

**SWAMI RAMANAND TEERTH  
MARATHWADA UNIVERSITY NANDED**

**CBCS PATTERN FOR  
B.A./ B.Sc. MATHEMATICS**

**Credit Course Effective From June 2016**

**For B.A./B. Sc I Year**

Semester	Section and Paper Code	Period per week	Paper No. and Title of the papers	Marks of Semester	Internal C.A.	Total Marks	Credits
I	CCM-1 Section A	4	Paper- I Differential Calculus	40	10	50	2
	CCM-1 Section B	4	Paper-II Algebra & Trigonometry	40	10	50	2
II	CCM-2 Section A	4	Paper –III Integral Calculus	40	10	50	2
	CCM-2 Section B	4	Paper- IV Geometry	40	10	50	2
Lab Course work (Annual Pattern Practical)	CCMP-1 Based on CCM- 1&2	3	Paper -V Practical on MATLAB only for B.Sc. Students	80	20 (R.B.=10 V.V=10)	100	4
Total Credits							12

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**CBCS PATTERN FOR B.A./ B.Sc. MATHEMATICS**

**Credit Course Effective From 2017-18**

**For B.A./B. Sc II Year**

Semester	Section And Paper Code	Period per week	Paper No. and Title of the papers	Marks of Semester	Internal C.A.	Total Marks	Credits
III	CCM-3 Section A	4	Paper –VI Real Analysis - II	40	10	50	2
	CCM-3 Section B	4	Paper – VII Group Theory	40	10	50	2
	CCM-3 Section C	4	Paper –VIII Ordinary Differential Equations (NOTE:- This Paper is Only For B.Sc. Students.)	40	10	50	2
	SEC-I		Five skill out of which one Skill can be chosen		15×3=45		2*
IV	CCM-4 Section A	4	Paper-IX Real Analysis–II	40	10	50	2
	CCM-4 Section B	4	Paper –X Ring Theory	40	10	50	2
	CCM-4 Section C	4	Paper XI Partial Differential Equation (NOTE:- This Paper is Only	40	10	50	2

			For B. Sc. Students)				
Lab Course work (Annual Pattern Practical)	CCMP-2 Based on CCM-3&4	3	Paper –XII Practical on MATLAB only for B.Sc. Students	80	20 (R.B.=10 V.V=10)	100	4
	SEC-II		Five skill out of which one Skill can be chosen		15×3=45		2*
Total Credits							20

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**CBCS PATTERN FOR B.A./ B.Sc. MATHEMATICS**

**Credit Course Effective From 2018-19**

**For B.A./B. Sc III Year**

Semester	Section Paper Code	Period per week	Title of the papers	External and Internal Exam	Internal C.A.	Total Marks	Credits
V	DSEM-5 Section A	4	Metric Spaces	40	10	50	2
	DSEM-5 Section B	4	Linear Algebra	40	10	50	2
	DSEM-5 Section C	4	Choose any one of the Following Electives papers i) Topology ii) Number Theory iii) Operation Research iv) Introduction to Fuzzy logic	40	10	50	2
	SEC-III		Five skill out of which one Skill can be chosen		15×3=45		2*
VI	DSEM-6 Section A	4	Numerical Analysis	40	10	50	2
	DSEM-6	4	Integral Transforms	40	10	50	2

	Section B						
	DSEM-6 Section C	4	Choose any one of the Following Electives papers i) ) Complex Analysis ii) Discrete Mathematics iii) Mechanics iv) Fundamentals of applied Statistics	40	10	50	2
Lab Course work (Annual Pattern Practical)	DSEMP-3 Based on DSEM-5&6	3	Practical on MATLAB only for B.Sc. Students	80	20 (R.B.=10 V.V=10)	100	4
	SEC-IV		Project Work	50			2*
<b>Total Credits</b>							<b>20</b>

**Swami Ramanand Teerth Marathwada University, Nanded  
(M.S.).  
B.A./B.Sc. First Year  
CBCS PATTERN FOR B.A./ B.Sc. MATHEMATICS  
SEMESTER - I & II**

**Effective from June -2016**

**B.A/B.Sc. F.Y. Semester- I**

**(CBCS PATTERN)**

**Paper I (MT 101): Differential Calculus  
( CCM-1(Section A) For 2 Credits)**

**(No. of periods: 60 Max. Marks:50)**

**Revision:** Relation, Functions, Limit, Continuity, Differentiation, Derivatives of some standard functions, Some rules of Differentiation.

