Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022

'B++' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Mathematics

Name of the Course: B.Sc. I (Sem.–I & II)

(Syllabus to be implemented from June 2022)

Preamble:

B.Sc.- I Mathematics syllabus has framed to provide the tools to get the easy and precise outcome to various applications of Science and Technology. Also logical development of various algebraic statements can be made to develop the innovative approach of various concepts and it can be applied to various abstract things. In the theory courses of Algebra, Calculus, Geometry, & Differential Equations.

Various theorems, corollaries and lemmas will be acquired by the Students. Change is the universal truth of the nature. So our aim is that Students should learn various techniques to find solutions. Those students who opted F.Y.B. Sc. Mathematics have to complete 2 theory courses for each semester and one practical entitled (Numerical Techniques in Laboratory) NTL-I [DSC- I A+I B] Courses (Annual). In the practical course of 100 marks students exercise the problem solving techniques for practical course. The details are mentioned in the syllabus.

Aims:

The aim of the course is to generate Intelligent and Skillful human beings with adequate theoretical and practical knowledge of the various mathematical systems. To include conceptual understanding in basic Phenomena, statements, theorems and development of appropriate problem solving skills suitable for applications and sufficient logical connectivity has provided.

Objectives of the Course:

1) To design the syllabus with specific focus on key Learning Areas.

2) To equip student with necessary fundamental concepts and knowledge base.

3) To develop specific problem solving skills.

4) To impart training on abstract concepts, analysis, deductive techniques.

5) To prepare students for demonstrating the acquired knowledge.

6) To encourage student to develop skills for developing innovative ideas.

7) A student be able to apply their skills and knowledge that is translate information presented verbally into mathematical form. Select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

8) A Student should get adequate exposure to local and global concerns that explore them many aspects of mathematical sciences.

Course Outcomes:

At the end of course the student will

1. Understanding the applications of matrices.

2. Understanding how they can calculate roots of a complex numbers.

3. Calculate the limit and examine the continuity of a function at point.

4. Explain the properties of three dimensional shapes.

5. Understand the genesis of ordinary differential equation.

6. Learn various methods of solving first order and first degree differential equations occurring in

   Physics, Chemistry and Engineering Sciences.

7. Learn how to change points and equations in Cartesians to Polar.

8. Understand the Geometry of plane and spheres.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Choice Based Credit System (CBCS)

(w. e. f. June - 2022)
Syllabus of B. Sc. Part-I (MATHEMATICS)

B.Sc.-I (Mathematics) (Honors) semester-wise Choice Based Credit System [CBCS] pattern to be implemented from June 2022. This syllabus of Mathematics carries 300 marks. In semester – I Internal examination (College Assessment) of 10 marks and external examination (University Assessment) of 40 marks [Total 40 +10 =50] for Theory paper – I & paper II each, also in semester – II for Theory paper –III & paper IV each and at the end of second term for **Numerical Technique Laboratory** [**NTL – I] [DSC-I A+ I B]** will be held. The distribution of marks is as follows. Internal examination (College Assessment) of 20 marks and external examination (University Assessment) of 80 marks [Total 80 +20 =100]

Semester –I (DSC IA)

(1) Paper -I: ALGEBRA	**(Marks 40+10 = 50)**
(2) Paper-II: CALCULUS	**(Marks 40+10 = 50)**

Semester –II (DSC-I B)

(3) Paper -III: GEOMETRY	**(Marks 40+10 = 50)**
(4) Paper-IV: DIFFERENTIAL EQUATIONS	**(Marks 40+10 = 50)**
(5) Numerical Technique Laboratory [**NTL - I**] [**DSC- I A + I B**]	**(Marks 80 +20 =100)**

Note:-

1 Total teaching periods for Paper –I / Paper –II and for Paper –III / Paper –IV are

five (5) per week for each semester.

