Punyashlok Ahilyadevi Holkar Solapur University, Solapur

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)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. First Year (Liberal Science)

Semester-I

Core Course: MATHEMATICS (Paper-I) Algebra

Teaching Scheme:	Examination Scheme:
Lectures – 3 Hours/week, 2 Credits	UA – 40 Marks
Practical – 4 Hours/week, 4 Credit	CIE – 10 Marks

About Course: This course is designed to emphasize the development of mathematical skills in Algebra .

Course Prerequisite:
Student shall have knowledge of Mathematics.

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 ofvarious algebraic statements can be made to develop the innovative approach of various concepts and it can be applied to various abstract things.

Various theorems, corollaries and lemmas will be acquired by the Students. Change is the universal truth of the nature. The main aim of this course is that students should learn various techniques to find solutions to the physical problems. T h o s e students who offered Mathematics as one of the subjects for B.Sc. Part –I level have to complete 2 theory courses for each semester and one practical Course (Annual). In the practical course of 100 marks students exercise the problem solving techniques. The details are mentioned in the syllabus.

Course Objectives:

1. Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
2. Ability to pursue advanced studies and research in pure and applied mathematical science.
3. Acquire good knowledge and understanding in advanced areas of mathematics, chosen by the student from the given courses.

Course Outcomes

At the end of this course, students will be able to

1. Understand the applications of matrices.

2. Find the roots of a complex numbers.

3. Understand applications of Euler's Theorem.

4. Understand abstract concepts of algebra

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]**

- **Continuous Internal Evaluation (CIE):**

  CIE will consists of Home Assignment/Tutorials/Tests/Seminars, etc.

- **Text Books:**
  - Algebra B.Sc.I (Sem-I) Mathematics Paper-I by Prof. S.J.Alandkar, Prof. N.I. Dhanshetti, Prof. A.S.Dhone, Prof. R.D.Mahimkar, Nirali Prakashan.
  - Algebra B.Sc.I (Sem-I) Mathematics Paper-I by Dr. B.P.Jadhav, Prof. A.M.Mahajan, Prof. S.P.Gade, Prof. B.D.Kokare Phadake Prakashan.
  - Algebra and Geometry B.Sc.- part I by Mr. L. G. Kulkarni, Dr. B. P. Jadhav, Dr. M.K. Kubde Dr.Mrs. P.D. Patwardhan Phadke Prakashan.

- **Reference Books:**
  - A text book of Matrices by Shantinarayan, S.Chand Co., (Pvt.) Ltd. New Delhi.
  - Modern Algebra by Vashishtha, Krishna Prakashan, Meerut.
  - First course in the theory of equations by L. E. Dickson, John Wiley and Sons Inc. London.
  - Theory of equations; with an introduction to the theory of binary algebraic forms by W. S. Burnside, A. W. Panton Dublin, University Press Series.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. First Year (Liberal Science)

Semester-I

Core Course: MATHEMATICS (Paper-II) Calculus

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 2 Credits	**UA – 40 Marks**
Practical – 4 Hours/week, 4 Credit	**CIE – 10 Marks**

About Course: This course is designed to emphasize the development of mathematical skills in Calculus.

Course Prerequisite:

Student shall have knowledge of Mathematics.

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 ofvarious algebraic statements can be made to develop the innovative approach of various concepts and it can be applied to various abstract things.

Various theorems, corollaries and lemmas will be acquired by the Students. Change is the universal truth of the nature. The main aim of this course is that students should learn various techniques to find solutions to the physical problems. T h o s e students who offered Mathematics as one of the subjects for B.Sc. Part –I level have to complete 2 theory courses for each semester and one practical Course (Annual). In the practical course of 100 marks students exercise the problem solving techniques. The details are mentioned in the syllabus.

Course Objectives:

1. Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
2. Ability to pursue advanced studies and research in pure and applied mathematical science.
3. Acquire good knowledge and understanding in advanced areas of mathematics, chosen by the student from the given courses.

Course Outcomes:

At the end of this course, students will be able to

1. Calculate the limit and examine the continuity of a function at point
2. Learn conceptual various variations while advancing from one variable to several variable in calculus.
3. Solve the examples by using reduction formulae.
4. Solve gradient, divergent and curl of the functions.
5. Understand the meaning of scalar point function and vector point function.

Unit. 1 (A): Differentiation: Indeterminate forms and L' Hospital's Rule, Successivedifferentiation, 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:
$\int_{0}^{\pi/2} \sin^n x \, d$, $\int_{0}^{\pi/2} \cos^n x \, dx$ and $\int_{0}^{\pi/2} \sin^m x \, .\cos^n x \, dx.$

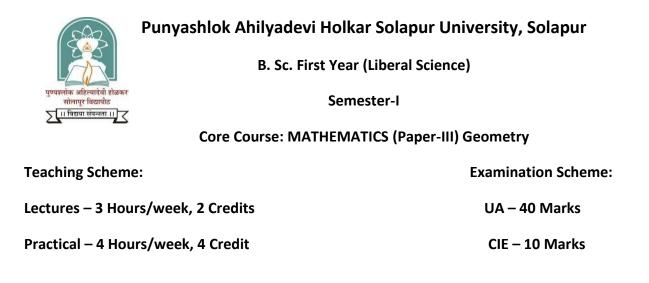(Note that reduction to these forms are not expected) **[7]**

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

- **Continuous Internal Evaluation (CIE):**

CIE will consists of Home Assignment/Tutorials/Tests/Seminars, etc.