**Unit I:** Hyperbolic functions, Higher order derivatives,  $n^{\text{th}}$  order derivatives, Leibnitz theorem, Equation of tangent and normal, Angle of intersection of two curves, Length of tangent, normal, sub tangent and subnormal at any point of a curve.

**Unit II:** Rolle's theorem, Lagrange's mean value theorem, Meaning of sign of derivative, Cauchy's mean value theorem, Generalized mean value theorems (Taylor's theorem, Maclaurin's theorem), Expansions of some functions. Indeterminate forms:  $0/0$ ,  $\infty/\infty$ ,  $0 \cdot \infty$ ,  $\infty - \infty$ ,  $0^0$ ,  $1^\infty$ ,  $\infty^0$ .

**Unit III:** Functions of two variables, Neighborhood of a point (a,b), Limit & Continuity, Partial derivatives, Geometrical Interpretation, Homogeneous functions, Theorems on total differentials, Equality of  $f_{xy}(a,b)$  &  $f_{yx}(a,b)$ , Equality of  $f_{xy}$  &  $f_{yx}$ , Taylors theorem for functions of two variables.

**TEXT BOOK:**

Shanti Narayan, “Differential Calculus” S. Chand & Co.

Scope: Unit I: 4.7, 5.1-5.5, 6.1-6.4.

Unit II: 7.1-7.7, 9.1-9.7.

Unit III : 10.1-10.9, A<sub>1</sub>- A<sub>3</sub>.

**REFERENCES:**

- 1) Differential calculus By shanty Narayan and P.K. Mittal ,S. Chand.
- 2) Text book on Differential Calculus”, Gorakh Prasad ,Pothishala Private limited pub.
- 3) Calculus , Schaum’s outline series By Ayres F.Mc Graw Hill,1981
- 4) Differential calculus By Edwards J., Mac Millan and Co. Ltd.
- 5) Introduction to Calculus by Green Span D. , Harper&Row
- 6) Lectures on Calculus and Differential Equations By T M Karadeand M S Bendre, Sonu Nilu Bandu ,Nagpur.
- 7) Theory and Problems on Advance Calculus , Murray and R.. Spiegel , Schaum Pub. Co. New York .
- 8) Advanced Calculus, G.P. Shrivastav, Hari Kishan, Nagendra Kumar, Ram Prasad and sons pub.

**B.A/B.Sc. F.Y. Semester- I**  
**(CBCS PATTERN)**  
**Paper II (MT 102): Algebra and Trigonometry**  
**((CCM-1,(Section B) , For 2 Credits))**  
**(No. of periods: 60 Max.Marks:50)**

**Unit I :** Matrices : Matrix, Different Types of Matrices, Equality of Matrices, Addition (Sum) of Two Matrices, Properties of Matrix Addition, Subtraction of Two Matrices, Multiplication of a Matrix by a Scalar, Properties of Multiplication of a Matrix by a Scalar, Multiplication of Two Matrices, Properties of Matrix Multiplication, Positive Integral Powers of a Matrix, Transpose of a Matrix, Conjugate of a Matrix, Transposed Conjugate of a Matrix, Determinant of a Square Matrix, Minor of an Element, Co-factor of an Element, Adjoint of a Square Matrix, Inverse of a Square Matrix, Singular and Non-singular Matrix, Orthogonal Matrices, The Determinant of an Orthogonal Matrix, Unitary Matrix.

