

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



NAAC Accredited-2022

'B⁺⁺' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

(As per New Education Policy २०२०)

Syllabus: Mathematics

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

(Syllabus to be implemented from June 2024)

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 and 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.

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 should 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) Understand the applications of matrices.
- 2) Understand for calculating roots of a complex numbers.
- 3) Able to 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) Aware of the Geometry of plane.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

(According to NEP 2020)

(w.e.f. from June-2024)

Syllabus of B. Sc. Part-I MATHEMATICS-(Major)

(Semester-I & II)

(Theory and Practical)

SEMESTER-I				
Subject (Major)	Paper Title	Credits	Hours/week	Total Contact Hours
Mathematics DSC1- 1	Paper-I- Algebra and calculus	2	2	30
Practical-I (DSC1-1)	Practical-I	2	4 (hours/week/batch)	60
SEMESTER-II				
Mathematics DSC1- 2	Paper-II- Geometry and Differential Equation	2	2	30
Practical-II (DSC1-2)	Practical-II	2	4 (hours/week/batch)	60

Semester -I

DSC1-1 Algebra and Calculus (Major)

Credits-2

(Contact Hours-30)

Unit I (A): Matrices and Linear Equations:

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. Application of matrices to a system of linear (both Homogeneous and Non-homogeneous) equations, Eigen values and Eigen vectors. [8]

Unit I (B): Complex numbers:

Modulus and Argument of a Complex Number, De Moivre's Theorem and its applications, Roots of Unity, Roots of Complex Numbers [7]

Unit. II (A): Differentiation:

Successive differentiation, n^{th} derivatives of some standard functions, Leibnitz's Theorem, Taylor's theorem and Maclaurin's Theorem (Statements only), Series expansions of e^x , $\sin x$, $\cos x$, $(1+x)^n \log(1+x)$. [8]

Unit. II (B): Function of two variables and Vector Calculus:

Limit and Continuity of function of two variables, Partial derivatives, Partial derivative of higher orders, Homogeneous functions, Euler's Theorem on Homogeneous functions and its corollaries. Scalar point function, Vector point function, Gradient, Directional derivatives, Divergence, Curl and its properties. [7]

Semester -I

DSC1-1 Practical-I: Mathematics (Major)

Credits-2.0

(Contact Hours- 60)

Title of the Practical	Contact Hours	Credits
Assignment No. 1. Rank of Matrix.(Row echelon and Normal form) Assignment No. 2. Inverse of Matrix by Cayley-Hamilton Method. Assignment No. 3. Solution of system of Linear Homogenous and Non-homogenous equation Assignment No. 4. Eigen values and Eigen vectors. Assignment No. 5. n^{th} roots of a complex number. Assignment No. 6 Applications of Leibnitz's Theorem. Assignment No. 7. Partial Differentiation Assignment No. 8. Examples on Euler's Theorem on Homogeneous functions Assignment No. 9. Numerical examples on directional derivative, gradient. Assignment No.10. Numerical examples on divergence, curl.	60	2.0

Semester -II

DSC1-2 Geometry and Differential Equation (Major)

Credits-2

(Contact Hours-30)

Unit I (A):-Change of Axis:

Translations, Rotations, Translations and Rotations, Invariants, Identifications of conics from general form of second degree equations.

[8]

Unit I (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.

[7]

Unit II (A):- Differential Equations of first order and first degree:

Exact differential equations, Necessary and Sufficient condition for exactness, Integrating Factor with four rules, Linear differential equations of the form: $\frac{dy}{dx} + Py = Q$, Bernoulli Equation. $\frac{dy}{dx} + Py = Qy^n$

[8]

Unit II (B):- Linear Differential Equations with Constant Coefficients:

[7]

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

Solution of $f(D)y = 0$ for non-repeated, repeated for both real roots and complex roots.