2 Total teaching periods for [DSC- I A+I B] are four (4) per week for whole class asone batch.

Duration of Semester Examination:

(i) For Paper –I /II (Two hours) in semester -I
(ii) For Paper –III/IV (Two hours) in semester -II
(ii) For NTL –I [DSC- I A+ I B] (Three hours for a batch of 20 students) annually.

Semester -I

Paper -I: Algebra 30 Periods

Unit 1 (A): Matrices : Elementary transformations, Rank of a Matrix (Echelon and Normal form), Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding the inverse of a matrix. **[6]**

Unit 1 (B): Linear Equations: Application of matrices to a system of linear (both Homogeneous and Non-homogeneous) equations, Eigen values and Eigen vectors. **[4]**

Unit 2 (A): Complex Number: Modulus and Argument of a Complex Number, DeMoivre's Theorem and its applications, Roots of Unity, Roots of Complex Numbers, Transcendental Functions (Circular Functions and Hyperbolic Functions of a complex variable with their inverses). **[15]**

Unit 2 (B): Introduction of Group:

Definition of a group and Basic properties with simple examples. **[5]**

Paper –II: Calculus 30 Periods

Unit. 1 (A): Differentiation: Indeterminate forms and L' Hospital's Rule, Successive differentiation, n^{th} derivatives of standard functions, Leibnitz's Theorem, Taylor's theorem and Maclaurin's Theorem (Statements only), Series expansions of e^x, cosx, sinx, $(1 + x)^n$, log(1+x) **[8]**

Unit.1 (B): Function of two variables: Limit and Continuity of function of two variables, Partial derivatives, Partial derivative of higher orders, Homogeneous functions, Euler's Theorem on Homogeneous functions. **[7]**

Unit. 2 (A): Reduction Formulae:

$\int_0^{\pi/2} sin^n x\, dx$, $\int_0^{\pi/2} cos^n x\, dx$ and $\int_0^{\pi/2} sin^m x \cdot cos^n x\, dx$.

(Note that reduction to these forms are not expected) **[7]**

Unit. 2 (B): Vector Calculus: Scalar point function, Vector point function, Directional derivatives, Gradient, divergence and Curl and its properties. **[8]**

Semester -II

Paper –III: Geometry   30 Periods

Unit 1 (A):-Change of Axis and Polar Co-ordinates: Translations, Rotations, Translations and Rotations, Invariants, Identifications of conics from general form of second degree equations, Polar Coordinates, Conversion formulae, Equation of a conics in Polar Co-ordinate System   **[10]**

Unit 1 (B):-Plane: General equation of plane, Normal equation, Intercept form, Angle between two planes, Plane through three points, Plane through a given point, Two sides of a Plane, Distance of a point from a plane, Family of planes.   **[10]**

Unit 2 : Sphere: Centre radius form, General equation of a sphere, Diameter form, Equation of a Tangent Plane and condition for tangency, Family of spheres $S+\lambda P=0$ and $S+\lambda S'=0$. **[10]**

Paper- IV: Differential Equation   30 periods

Unit 1 (A):- Differential Equations of first order and first degree: [Part-I] Variables separable, Homogeneous, non- homogeneous differential Equations.   [7]

Unit 1 (B):- Differential Equations of first order and first degree: [Part-II]

Exact differential equations, Necessary and Sufficient condition for exactness, Integrating

Factor with four rules, Linear differential equations of the form: $dy/dx+Py= Q$, Bernoulli Equation $dy/dx+Py=Qy^n$.   [**8**]

Unit 2 (A):- Linear Differential Equations with Constant Coefficients: [Part-I]

Complementary function and particular integral, General solution of $f(D) y=X$, Solution of

$f(D)y=0$ for non-repeated , repeated real roots and complex roots.   **[7]**

Unit 2 (B):- Linear Differential Equations with Constant Coefficients: [Part-II]

Solution of $f(D)y=X$, where X   is of the form e^{ax}, $\sin(ax)$, $\cos(ax)$, x^m , $e^{ax}V$.   **[8]**

Numerical Technique Laboratory [NTL –I] [DSC – I A+I B]

(4 Periods per week)

Assignment- 1 Inverse of Matrix by Cayley- Hamilton Method

Assignment -2: Solution of system of Linear Homogeneous Equations.