**Unit II :** Rank of a Matrix and Linear Equations : Minor of Order  $k$  of a Matrix, Rank of a Matrix, Elementary Row and Column Operations, Elementary Operations, The Inverse of an Elementary Operation, Row and Column Equivalent, Equivalent Matrices, Working Procedure for Finding Rank Using Elementary Operations, Row-Echelon Matrix, Row Rank and Column Rank of a Matrix, Linear Equations, Equivalent Systems, System of Homogeneous Equations.

Characteristic Roots and Characteristic Vectors : Definitions, To Find Characteristic Vectors, Cayley-Hamilton Theorem (Statement Only)

**Unit III** : Trigonometry : Complex Quantities, DeMoivre's Theorem, Expansions of  $\sin n\theta$  and  $\cos n\theta$ , Expansions of the sine and cosine of an Angle in Series of Ascending Powers of the Angle, Expansions of the sines and cosines of Multiple Angles, and of Powers of sines and cosines, Exponential Series for Complex Quantities, Circular Functions for Complex Angles, Hyperbolic Functions, Inverse Circular Functions, Inverse Hyperbolic Functions.

**TEXT BOOK :**

Topics in Algebra By Om P. Chug, Kulbhusan Prakash, A.D.Gupta,

Anmol Publications Pvt. Ltd., New Delhi (First Edition 1997)

**Scope : Unit I** : Chapter 10 : 10.1 to 10.17 (10.13, 10.15, 10.17 Only Statements), 10.20 to 10.22, 10.27 to 10.32, 10.34 to 39 (10.39 Only Statements)

**Unit II** : Chapter 11 : Art 11.1, 11.2, 11.5 to 11.16, 11.32 to 11.39  
Chapter 12 : Art 12.1 to 12.3, 12.18 (Only Statement)

**Text Book : 2.** Plane Trigonometry Part II By S.L.Loney,

A.I.T.B.S. Publishers and Distributors, Delhi (Reprint 2003)

**Scope : Unit III** : Art. 17, 18, 19, 21, 22, 27, 32, 33, 42, 43, 44, 45, 46, 47, 56, 57, 58, 59, 60, 61, 62, 63, 67, 68, 69, 71, 73, 74, 76, 77, 79.

**REFERENCES :**

1. A Text Book of Matrices By Shanti Narayan (S.Chand & Company Ltd., New Delhi)
2. Matrices By A.R.Vasishtha (Krishna Prakashan Media (P) Ltd., Meerut)
3. First Course in Linear Algebra by P.B.Bhattacharya, S.K.Jain, S.R.Nagpaul (New Age International (P) Limited Publishers)



4. Elementary Topics in Algebra By K. Khurana and S.B. Malik. (Vikas Publishing House Pvt. Ltd., New Delhi.)
5. Higher Trigonometry B. C. Das, B. N. Mukherjee, By (U.N.Dhur & Sons Private Ltd. Kolkata)
6. Arihant Trigonometry, Amit M. Agrawal (Arihant Publication Pvt. Ltd).
7. Lectures on Algebra and Trigonometry By T M Karade and M S Bendre, Sonu Nilu Bandu ,Nagpur.
8. Text Book on Trigonometry By R S Verma and K. S. Shukla, Pothishala Private limited pub.
9. Elementary Matrix Algebra By Hohn Franz E, Amerind Pub. Co. Pvt. Ltd.
10. Text Book on Algebra and Theory Of Equations By Chandrika Prasad, Pothishala Private limited pub.

**B.A/B.Sc. F.Y. Semester- II**  
**(CBCS PATTERN)**  
**Paper III (MT 103): Integral Calculus**  
**(CCM-2,(Section A) , For 2 Credits)**  
**(No. of periods: 60 Max. Marks:50)**

**Unit I : Integration, Definition, Standard Forms,**

Methods of Integration, Integral of product of two functions, Reduction formulae, Integral of rational fractions, Partial fractions, Non-repeated linear factors, Repeated factors, Integration of Irrational Algebraic fractions, A rational function of a root of a linear expression and x, Integration of  $x^m(a + b^n)^p$ , Reduction formulae for  $\int x^m (a + b^n)^p dx$ .

