VIVEKANAND COLLEGE, KOLHAPUR

(AUTONOMOUS)

DEPARTMENT OF MATHEMATICS

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

Curriculum, Teaching and Evaluation Structure

for

B.Sc.-I Mathematics

Semester-I & II

(Implemented from academic year 2023-24 onwards)

Vivekanand College, Kolhapur (Autonomous)

Department of Mathematics
B.Sc. I

POs:

- **PO1: Disciplinary Knowledge:** Graduates will gain in-depth understanding in their specific major or discipline, mastering the foundational principles and theories, as well as advanced concepts. Execute strong theoretical and practical understanding developed from the specific programme in the area of work.
- **PO2: Problem-Solving Skills:** Graduates will learn to use their knowledge to identify, analyse, and solve problems related to their field of study Students should progress their vertical mobility
- **PO3: Analytical Skills:** Graduates will gain the ability to collect, analyse, interpret, and apply data in a variety of contexts. They might also learn to use specialized software or equipment
- **PO4: Research Skills and Scientific temper:** Depending on the field, graduates might learn how to design and conduct experiments or studies, analyse results, and draw conclusions. They might also learn to review and understand academic literature.
- **PO5: Communication Skills:** Many programs emphasize the ability to communicate effectively, both orally and in writing. Graduates may learn to present complex information clearly and succinctly, write detailed reports, and collaborate effectively with others.
- **PO6: Ethics and Professionalism**: Graduates may learn about the ethical and professional standards in their field, and how to apply them in real-world situations.

B.Sc. In Mathematics

PSOs:

- **PSO1:** Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
- **PSO2:** The skills and knowledge gained has intrinsic beauty, which also leads to proficiency in analytical reasoning. This can be utilised in modelling and solving real life problems.
- **PSO3:** Students should be able to recall basic facts about mathematics and train the students to extract information, formulate and solve problems in systematic and logical manner.
- **PSO4:** Students will learn numerical aptitude applying both qualitative and quantitative knowledge for their further career.
- **PSO5:** This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

VIVEKANAND COLLEGE, KOLHAPUR (AUTONOMOUS)

Department of Mathematics

Teaching and Evaluation Scheme

Three/Four- Years UG Programme

Department/Subject Specific Core or Major (DSC)

First Year Semester-I & II

Sr. No.	Course Abbr.	Course code	Course Name	Teaching Scheme Hours/week		Examination Scheme and Marks				Course Credits
				TH	PR	ESE	CIE	PR	Marks	
Semester-I										
1	DSC-I	DSC03MAT11	Differential Calculus	2	-	40	10	-	50	2
2	DSC-II	DSC03MAT12	Basic algebra and Complex numbers	2	-	40	10	-	50	2
3	MIN-I	MIN03MAT11	Differential Calculus	2	-	40	10	-	50	2
4	MIN-II	MIN03MAT12	Basic algebra and Complex numbers	2	-	40	10	-	50	2
5	OEC-I	OEC03MAT11	Logical reasoning	2	-	40	10	-	50	2
6	OEC-II	OEC03MAT12	Quantitative Aptitude	2	-	40	10	-	50	2
Semester-II										
1	DSC-III	DSC03MAT21	Differential Equations-I	2	-	40	10	-	50	2
2	DSC-IV	DSC03MAT22	Geometry	2	-	40	10	-	50	2
3	MIN-III	MIN03MAT21	Differential Equations-I	2	-	40	10	-	50	2
4	MIN-IV	MIN03MAT22	Geometry	2	-	40	10	-	50	2
5	OEC-III	OEC03MAT21	Quantitative Analysis	2	-	40	10	-	50	2
6	OEC-IV	OEC03MAT22	Introduction to Applied Mathematics	2	-	40	10	-	50	2
7	SEC-I	SEC03MAT29	Foundation of Mathematics	2	-	50	-	-	50	2
Annual										
1	DSC-PR-I	DSC03MAT29	DSC Mathematics Lab-1	-	4	-	-	50	50	4
2	MIN-PR-I	MIN03MAT29	MIN Mathematics Lab-1	-	4	-	-	50	50	4
3	OEC-PR-I	OEC03MAT29	OEC Mathematics Lab-1	-	4	-	-	50	50	4
	Total			**26**	**12**	**530**	**120**	**150**	**800**	**38**

B. Sc. Part – I Semester -I Mathematics

DSC-I: DSC03MAT11: Differential Calculus

Theory: 30 hrs.
Marks-50 (Credits: 02)