Assignment -3: Solution of system of linear non-homogeneous Equations.

Assignment -4: Eigen values and Eigen vectors.

Assignment -5: n^{th} roots of a complex numbers.

Assignment -6: Examples of a group.

Assignment -7: Applications of Leibnitz's theorem.

Assignment -8: Reduction formulae.

Assignment -9: Partial differentiation.

Assignment -10: Numerical examples on Gradient, Divergence and Curl.

Assignment -11: Change of axis and invariants.

Assignment -12: Translation and Rotations.

Assignment -13: Conversion between Polar and Cartesian of points and equations.

Assignment -14: Family of Planes.

Assignment -15: Family of Spheres.

Assignment -16: Linear differential equations of first order and first degree [Part-I]

Assignment -17: Linear differential equations of first order and first degree [Part-II]

Assignment -18: Solution of $f(D)y=X$, where $X= e^{ax}$ and x^m.

Assignment -19: Solution of $f(D)y=X$, where $X=\sin(ax)$ and $\cos(ax)$.

Assignment -20: Solution of $f(D)y=X$, where $X= e^{ax}V$.

References:

1. **Text Books of Matrices** by Shanti Narayan.

2. **Modern Algebra** by A. R. Vasista, Krishna Prakashan Media Co. Meerut.

3. **ALGEBRA, B. Sc. – I (Semester –I) Mathematics- Paper-I** by Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, [Nirali Prakashan].

4. **Algebra (B.Sc.-I Paper-I)** by Dr. B. P. Jadhav, Prof.A.M.Mahajan, Prof. S..P..Gade, Prof. Kokare B.D . [Phadke Prakashan]

5. **Differential Calculus** by Shanti Narayan

6. **A text book of Vector Calculus**, by Shanti Narayan.

7. **Calculus, B. Sc. – I (Semester –I)** Mathematics- Paper-II by Prof. S. J. Alandkar, Prof. N.I.Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan.

8. **Calculus (B. Sc. I, Paper- II)** by Dr. B. P. Jadhav , Prof.A.M.Mahajan , , Prof.S.P.Gade, Prof Kokare B.D . [Phadke Prakashan]

9. **Analytical Geometry of Three dimensions**, by P. K. Jain and Khalil Ahmid , Wiley Eartern Ltd. 1994.

10. **Geometry, (B.Sc.-I Paper-I) (Semester –II) MATHEMATICS**- Paper-III By Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan.

11. **Geometry (B.Sc.-I Paper-I)** by Dr. B. P. Jadhav , Prof.A.M.Mahajan Prof.S.P.Gade, Prof. Kokare B.D. [Phadke Prakashan].

12. **Differential equations**, by G. S. Diwan, D. S. Agashe. Popular Prakash, Bombay.

13. **Differential equations**, by Sharma and Gupta Krishna Prakashan Media Co. Meerut.

14. **Differential Equation , B. Sc. – I (Semester –II) Mathematics- Paper-IV** By Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. and Prof. R. D. Mahimkar, Nirali Prakashan.

15. **Differential Equations (B. Sc. I, Paper- II)** by Dr. B. P. Jadhav ,Prof.A.M.Mahajan , Prof.S.P.Gade, Prof. Kokare B.D . [Phadke Prakashan].

16. Ordinary and Partial Differential Equations By Dr. M. D. Raisinghania S. Chand Pulication, New Delhi, 19th edition

Equivalent Subject for Old Syllabus:

Sem. - I

Sr. No.	Name of the old Paper	Name of the new Paper
1	Paper-I : Algebra	Paper-I : Algebra
2	Paper-II : Calculus	Paper-II : Calculus

Sem.-II

Sr. No.	Name of the old Paper	Name of the new Paper
1	Paper-III : Geometry	Paper-III : Geometry
2	Paper-IV : Differential Equation	Paper-IV : Differential Equation