**Unit II : Integration of Transcendental Functions :**

Integration of  $\sin^m x$ ,  $\cos^n x$ , reduction formulae for  $\int \sin^n x dx$ , reduction formulae for  $\int \sin^m x \cos^n x dx$ , Integration of  $\tan^n x$  and  $\cot^n x$ , Integration of  $\sec^n x$  and  $\operatorname{cosec}^n x$ , Integration of  $x^n \sin mx$  or  $x^n \cos mx$ ,  
Definite Integrals : Definitions, General properties of the definite integrals, The integral as the limit of a sum, Areas

### **Unit III : Areas of Curves :**

Areas of curve given by Cartesian equations, Areas of curves given by polar equations. Multiple Integrals : Double integrals, Evaluation of double integrals, Area by double integration, Volume under a surface, Triple integrals, Gamma function, Definition, An important property, Product of two single integrals, Value of  $\Gamma(1/2)$ , Integral of  $\sin^{2m-1}x \cos^{2n-1}x$ , Beta function, Dirichlet's integral

### **TEXT BOOK :**

Integral Calculus, by Gorakh Prasad, Pothishala Private Limited, 2, Lajpat Road, Allahabad-211002

### **Scope :**

#### **Unit I :**

Chapter 1 : 1.10, 1.11, 1.13, 1.3, 1.35, 1.37

Chapter 2 : 2.1, 2.2, 2.3

Chapter 3 : 3.1, 3.8, 3.81

#### **Unit II :**

Chapter 4 : 4.1, 4.11, 4.12, 4.2, 4.21, 4.4

Chapter 5 : 5.1, 5.2, 5.3, 5.4, 5.5

#### **Unit III :**

Chapter 7 : 7.1, 7.2

Chapter 10 : 10.1, 10.2, 10.3, 10.31, 10.7

Chapter 11 : 11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7

### **REFERENCES :**

[1] *Mathematical Analysis By S.C.Malik & Savita Arora (Second revised edition).*

[2] *Advanced Calculus* by Spiegel M. R., Schaum's Outline Series, McGraw Hill Book Company.

[3] *Calculus A Complete Course* by Robert A. Adams, Pearson Addison Wesley, Toronto.

[4] *Calculus Volumes I, II* by Apostol T. M., Wiley.

[5] *Differential and Integral Calculus Volumes I, II* by N. Piskunov, G. K. Publishers, Noida

[6] Integral calculus by Shanti Narayan and P.K.Mittal,S.Chand and Comp.Ltd.

[7]Advanced Integral calculus by J.K.Goyal and K.P.Gupta,Pragati Prakashan,Meerut.

[8] Integral calculus by U.P.Singh,R.J.Srivastave and N.H.Siddiqui,Dominant Publishers and Distributors New Delhi-110002.

[9] Problems in Mathematical Analysis III: Integration, Kaczor, W.J., Nowak, M.T., University Press.

**B.A/B.Sc. F.Y. Semester- II**  
**(CBCS PATTERN)**  
**Paper IV (MT 104): Geometry**  
**(CCM-2, (Section B ), For 2 Credits)**  
**(No. of periods: 60 Max.Marks:50)**

**Unit I** : Co-ordinates : Direction cosines of a line, a useful relation, relation between direction cosines, Projection on a straight line, projection of a point on a line, projection of a segment on another line, projection of a broken line, projection of the join of two lines. angle between two lines.

The Plane : Theorem , converse of the preceding theorem, Transformation to the normal form, direction cosines of the normal to a plane, angle between two planes, determination of plane under given conditions, intercept form of the equation of a plane, plane through three

points, system of planes, two sides of a plane, length of perpendicular from a point to a plane, bisectors of angle between two planes.

**Unit II** : Right line : Representation of line, equation of line through a given point drawn in a given direction, equation of a line through two points, two forms of the equation of line, Transformation from the unsymmetrical to the symmetrical form, angle between a line and a plane, condition for a line to lie in a plane, coplanar lines, condition for coplanarity of lines, Number of arbitrary constants in the equation of straight line, determination of lines satisfying given conditions, the shortest distance between two lines, length of the perpendicular from a point to a line.