Course Outcomes (COs):

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

1. Calculate the limit and examine the continuity of a function at a point.
2. Employ theorem on properties of continuity in various examples.
3. Understand the consequences of various mean value theorems for differentiable functions.
4. Understand Higher order derivatives, Taylor's theorem and indeterminate form

UNIT	Contents	Hours Allotted
1	Limit And Continuity: 1.1 Definition of limit of a real-valued function 1.2 Algebra of limits 1.3 Limit at infinity and infinite limits 1.4 Definition: Continuity at a point and Continuous functions on interval 1.5 Theorem: If f and g are continuous functions at point $x = a$, then $f+g$, $f-g$, $f.g$ and f/g are continuous at point. 1.6 Theorem: Composite function of two continuous functions is continuous. 1.7 Examples on continuity. 1.8 Classification of Discontinuities (First and second kind), Removable Discontinuity, Jump Discontinuity.	08
2	Properties of continuity of Real Valued functions: 2.1 Theorem: If a function is continuous in the closed interval [a, b] then it is bounded in [a, b] 2.2 Theorem: If a function is continuous in the closed interval [a, b], then it attains its bounds at least once in [a, b]. 2.3 Theorem: If a function f is continuous in the closed interval [a, b] and if f(a) and f(b) are of opposite signs then there exists $c \in (a, b)$ such that $f(c) = 0$, 2.4 Theorem: If a function f is continuous in the closed interval [a, b] and if $f(a) \neq f(b)$ then f assumes every value between f (a) and f (b). 2.5 Uniform continuity.	05
3	Differentiability: 3.1Differentiability of a real-valued function 3.2 Geometrical interpretation of differentiability 3.3 Relation between differentiability and continuity 3.4Chain rule of differentiation 3.5 Mean Value theorems: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem 3.6 Geometrical interpretation of mean value theorems. 3.7 Partial differentiation	08
4	Successive differentiation 4.1 Successive differentiation 4.2 Leibnitz's theorem and its application 4.3Maclaurin's and Taylor's theorems 4.4 Maclaurin's and Taylor's expansion for standard function 4.5 Indeterminate form.	09

Recommended Books:

1.Shanti Narayan, Dr. P. K. Mittal, Differential Calculus, S. Chand Publications

2. Gorakh Prasad (2016). Differential Calculus (19 th edition). Pothishala Pvt. Ltd.

Reference Books:

1.Hari Kishan, Calculus, Atlantic Publishers.

2. Michael Spivak, Calculus, Cambridge University Press.

B. Sc. Part – I Semester -I Mathematics

DSC-II: DSC03MAT12: Basic Algebra and Complex Numbers

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Understand the importance of roots of real and complex polynomials and learn various methods of obtaining roots
2. Employ De Moivre's theorem in a number of applications to solve numerical problems.
3. Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.
4. Find eigenvalues and corresponding eigenvectors for a square matrix.

UNIT	Contents	Hours Allotted
1	Theory of Equations 1.1 Elementary theorems on the roots of an equations 1.2 The remainder and factor theorems, Synthetic division 1.3 Factored form of a polynomial. 1.4 The Fundamental theorem of algebra. 1.5 Relations between the roots and the coefficients of polynomial equations 1.6 Integral and rational roots.	07
2	Complex Numbers: 2.1 Introduction 2.2 Polar representation of complex numbers 2.3 De Moivre's theorem (integer and rational indices) 2.4 Roots of a complex number, expansion of $\cos n\theta, \sin n\theta$ 2.5 Euler's exponential form of a complex number 2.6 circular function and its periodicity 2.7 Hyperbolic function	08
3	Matrices: 3.1 Types of Matrix, Transpose of matrix, Conjugate of matrix, Transposed-conjugate of a matrix 3.2 Row reduction and echelon forms 3.3The rank of a matrix and applications, Inverse of matrix 3.4 Eigenvalues and eigenvectors of matrix 3.5 Cayley-Hamilton theorem and its application	08
4	System of linear equations 4.1 Homogeneous linear equations 4.2 Nature of solution of AX = 0 4.3 Non – Homogeneous linear equations 4.4 Working rule for finding solution of AX = B 4.5 Examples.	07

Recommended Books:

1. W. S. Bunside and A. R. Panton:The Theory of Equations: With an Introduction to the Theory of Binary Algebraic Forms, Dover Phoenix Editions, 2005.

