find definite integral of a given function.
- (h) Find numerical integral of a given function.
- (i) Find Taylor series expansion of a given function  $f(x)$  about  $x=a$  upto degree  $n$ .

**Pr no: (4) 2D Graphics :**

- (a) Draw a line passing through the given points.
- (b) Draw a polygon having the given points as its vertices.
- (c) Draw a circle with the given point as center and with the given radius.
- (d) Plotting the graph of a given function  $f(x)$ .
- (e) Draw the graph of the function. (given in parametric form)
- (f) Drawing graph of the function. (in polar form)
- (g) Drawing combine graphs.
- (h) Using options in plotting of 2D graphs.

**Pr no: (5) 3D Graphics :**

- (a) Drawing a line in three dimension.
- (b) Draw a sphere with the given point as center and with the given radius.
- (c) Drawing Platonic solids (tetrahedron, cube, octahedron, dodecahedron, icosahedrons)
- (d) Draw the graph of given function  $f(x,y)$  in 3D.
- (e) Draw the graph of given function  $f(x,y)$  in 3D. (parametric form)
- (f) Using options in plotting of 3D graphs.

**Pr no: (6) Simplification and expansion of a given symbolic function.**

**Pr no: (7) Finding partial fractions of a given function  $f(x)$ .**

**Pr no: (8) Linear Algebra:**

- (a) Entering  $m \times n$  matrix and finding its determinant .
- (b) Finding transpose, adjoint and conjugate of a given matrix.
- (c) To determine whether the entered matrix is square, zero, identity, scalar, symmetric, invertible , nilpotent, idempotent or not.
- (d) Entering a square matrix and finding its inverse if exists.
- (e) Finding rank, nullity no. of rows, no. of columns, trace, transpose of a given matrix.
- (f) Finding Echelon form of the entered matrix.
- (g) Finding characteristic polynomial, eigen values and eigen vectors of the entered matrix.
- (h) Performing row operations on the entered matrix.

**Pr no: (9) Number Theory:**

- (a) Determine the entered number is a prime or not.
- (b) Find the next prime ,previous prime next probable prime to the entered number.
- (c) Finding primes  $p$  such that  $m \leq p < n$ . (using `prime_range(m,n)`)
- (d) Finding prime powers ( using `prime_powers(m,n)`).
- (e) Finding continued fractions of  $x$ .

**Pr no: (10) Group Theory and Graph Theory:**

- (a) Permutation group, Symmetric group and Alternating group of  $n$  symbols.
- (b) Abelian group, Matrix groups ( $GL$ =General Linear group and  $SL$ =Special Linear group), normal subgroups.
- (c) Drawing graphs with given vertices and edges.
- (d) Chromatic polynomial of graph  $G$ .
- (e) Testing planarity of graph.
- (f) Finding Shortest Path in a graph  $G$ .

**Notes :**

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-6.
- 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
	<b>TOTAL</b>	[	<b>50 Marks</b>

**B.Sc. Mathematics**  
**SEMESTER -6**  
**MATHEMATICS PAPER BSMT – 602(B) (PRACTICAL)**  
**NUMERICAL ANALYSIS – II**

Pr. No.(1)	Gauss forward interpolation formula.
Pr. No.(2)	Gauss backward interpolation formula.
Pr. No.(3)	Sterling's or Bessel's formula
Pr. No.(4)	Laplace-Everett's formula
Pr. No.(5)	Interpolation with unequal intervals.
Pr. No.(6)	Numerical differentiation.
Pr. No.(7)	Numerical integration.
Pr. No.(8)	Taylor's or Picard's
Pr. No.(9)	Euler's method.
Pr. No.(10)	Runge's method
Pr. No.(11)	Runge-Kutta's method
Pr. No.(12)	Milne's method

Journal and viva.

**Notes :**

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-6.
- 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
	<b>TOTAL</b>	[	<b>50 Marks</b>

**B.Sc. Mathematics**  
**SEMESTER -6**  
**MATHEMATICS PAPER BSMT – 603(B) (PRACTICAL)**  
**OPTIMIZATION**

- Pr. No.(1) Solve the given LPP using Graphical method.  
Pr. No.(2) Solve the given LPP using Simplex method.  
Pr. No.(3) Solve the given LPP using BIG -M method.  
Pr. No.(4) Solve the given LPP using TWO-PHASE method.  
Pr. No.(5) Obtain DUAL of the given Primal LPP;  
Pr. No.(6) Find the initial solution of given transportation problem using NWCM method.  
Pr. No.(7) Find the optimum solution of given transportation problem using LCM method.  
Pr. No.(8) Find the optimum solution of given transportation problem using VAM method.  
Pr. No.(9) Find the optimum solution of given transportation problem using MODI method.  
Pr. No.(10) Find the optimum solution of given assignment problem.

Journal and viva.

**Notes :**

- There shall be **SIX** periods of **1 hour** per week per batch of **15** students.
- **10** practical should be done during semester-6.
- 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
	<b>TOTAL</b>	[	<b>50 Marks</b>