Transformation of Co-ordinates: Introduction , change of origin, change of the direction of a axes, relation between direction cosines of three mutual perpendicular lines.

**Unit III** : The Sphere: Definition, equation of sphere, General equation of a sphere, The sphere through four given points, sphere, plane section of a sphere, intersection of two spheres, sphere with a given diameter, equation of a circle, sphere through a given circle, intersection of a sphere and a line, Power of a point, equation of a tangent plane, plane of contact, the polar plane , pole of plane, some results concerning poles and polars, angle of intersection of two spheres, condition for the orthogonally of two spheres.

Cones, Cylinders: Definition, equation of a cone with a conic as a guiding curve, The right circular cone, definition, the cylinder, equation of a cylinder, the right circular cylinder, definition.

**TEXT BOOK :**

Analytical Solid Geometry, By Shanti Narayan and Dr. P.K. Mittal

( S. Chand Publication.)

**Scope : Unit I** : Chapter 1 : Art. 1.6, to 1.8

Chapter 2 : Art. 2.1 to 2.7

**Unit II** : Chapter 3 : Art. 3.1 to 3.7.

Chapter 5 : Art. 5.1 to 5.2

**Unit III** : Chapter 6 : Art. 6.1 to 6.7.

## REFERENCES

- 1) Analytical Geometry of two and three dimentions, By Quiz Zameeruddin:  
Narsoba Pub.
- 2) Text Book on coordinate Geometry, By Gorakh Prasad, H.C. Gupta;  
Pothishala Pub.
- 3) Lecturers on Vector Analysis and Geometry, By T.M. Karde and M.S.  
Bendre.
- 4) Analytical Geometry of Three dimensions ,By N. Saran and R.S. Gupta ,  
Pothishala Pub.
- 5) A Text Book of Analytical Geometry of Three dimensions, By P. K. Jain  
and Khalil Ahmad ,Wiley Eastern Ltd.
- 6) Elementary Treatise on Co-ordinate geometry of three Dimensions By  
R.J.T. Bell, Mac Millan India Ltd.

## **B.Sc. F.Y. PRACTICAL PAPER**

**(Annual pattern)**

*WITH EFFETIVE FROM June 2016.*

**CBCS PATTERN**

**PAPER V: (MP105): PRACTICAL PAPER:  
(CCMP-1, Based on CCM-1 and 2 , For 4 Credits) (No. Of  
(Periods per Batch 2 per week , max . marks 100 )  
SOFTWARES: MATLAB or Related Freeware.**

**N.B.:** PRACTICAL PAPER IS ONLY FOR B.Sc. Students.

**Section 1:** Introduction to MATLAB: MATLAB Programming language, Built-in Functions, Graphics, computations, External interface and Tool boxes. Basics of MATLAB: MATLAB windows, desktop, command window, workspace, Figure and Editor Windows, Input-output, File types, platform dependence, Printing. Programming in MATLAB: Scripts and

functions. Script files, function files: Executing of function, writing good functions, sub functions, compiled functions.

**Section 2:** Interactive computation :- (MATRICES) Matrices and Vectors, input, indexing, matrix manipulation, creating vectors. Matrix and Array operations, Arithmetic operations, Relational operations, logical operations, Elementary math functions, matrix functions, character string. Command line Functions, Inline functions, Anonymous functions .Built-in functions, finding the determinant of matrix, finding eigen-values and eigenvectors.

Saving and loading Data, Importing data files, recording a session. Applications: - Linear Algebra. Solving a linear system, Gaussian elimination, Finding eigenvalues and eigenvectors, matrix factorization, advanced topics.

**Section 3:** Plotting of Graphs: - Plotting simple Graphs. Graphics: - Plotting of 2D graphs, Using subplot for multiple graphs, 3DPlots (Drawing of different Geometrical objects), saving and Printing.