2. Brown and Churchill, Complex Variables and Applications, 7th Edition, McGraw Hill, 2010.

3. Serge Lang: Introduction to Linear Algebra, Second Edition, 1986

Reference Books:

1.M.L.Khanna, Theory of Equations, Jai Prakash Nath and Company

2.P.N. Wartikar, J.N. Wartikar, A Textbook of Applied Mathematics, Pune Vidyarthi Griha Prakashan, Pune

3.A. R. Vasishtha, A. K. Vasishtha, Matrices, Krishna Prakashan Media(P) Ltd,Meerut

4. S. Kumaresan, Linear Algebra: A Geometric Approach, Prentice Hall of India, New Delhi, 1999

B. Sc. Part – I Semester -II Mathematics

DSC-III: DSC03MAT21: Differential Equations - I

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations
2. Calculate P.I and C.F. of different types of differential equation
3. Solve differential equation of degree more than one.
4. Learn techniques of solving Clairaut's Equation.

UNIT	Contents	Hours Allotted
1	Differential Equations of first order and first degree: 1.1 Revision: Definition of Differential equation, order and degree of Differential equation. 1.2 Definition: Exact Differential equations. 1.2.1 Theorem: Necessary and sufficient condition for exactness. 1.2.2Working Rule for solving an exact differential equation 1.2.3 Integrating Factor (I.F.) by using rules (without proof). 1.3 Linear Differential Equation: Definition. 1.3.1 Method of solution. 1.4 Bernoulli's Differential Equation: Definition. 1.4.1 Method of solution. 1.5 Orthogonal trajectories: Cartesian and polar co-ordinates.	08
2	Linear Differential Equations with constant Coefficients: 2.1 Definition: Complementary function (C.F.) and particular integral (P.I.), operator D. 2.2 General Solution of f(D) y=0. 2.2.1 Solution of f (D) y = 0 when A.E. has non-repeated roots. 2.2. 2 Solution of f (D) y = 0 when A.E. has repeated roots. 2.2.3 Solution of f (D) y = 0 when A.E. has non-repeated roots real and complex roots. 2.3 Solution of D(y) = X, where X is of the form 2.3.1 $e^{ax}, where\ a\ is\ constant$ 2.3.2 $\sin(ax)\ and \cos(ax)$ 2.3.3 x^m, m is positive integer 2.3.4 $e^{ax}V, where\ V\ is\ a\ function\ of\ x$ 2.3.5 $xV, where\ V\ is\ a\ function\ of\ x.$	12
3	Equations of first order but not first degree: 3.1 Equations that can be factorized 3.1.1 Equation solvable for p 3.2 Equations that cannot be factorized 3.2.1 Equation solvable for x 3.2.2 Equation solvable for y	06
4	Clairaut's Equation: 4.1 Clairaut's form 4.2 Method of solution	04

	4.3 Equation reducible to Clairaut's form 4.4 Special form reducible to Clairaut's form	

Recommended Books:

1.Daniel A. Murray, Introductory course in Differential Equations, Khosla Publishing House (1 January 2021)

2. Diwan, Agashe, Differential Equations, Popular Prakashan, Mumbai

Reference Books:

1. M. L. Khanna, Differential Equations, Jai Prakash Nath and Company

2. Dr. M. D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand Publications

B. Sc. Part – I Semester -II Mathematics
DSC-IV: DSC03MAT22: Geometry
Theory: 30 hrs.
Marks-50 (Credits: 02)

Course Outcomes (COs)
On completion of the course, the students will be able to:

1. Define the translation, rotation and understand relation between rotation and translation.
2. Estimate polar equation of circle, conic, chord, tangent.
3. Understand the various equation form sphere.
4. Learn various equation forms of cone.