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

Semester -II

DSC1-2 Practical-II: Mathematics (Major)

Credits-2.0

(Contact Hours- 60)

Title of the Practical	Contact Hours	Credits
Assignment No. 1. Translation. Assignment No. 2. Rotations. Assignment No. 3. Identification of Conics Assignment No. 4. Family of Planes. Assignment No. 5. Exact differential equation Assignment No. 6. Linear and Bernoulli Equation. Assignment No. 7. Solution of $f(D)y = 0$ Assignment No. 8 Solution of $f(D)y = X$, where $X = e^{ax}$ Assignment No. 9 Solution of $f(D)y = X$, where $X = x^m, X = e^{ax}V$ Assignment No.10 Solution of $f(D)y = X$, where $X = \sin(ax), \cos(ax)$	60	2

Recommended Books:-

1. Text Books of Matrices by Shanti Narayan.
2. Modern Algebra by A. R. Vasista, Krishna Prakashan Media Co. Meerut.
3. Differential Calculus by Shanti Narayan S.Chand Publication
4. A text book of Vector Calculus, by Shanti Narayan.
5. Analytical Solid Geometry of Three dimensions, by P. K. Jain and Khalil Ahmad ,Wiley Eartern Ltd. 1994.
6. Ordinary and Partial Differential Equations By M. D. Raisinghanian S. Chand Publication, New Delhi, 19th edition.
7. Differential equations, by G. S. Diwan, D. S. Agashe. Popular Prakashan Bombay.

Reference Books:-

1. Algebra, (B. Sc. – I Paper-I) by Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. A. S. Dhone Prof. R. D. Mahimkar, [Nirali Prakashan].
2. Algebra (B.Sc.-I Paper-I) by Dr. B. P. Jadhav, Prof.A.M.Mahajan, Prof. S..P..Gade, Prof. B.D. Kokare [Phadke Prakashan]
3. Calculus, (B. Sc. – I Paper-II) Mathematics- Paper-II by Prof. S. J. Alandkar, Prof.

- N.I.Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan.
4. 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]
 - 5 Geometry, (B.Sc.-I Paper-III) By Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar,Nirali Prakashan.
 - 6 Geometry (B.Sc.-I Paper-III) by Dr. B. P. Jadhav , Prof.A.M.Mahajan Prof.S.P.Gade, Prof. Kokare B.D. [Phadke Prakashan].
 - 7 Differential Equation , (B.Sc. – I Paper-IV) By Prof. S. J. Alandkar, Prof. N. I. Dhanshetti, Prof. Dhone A. S. and Prof. R.D. , Mahimkar, Nirali Prakashan.
 - 8 Differential Equations (B. Sc. I, Paper- IV) by Dr. B. P. Jadhav ,Prof.A.M.Mahajan , Prof.S.P.Gade, Prof. Kokare B.D . [Phadke Prakashan].

**Syllabus of B. Sc. Part-I- Generic/ Open Elective
(Mathematics)
(GE/OE (Mathematics))**

**(Semester- II)
(Theory)**

SEMESTER-II				
Subject (Minor)	Paper Title	Credits	Hours/week	Total Contact Hours
OE1 Mathematics	Quantitative Aptitude-I	2	2	30

SEMESTER-II: OE:

OE- Quantitative Aptitudes for Competitive Examinations

(Credit 02)

(Contact Hours: 30)

Unit-1:Arithmetical Ability-I

[10]

- 1.1 Number Systems
- 1.2 LCM and HCF
- 1.3 Decimal Fractions
- 1.4 Simplifications
- 1.5 Square roots and Cube roots

Unit-2: Arithmetical Ability-II

[10]

- 2.1 Average
- 2.2 Problems on numbers
- 2.3 Problems on ages
- 2.4 Surds and Indices
- 2.5 Percentages

Unit-3:Business Mathematics

[10]

- 3.1 Profit and Loss
- 3.2 Ratio and Proportion
- 3.3 Partnerships
- 3.4 Simple Interest
- 3.5 Compound Interest
- 3.6 Shares and Stocks
- 3.7 Discount

Reference Books:

1. Quantitative Aptitude by R. S. Aggarwal, S. Chand Publishing House
2. The Pearson Guide to Quantitative Aptitude for Competitive Examinations. By Dinesh Khattar, Pearson.
3. Aptipedia Aptitude Encyclopedia by Face. Wiley. 2nd edition.
4. Shortcuts in Quantitative Aptitude for Competitive Exams by Disha Publications.
5. Fast Track Objective Arithmetic by Rajesh Verma.
6. Magical Book on Quicker Maths by M. Tyra.
7. Quantitative Aptitude Quantum CAT by Sarvesh K. Verma
8. CSAT by Unique Publishers.