**Reference Book:** (for MATLAB Users).

1. Getting Started With MATLAB 7. Rudra Pratap, Oxford University Press, (Indian Eden)[www.oup.com](http://www.oup.com), ISBN-0-19-568001-45

**Scope** Chapter 1: Art. 1.1,1.6. Chapter 3: art 3.1, 3.2, 3.4, 3.5, 3.6, 3.7,

Chapter 4: 4.1, 4.2

Chapter 5: Art. 5.1

Chapter 6: Art 6.1, 6.2, 6.3.

**NOTE:** 1) Section 1 is introductory part, so no question to be set for Examination.

2) Record book must contain 10 practical on section 2 and 10 Practical on section 3.

## B.Sc. F.Y. PRACTICAL PAPER

(Annual pattern)

*WITH EFFECTIVE FROM June 2016*

(LIST OF PRACTICALS)

**N.B.:** PRACTICAL PAPER IS ONLY FOR B.Sc. Students

Any twenty of the following practical problems :

- 1) To enter the Matrix  $A$  and pick-out following entries from it :  $A_{11}$ ,  $A_{21}$ ,  $A_{22}$ ,  $A_{23}$ .
- 2) To find the transpose a matrix.
- 3) For two matrices  $A$  and  $B$ , to find  $A + B$  &  $B + A$  and to verify whether the matrix addition is commutative.

- 4) For a square matrix  $A$  to find  $A^2, A^3, A^4, A^5$ .
- 5) For two matrices  $A$  and  $B$ , confirmable for multiplication from both sides, to find  $AB$  and  $BA$ .
- 6) To verify the associativity of matrix addition.
- 7) To verify both left distributive law and right distributive law.
- 8) To find the determinant of a square matrix.
- 9) To find the inverse of a square matrix.
- 10) To find the rank of the matrices.
- 11) To solve the system of linear equations whose matrix equation is  $Ax = b$  and check the solution.
- 12) To find the eigen values of a square matrix.
- 13) To find the eigen vectors of a square matrix.
- 14) To find the characteristic polynomial of a square matrix.
- 15) To find the conjugate a matrix.
- 16) To plot  $f(x) = e^{-x/10} \sin x$  for  $x$  between 0 and 20.
- 17) To plot  $r(\theta) = 1 + 2\sin^2(2\theta)$  for  $0 < \theta < 2\pi$ .
- 18) To plot the contours of  $z = \cos x \cos y \exp\left(-\sqrt{x^2 + y^2}/4\right)$  over the default domains.
- 19) To plot the surface for  $z = \frac{-5}{(1+x^2+y^2)}$  over the domain  $|x| < 3$  and  $|y| < 3$ .
- 20) To plot multiple graphs  $y_1 = \sin t, y_2 = t, y_3 = 1 - \frac{t^3}{3!} + \frac{t^5}{5!}$  in same figure window.
- 21) To plot  $x = e^{-t}, y = t, 0 \leq t \leq 2\pi$ .
- 22) To plot  $f(t) = t \sin t, 0 \leq t \leq 10\pi$ .
- 23) To plot the surface  $z = \frac{xy(x^2 - y^2)}{x^2 + y^2}, -3 \leq x \leq 3, -3 \leq y \leq 3$  by computing the values of  $z$  over 50 x 50 grid on specified domain.
- 24) To draw a cylinder with base radius  $r = 40$  and top radius  $r = 60$
- 25) To plot the unit sphere.
- 26) To draw discrete data plot with stems :  $x = t, y = t \sin(t), z = e^{t/10} - 1$  for  $0 \leq t \leq 6\pi$ .
- 27) To draw the MATLAB logo ( $z = \cos x \cdot \cos y \cdot e^{-\sqrt{x^2+y^2}/4}$  for  $|x| \leq 5, |y| \leq 5$ ).
- 28) To draw the pie chart for the world population by continents for data.
- 29) To draw the bar chart for the world population by continents for data.
- 30) To plot  $x = t, y = e^t, 0 \leq t \leq 2\pi$ .

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