UNIT	Contents	Hours Allotted
1	Changes of axis: 1.1 Translation 1.2 Rotation 1.3 Translation and Rotation 1.4 Rotation followed by Translation 1.5 Translation followed by Rotation 1.6 Invariants, Basic theorems	06
2	Polar Coordinates 2.1 Polar equation of circle: 2.1.1 Centre – radius form 2.1.2 Centre at the pole 2.1.3 Passing through the pole and touching the polar axis at the pole 2.1.4 Passing through the pole and with centre on the initial line 2.1.5 Passing through the pole and the diameter through pole making an angle α with initial line 2.2 Equation of chord, tangent and normal to the circle$r = 2acos\theta$ 2.3 Polar equation of a conic in the form$\frac{l}{r} = 1 \pm ecos\theta$ 2.4 Polar equation of a conic in the form$\frac{l}{r} = 1 \pm ecos(\theta - \alpha)$ 2.5 chord, tangent and normal of conic	08
3	Sphere: 3.1 Equation in different form 3.1.1 centre – radius form 3.1.2 General form 3.1.3 Diameter form 3.1.4 Intercept form 3.2 Intersection of sphere with straight line and a plane 3.3 Power of a point and radical plane 3.4 Tangent plane and condition of tangency 3.5 Equation of circle 3.6 Intersection of (i) two sphere (ii) a sphere and plane 3.7 Orthogonality of two spheres	09
4	Cone 4.1 Definitions of cone, vertex, generators 4.2 Equation of a cone with vertex at a point (X_1, Y_1, Z_1)	07

	4.3 Equation of a cone with vertex at origin 4.4 Right circular cone and equation of a right circular cone 4.5 Enveloping cone and equation of an enveloping cone 4.6 Equation of a tangent plane 4.7 Condition of tangency	

Recommended Books:

1. Shanti Narayan: Analytical Solid Geometry, S. Chand and Company Ltd, New Delhi, 1998.

Reference Books:

1. S.P. Patankar, S.P. Thorat, Geometry, Nirali Prakashan.

2. Askwyth, E. H: The Analytical Geometry of the Conic Sections.

3. P.K.Jain and Khalil Ahmad, A Textbook of Analytical Geometry of Three Dimensions, Wiley Estern Ltd. 1999.

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DSC-PR -I : DSC03MAT29: DSC MATHEMATICS LAB – I

Practical Four Lectures of 60 minutes per week per batch

Marks-50 (Credits: 02)

Practicals:

1. Examples on Rolle's theorem.

2. Examples on Lagrange's mean value

3. Examples on Indeterminate form.

4. Examples on Successive differentiation

5. Examples on Factor theorem and Synthetic division

6. Examples on De Moivre's theorem

7.. Examples on Eigenvalues and Eigenvectors

8. Examples on Cayley-Hamilton theorem

9. Examples on homogeneous linear equation

10. Examples on Non homogeneous linear equation

11. Examples on Exact differential equation

12.Examples on Orthogonal trajectories

13. Examples on D(y) = X, where X is of the form $e^{ax}, where\ a\ is\ constan,$ $\sin(ax)$ and $\cos(ax)$

14.Examples on D(y) = X, where X is of the form x^m, m is positive integer, $e^{ax}V, where\ V\ is\ a\ function\ of\ x$

15. Examples on Equation solvable for p

16. Examples on reducible to Clairaut's equation

17. Examples on Translation

18. Examples on Rotation

19. Examples on Polar coordinates

20. Examples on Equation of sphere in different forms

B. Sc. Part – I Semester -I Mathematics

MIN-I: MIN03MAT11: Differential Calculus

Theory: 30 hrs.
Marks-50 (Credits: 02)

Course Outcomes (COs):

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

1. Calculate the limit and examine the continuity of a function at a point.
2. Employ theorem on properties of continuity in various examples
3. Understand the consequences of various mean value theorems for differentiable functions.
4. Understand Higher order derivatives, Taylor's theorem and indeterminate form

UNIT	Contents	Hours Allotted
1	Limit And Continuity: 1.1 Definition of limit of a real-valued function 1.2 Algebra of limits 1.3 Limit at infinity and infinite limits 1.4 Definition: Continuity at a point and Continuous functions on interval 1.5 Theorem: If f and g are continuous functions at point $x = a$, then $f+g$, $f-g$, $f.g$ and f/g are continuous at point. 1.6 Theorem: Composite function of two continuous functions is continuous. 1.7 Examples on continuity. 1.8 Classification of Discontinuities (First and second kind), Removable Discontinuity, Jump Discontinuity.	08
2	Properties of continuity of Real Valued functions: 2.1 Theorem: If a function is continuous in the closed interval [a, b] then it is bounded in [a, b] 2.2 Theorem: If a function is continuous in the closed interval [a, b], then it attains its bounds at least once in [a, b]. 2.3 Theorem: If a function f is continuous in the closed interval [a, b] and if f(a) and f(b) are of opposite signs then there exists $c\in(a, b)$ such that $f(c) = 0$, 2.4 Theorem: If a function f is continuous in the closed interval [a, b] and if $f(a) \neq f(b)$ then f assumes every value between f (a) and f (b). 2.5 Uniform continuity.	05
3	Differentiability: 3.1Differentiability of a real-valued function 3.2 Geometrical interpretation of differentiability 3.3 Relation between differentiability and continuity 3.4Chain rule of differentiation 3.5 Mean Value theorems: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem 3.6 Geometrical interpretation of mean value theorems. 3.7 Partial differentiation	08
4	Successive differentiation 4.1 Successive differentiation 4.2 Leibnitz's theorem and its application 4.3Maclaurin's and Taylor's theorems 4.4 Maclaurin's and Taylor's expansion for standard function 4.5 Indeterminate form.	09