- **Text Books:**
  - Calculus B.Sc.-I (sem-II) Mathematics Paper-II by Prof. S.J. Alandkar, Prof. N.I. Dhanshetti, Prof. Dhone A.S., Prof. R.D.Mahimakar, Nirali Prakashan.
  - Calculus B.Sc.I (sem-II) Mathematics paper-II by Prof.Dr. B.P.Jadhav, Prof. A.M. Mahajan, Prof.Dr. S.P.Gade, Prof. B.D.Kokare, Phadke Prakashan.

- **Reference Books:**

  - Differential Calculus by Shantinarayan S.Chand and Co., New Delhi.
  - A Text Book of Vector Calculus by Shantinarayan and kapoor S.Chand and Co., New Delhi.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. First Year (Liberal Science)

Semester-I

Core Course: MATHEMATICS (Paper-III) Geometry

Teaching Scheme: **Examination Scheme:**

Lectures – 3 Hours/week, 2 Credits   UA – 40 Marks

Practical – 4 Hours/week, 4 Credit   CIE – 10 Marks

About Course: This course is designed to emphasize the development of mathematical skills in Geometry.

Course Prerequisite:
Student shall have knowledge of Mathematics

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.

Various theorems, corollaries and lemmas will be acquired by the Students. Change is the universal truth of the nature. The main aim of this course is that students should learn various techniques to find solutions to the physical problems. T h o s e students who offered Mathematics as one of the subjects for B.Sc. Part –I level have to complete 2 theory courses for each semester and one practical Course (Annual). In the practical course of 100 marks students exercise the problem solving techniques. The details are mentioned in the syllabus.

Course Objectives:

1. Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
2. Ability to pursue advanced studies and research in pure and applied mathematical science.

3. Acquire good knowledge and understanding in advanced areas of mathematics, chosen by the student from the given courses.

Course Outcomes:

At the end of this course, students will be able to

1. Explain the properties of three-dimensional shapes.

2. Understand the geometrical terminologies for plane, sphere.

3. Learn translations, rotations and coordinate system.

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]**

- **Continuous Internal Evaluation (CIE):**

CIE will consists of Home Assignment/Tutorials/Tests/Seminars, etc.

- **Text Books:**
  - Geometry B.Sc.I (Sem-II) Paper-III by Dr. B.P. Jadhav, Prof. A.M.Mahajan, Dr. S.P.Gade, Prof. B.D.Kakare, Phadke Prakashan First Edition-2019.
  - Algebra B.Sc.I (Sem-I) Mathematics Paper-I by Prof. S.J.Alandkar, Prof. N.I. Dhanshetti, Prof. A.S.Dhone, Prof. R.D.Mahimkar, Nirali Prakashan.

- **Reference Books:**

  - Analytical Solid Geometry by Shantinarayan S.Chand & Co. Pvt. Ltd. New Delhi.
  - The Elements of Co-ordinate by Loney S.L. Macmillan & Co. Ltd. London.
  - New Textbook of Co-ordinate Geometry by Mathur S.M. Atmaram and Sons., Delhi.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. First Year (Liberal Science)

Semester-I

Core Course: MATHEMATICS (Paper-IV) Differential Equation

Teaching Scheme:	Examination Scheme:
Lectures – 3 Hours/week, 2 Credits	UA – 40 Marks
Practical – 4 Hours/week, 4 Credit	CIE – 10 Marks

About Course: This course is designed to emphasize the development of mathematical skills in Differential Equation

Course Prerequisite:
Student shall have knowledge of Mathematics

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.

Various theorems, corollaries and lemmas will be acquired by the Students. Change is the universal truth of the nature. The main aim of this course is that students should learn various techniques to find solutions to the physical problems. T h o s e students who offered Mathematics as one of the subjects for B.Sc. Part –I level have to complete 2 theory courses for each semester and one practical Course (Annual). In the practical course of 100 marks students exercise the problem solving techniques. The details are mentioned in the syllabus.

Course Objectives:

1. Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.
2. Ability to pursue advanced studies and research in pure and applied mathematical science.
3. Acquire good knowledge and understanding in advanced areas of mathematics, chosen by the student from the given courses.

Course Outcomes:

At the end of this course, students will be able to

1. Understand the genesis of ordinary differential equations.
2. Learn various techniques of getting exact solutions of solvable first order differential equations.
3. Formulate mathematical models in the form of ordinary differential equations to suggest possible solutions of the day-to-day problems arising in physical, chemical and biological disciplines.
4. Solve the exact differential equation, linear differential equations with constant coefficients.

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: $dy/dx+Py= Q$, Bernoull 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]**

- **Continuous Internal Evaluation (CIE):**

CIE will consists of Home Assignment/Tutorials/Tests/Seminars, etc.

- **Text Books:**
  - Differential Equation B.Sc.I (Sem-II) Mathematics Paper-IV. By Prof.Dr. B.P. Jadhav, Prof. A.M.Mahajan, Prof. Dr.S.P.Gade, Prof. B.D.Kokare , Phadke Prakashans First Edition-2019.
  - Differential Equation B.Sc.I (Sem-II) Mathematics Paper-IV by Prof. S.J.Alandkar, Prof. N.I.Dhanshetti, Prof. Dhone A.S., Prof. R.D.Mahimkar, Nirali Prakashan, Pune.

- **Reference Books:**

  - Introductory Course on Differential Equation by Murray D.A. Orient Longmart India.
  - Ordinary and Partial Differential Equations by Raisinghania M.D. S.Chand and Co. Pvt. Ltd. New Delhi.

PRACTICAL (CORE COURSE) Mathematics
B. Sc. First Year (Liberal Science)
Semester-I & II

Practical – I : Mathematics

Teaching Scheme:	**Examination Scheme:**
Practical – 4 Hours/week, 4 Credit	**UA – 80 Marks**
	CIE – 20 Marks

List of Practicals: (Minimum 20, Maximum 25)

Students should perform minimum 20 practical during Semester I & II

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) an**d** cos(ax).

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