Recommended Books:

1.Shanti Narayan, Dr. P. K. Mittal, Differential Calculus, S. Chand Publications

2. Gorakh Prasad (2016). Differential Calculus (19 th edition). Pothishala Pvt. Ltd.

Reference Books:

1.Hari Kishan, Calculus, Atlantic Publishers.

2. Michael Spivak, Calculus, Cambridge University Press

B. Sc. Part – I Semester -I Mathematics

MIN-II: MIN03MAT12: Basic Algebra and Complex Numbers

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Understand the importance of roots of real and complex polynomials and learn various methods of obtaining roots
2. Employ De Moivre’s theorem in a number of applications to solve numerical problems.
3. Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, using rank.
4. Find eigenvalues and corresponding eigenvectors for a square matrix.

UNIT	Contents	Hours Allotted
1	Theory of Equations 1.1 Elementary theorems on the roots of an equations 1.2 The remainder and factor theorems, Synthetic division 1.3 Factored form of a polynomial. 1.4 The Fundamental theorem of algebra. 1.5 Relations between the roots and the coefficients of polynomial equations 1.6 Integral and rational roots.	07
2	Complex Numbers: 2.1 Introduction 2.2 Polar representation of complex numbers 2.3 De Moivre’s theorem (integer and rational indices) 2.4 Roots of a complex number, expansion of $\cos n\theta, \sin n\theta$ 2.5 Euler’s exponential form of a complex number 2.6 circular function and its periodicity 2.7 Hyperbolic function	08
3	Matrices: 3.1 Types of matrix: Triangular matrix, Symmetric matrix, Skew-symmetric matrix, singular matrix, non-singular matrix 3.2 Transpose of matrix, Conjugate of matrix, Transposed- conjugate of a matrix, Hermition matrix, Skew- Hermition matrix 3.3 Row reduction and echelon forms 3.4The rank of a matrix and applications, Inverse of matrix 3.5 Eigen values and eigen vectors of matrix 3.6 Cayley-Hamilton theorem and its application	08
4	System of linear equations 4.1 Homogeneous linear equations 4.2 Nature of solution of AX = 0 4.3 Non – Homogeneous linear equations 4.4 Working rule for finding solution of AX = B 4.5 Examples.	07

Recommended Books:

1. W. S. Bunside and A. R. Panton: The Theory of Equations: With an Introduction to the Theory of Binary Algebraic Forms, Dover Phoenix Editions, 2005.

2. Brown and Churchill, Complex Variables and Applications, 7th Edition, McGraw Hill, 2010.

3. Serge Lang: Introduction to Linear Algebra, Second Edition, 1986

Reference Books:

1.M.L.Khanna, Theory of Equations, Jai Prakash Nath and Company

2.P.N. Wartikar, J.N. Wartikar, A Textbook of Applied Mathematics, Pune Vidyarthi Griha Prakashan, Pune

3.A. R. Vasishtha, A. K. Vasishtha, Matrices, Krishna Prakashan Media(P) Ltd,Meerut

4. S. Kumaresan, Linear Algebra: A Geometric Approach, Prentice Hall of India, New Delhi, 1999

B. Sc. Part – I Semester -II Mathematics

MIN-III: MIN03MAT21: Differential Equations - I

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations
2. Calculate P.I and C.F. of different types of differential equation
3. Solve differential equation of degree more than one.
4. Learn techniques of solving Clairaut's Equation.

UNIT	Contents	Hours Allotted
1	Differential Equations of first order and first degree: 1.1 Revision: Definition of Differential equation, order and degree of Differential equation. 1.2 Definition: Exact Differential equations. 1.2.1 Theorem: Necessary and sufficient condition for exactness. 1.2.2Working Rule for solving an exact differential equation 1.2.3 Integrating Factor (I.F.) by using rules (without proof). 1.3 Linear Differential Equation: Definition. 1.3.1 Method of solution. 1.4 Bernoulli's Differential Equation: Definition. 1.4.1 Method of solution. 1.5 Orthogonal trajectories: Cartesian and polar co-ordinates.	08
2	Linear Differential Equations with constant Coefficients: 2.1 Definition: Complementary function (C.F.) and particular integral (P.I.), operator D. 2.2 General Solution of f(D) y=0. 2.2.1 Solution of f (D) y = 0 when A.E. has non-repeated roots. 2.2. 2 Solution of f (D) y = 0 when A.E. has repeated roots. 2.2.3 Solution of f (D) y = 0 when A.E. has non-repeated roots real and complex roots. 2.3 Solution of D(y) = X, where X is of the form 2.3.1 $e^{ax}, where\ a\ is\ constant$ 2.3.2 $\sin(ax)\ and \cos(ax)$ 2.3.3 x^m, m is positive integer 2.3.4 $e^{ax}V, where\ V\ is\ a\ function\ of\ x$ 2.3.5 $xV, where\ V\ is\ a\ function\ of\ x.$	12
3	Equations of first order but not first degree: 3.1 Equations that can be factorized 3.1.1 Equation solvable for p 3.2 Equations that cannot be factorized 3.2.1 Equation solvable for x 3.2.2 Equation solvable for y	06
4	Clairaut's Equation: 4.1 Clairaut's form 4.2 Method of solution 4.3 Equation reducible to Clairaut's form 4.4 Special form reducible to Clairaut's form	04

Recommended Books:

1.Daniel A. Murray, Introductory course in Differential Equations, Orient Longman

2. Diwan, Agashe, Differential Equations, Popular Prakashan, Mumbai

Reference Books:

1. M. L. Khanna, Differential Equations, Jai Prakash Nath and Company

2. Dr. M. D. Raisinghania, Ordinary and Partial Differential Equations, S. Chand Publications

B. Sc. Part – I Semester -II Mathematics

MIN-IV: MIN03MAT22: Geometry

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Define the translation, rotation and understand relation between rotation and translation.
2. Estimate polar equation of circle, conic, chord, tangent.
3. Understand the various equation form sphere.
4. Learn various equation forms of cone.

UNIT	Contents	Hours Allotted
1	Changes of axis: 1.1 Translation 1.2 Rotation 1.3 Translation and Rotation 1.4 Rotation followed by Translation 1.5 Translation followed by Rotation 1.6 Invariants, Basic theorems	06
2	Polar Coordinates 2.1 Polar equation of circle: 2.1.1 Centre – radius form 2.1.2 Centre at the pole 2.1.3 Passing through the pole and touching the polar axis at the pole 2.1.4 Passing through the pole and with centre on the initial line 2.1.5 Passing through the pole and the diameter through pole making an angle α with initial line 2.2 Equation of chord, tangent and normal to the circle $r = 2acos\theta$ 2.3 Polar equation of a conic in the form $\frac{l}{r} = 1 \pm ecos\theta$ 2.4 Polar equation of a conic in the form $\frac{l}{r} = 1 \pm ecos(\theta - \alpha)$ 2.5 chord, tangent and normal of conic	08
3	Sphere: 3.1 Equation in different form 3.1.1 centre – radius form 3.1.2 General form 3.1.3 Diameter form 3.1.4 Intercept form 3.2 Intersection of sphere with straight line and a plane 3.3 Power of a point and radical plane 3.4 Tangent plane and condition of tangency 3.5 Equation of circle 3.6 Intersection of (i) two sphere (ii) a sphere and plane 3.7 Orthogonality of two spheres	09
4	Cone 4.1 Definitions of cone, vertex, generators 4.2 Equation of a cone with vertex at a point (X_1, Y_1, Z_1) 4.3 Equation of a cone with vertex at origin 4.4 Right circular cone and equation of a right circular cone	07

	4.5 Equation of a tangent plane 4.6 Condition of tangency	

Recommended Books:

1. Shanti Narayan: Analytical Solid Geometry, S. Chand and Company Ltd, New Delhi, 1998.

Reference Books:

1. S.P. Patankar, S.P. Thorat, Geometry, Nirali Prakashan.

2. Askwyth, E. H: The Analytical Geometry of the Conic Sections.

3. P.K.Jain and Khalil Ahmad, A Textbook of Analytical Geometry of Three Dimensions, Wiley Estern Ltd. 1999.

MIN-PR -I : MIN03MAT29: DSC MATHEMATICS LAB – I

Practical Four Lectures of 60 minutes per week per batch

Marks-50 (Credits: 02)

Practicals:

1. Examples on Rolle's theorem.

2. Examples on Lagrange's mean value

3. Examples on Indeterminate form.

4. Examples on Successive differentiation

5. Examples on Factor theorem and Synthetic division

6. Examples on De Moivre's theorem

7.. Examples on Eigenvalues and Eigenvectors

8. Examples on Cayley-Hamilton theorem

9. Examples on homogeneous linear equation

10. Examples on Non homogeneous linear equation

11. Examples on Exact differential equation

12.Examples on Orthogonal trajectories

13. Examples on D(y) = X, where X is of the form $e^{ax}, where\ a\ is\ constan,$ $\sin(ax)$ and $\cos(ax)$

14.Examples on D(y) = X, where X is of the form x^m, m is positive integer,
$e^{ax}V, where\ V\ is\ a\ function\ of\ x$

15. Examples on Equation solvable for p

16. Examples on reducible to Clairaut's equation

17. Examples on Translation

18. Examples on Rotation

19. Examples on Polar coordinates

20. Examples on Equation of sphere in different forms

B. Sc. Part – I Semester -I Mathematics

OEC - I: OEC03MAT11: Logical Reasoning

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Understand the basic concepts of logical reasoning Skills
2. Understand basic concepts Integers, Rational and Irrational numbers.
3. Solve the problems on Clock Train and Calendar
4. Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability

UNIT	Contents	Hours Allotted
1	1.1 Number system 1.2 Fractions 1.3 Surds and Indices 1.4 Squares and Square Roots 1.5 Cubes and Cube Roots 1.6 HCF and LCM 1.7 Logarithm	08
2	2.1Alphabet 2.2 Series 2.3 Analogy 2.4 Coding/ Decoding 2.5 Blood Relationship	10
3	3.1 Distance and direction 3.2 Ranking/ arrangement 3.3 Syllogism 3.4 Inequalities 3.5 Problems Based on Ages	06
4	4.1 Problems on Clock 4.2 Problems on Calendar 4.3 Problem solving	06

Reference Books:

1.R. S. Aggarwal, A Modern Approach to Verbal Non Verbal Reasoning, S. Chand Publications

B. Sc. Part – I Semester -I Mathematics

OEC - II: OEC03MAT12: Quantitative aptitude

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Understand the basic concepts of quantitative ability
2. Familiarize basic concepts of Permutation and Combinations.
3. Solve geometrical problems by using short-cut method
4. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

UNIT	Contents	Hours Allotted
1	1.1 Series 1.2 Progression and Sequence 1.3 Fractions	06
2	2.1Percentage 2.2Profit and Loss 2.3 Allegation and Mixtures 2.4 Ratio and Proportion	08
3	3.1Triangles 3.2Quadrilaterals 3.3Circles 3.4Cylinders 3.5Cones 3.6Spheres	10
4	4.1 Permutation 4.2 Combination	06

Reference Books:

1.R. S. Aggarwal, Quantitative Aptitude, S. Chand Publications.

2. Arun Sharma, How to prepare for Quantitative Aptitude for CAT, Mc Graw Hill.

B. Sc. Part – I Semester -II Mathematics

OEC - III: OEC03MAT21: Quantitative analysis

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Understand basic concepts Polynomials, Quadratic equations
2. Familiarize basic concepts of simple and compound interest.
3. Interpret the bar, pie, line chart
4. Analyze the problems on Heights, Distances and speed

UNIT	Contents	Hours Allotted
1	1.1 Algebra of Polynomials 1.2 Quadratic Equations 1.3 Partnership 1.4 Simple Interest. 1.5 Compound Interest	08
2	2.1 Time, Speed and distance 2.1 Time and Work 2.3 Boat streams 2.4 Height and Distance 2.5 Relative speed	10
3	3.1 Work and Wages 3.2 Pipes and Cistern 3.3 Allegation 3.4 Problems on Trains 3.5 Averages	06
4	4.1 Tabulation 4.2 Line Chart 4.3 Pie chart 4.4 Bar Chart	06

Reference Books:

1.R. S. Aggarwal, Quantitative Aptitude, S. Chand Publications

2. Arun Sharma , How to prepare for Quantitative Aptitude for CAT, Mc Graw Hill.

B. Sc. Part – I Semester -II Mathematics

OEC - IV: OEC03MAT22: Introduction to Applied Mathematics

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Find determinant of second and third order matrices and inverse of matrix by adjoint method
2. Compute the addition and multiplication of matrices and inverse of matrix by adjoint method
3. Familiarize basic concept of set theory and recognize different types of functions
4. Learn to find feasible solution of linear programming problem.

UNIT	Contents	Hours Allotted
1	The Fundamentals of Linear Algebra: 1.1 The role of linear algebra 1.2 Addition and subtraction of matrices 1.3 Scalar multiplication, vector multiplication 1.4 Multiplication of matrices 1.5 Commutative, associative and distributive laws in matrix algebra 1.6 Identity and Null matrices 1.7 Matrix expression of a system of linear equations 1.8 Row operations 1.9 Augmented matrix 1.10 Gaussian method of solving linear equations	10
2	Matrix Inversion: 2.1 Determinants and Non-singularity 2.2 Third-order Determinants 2.3 Minors and Cofactors 2.4 Laplace Expansion and Higher-order Determinants 2.5 Properties of a Determinant 2.6 Cofactor and Adjoint Matrices 2.7 Inverse Matrices 2.8 Solving Linear Equations with the inverse 2.9 Cramer's Rule for Matrix Solutions and The Gaussian Method of Inverting a Matrix.	08
3	Set theory: 3.1 set, subset, types of set 3.2 Relations 3.2.1 Types of relation 3.3 Function 3.3.1 Types of function	06
4	Linear Programming Problem 4.1Introduction, Definition: Linear Programming 4.2Objective function, decision variables, constraints, Formulation of L.P.P. (Two variable only) 4.3 Definition: Solution to L.P.P., Feasible Solution, Optimal Solution, Solution of L.P.P. by graphical method (Cases having no solution, multiple solutions, unbounded solution) Examples.	06

Recommended Books:

1. Kumbhojkar G.V., Business Mathematics
2. Serge Lang: Introduction to Linear Algebra, Second Edition, 1986.

Reference Books:

1. Shantinarayan, Text Book of Matrices
2. Soni R. S., Business Mathematics

OEC– PR – I: OEC03MAT29: OEC MATHEMATICS LAB - I

Practical Four Lectures of 60 minutes per week per batch
Marks-50 (Credits: 02)

Practicals:

1.Examples on HCF and LCM

2. Problems on Coding/ Decoding

3.Problem based on ages

4. Problems on clock

5. Problems on calendar

6. Examples on series

7. Examples on percentage

8. Examples on Triangles

9. Examples on cones

10. Examples on permutation and combination

11. Examples on Simple and compound interest

12. Examples on Time and work

13. Examples on Work and wages

14. Examples on Averages

15. Examples on Line, bar, pie chart

16.Examples on Determinants

17. Examples on Inverse of matrix by adjoint method

18. Examples on Permutation and combination

19. Examples on Set theory

20. Examples on L.P.P.

B. Sc. Part – I Semester -II Mathematics

SEC - I: SEC03MAT29: Foundation of Mathematics

Theory: 30 hrs.

Marks-50 (Credits: 02)

Course Outcomes (COs)

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

1. Describe fundamentals of set theory, relations, functions, equivalence classes.
2. Apply techniques of proof to prove the statement in different ways.
3. Evaluate the images and inverse images of elements under functions.
4. Analyze statements logically and write it using quantifiers

UNIT	Contents	Hours Allotted
1	Statements and Logic 1.1 Statements 1.2 Statements with quantifiers 1.3 Compound Statements 1.4 Implications	06
2	Sets and Relations: 2.1Definition 2.2Operations on sets 2.3Family of sets, Power set, Cartesian product of sets 2.4Types of relation 2.5Equivalence relations 2.6Equivalence classes and partition of set.	10
3	Functions: 3.1 One-one function 3.2 Onto function 3.3 Bijective function 3.4Composition of functions 3.5Inverse of function, Inverse Image of sets	07
4	Induction Principle 3.1 The induction principle 3.2 The strong induction principle 3.3 Well-ordering principle	07

Recommended Books:

1. Ajit Kumar, S. Kumaresan and B. K. Sarma, A Foundation Course in Mathematics, Narosa

Reference Books:

1. Robert Bartle and Donald Sherbert, Introduction to real Analysis (Fourth Edition), John Wiley and Sons Inc.
2. Kenneth Rosen, Discrete Mathematics and its Applications (Seventh Edition), Mc Graw Hill.