Syllabus of B. Sc. Part-I- Skill Enhancement Courses (Mathematics)

SEC-1 (Mathematics)

Semester- I (Practical)

SEMESTER-I				
Enhancement Courses (Mathematics)	Paper Title	Credits	Hours/week	Total Contact Hours
SEC-1 Mathematics	Programming in C Part-I	2	2	30

SEC-1: Programming in C Part-I

Credits: 02

(Contact Hours: 30)

Course Objectives:

- To understand overview of C.
- To learn Constants, Variables and Data Types.
- To understand Operators and Expressions.
- To learn Managing Input and Output operators.

Pedagogy: 1. Lecture Method 2. Demonstration Method
 3. Laboratory Method 4. Heuristic Method
 5. Project Method

Unit-1: Overview of C

[7]

- 1.1 Importance of C
- 1.2 Sample C Program
- 1.3 Basic structure of C programs
- 1.4 Programming Style
- 1.5 Executing a C Program

Unit-2: Constants, Variables and Data Types

[8]

- 2.1 Characters in C
- 2.2 C token
- 2.3 Constants
- 2.4 Keywords and Identifiers
- 2.5 Variables
- 2.6 Data Types

Unit-3: Operators and Expressions

[8]

- 3.1 Types of Operators
- 3.3 Arithmetic expressions
- 3.4 Evaluation of expressions
- 3.5 Some computational problems

Unit-4: Managing Input and Output operators

[7]

- 4.1 Reading a character
- 4.2 Writing a character
- 4.3 Formatted input
- 4.4 Formatted output

Course Outcome: Upon successful completion of the course, students will be able to:

- Understand overview of C.
- Learn Constants, Variables and Data Types.
- Understand Operators and Expressions.
- Learn Managing Input and Output operators.

Reference Books:

1. Programming in C by Kernighan Brian W. 2nd edition Pearson.
2. C Programming in Easy steps by Mike Mc Grath 5th edition in easy steps Limited.
3. Let us C by Yashwant Kanetkar BPB Publications; Nineteenth edition (15 December 2022); BPB Publications, Ansari Road, Dariya Ganj.
4. Programming in ANSIC by E. Balagurusamy. 8th edition, McGraw Hill India.
5. Programming in C by Schaum Series. By Byron Gottfried.

SEMESTER-II				
Enhancement Courses (Mathematics)	Paper Title	Credits	Hours/week	Total Contact Hours
SEC-2 Mathematics	Programming in C Part-II	2	2	30

SEC-2: Programming in C-Part II

Unit-1 Decision Making and Branching

[8]

- 1.1 Introduction
- 1.2 Decision making with IF statement
- 1.3 Simple if statement
- 1.4 The IF.... ELSE statement
- 1.5 Nesting of IF.... ELSE statement
- 1.6 The Else If ladder
- 1.7 The switch statement
- 1.8 The ?: operator
- 1.9 The GOTO statement

Unit-2 Decision Making and Looping

[7]

- 2.1 Introduction
- 2.2 The WHILE statement
- 2.3 The DO statement
- 2.4 The FOR statement
- 2.5 Jumps in loops

Unit-3 Arrays

[8]

- 3.1 Introduction
- 3.2 One dimensional array
- 3.3 Two-dimensional array
- 3.4 Initializing two dimensional arrays
- 3.5 Multidimensional arrays

Unit-4 User-defined functions

[7]

- 4.1 Introduction
- 4.2 Need for user-defined functions
- 4.3 A multifunction program
- 4.4 The form of C functions
- 4.5 Return values and their types

Recommended book (Scope of syllabus)

[1] Programming in C by E. Balagurusamy, McGraw Hill, New- Delhi

Unit-1: 5.1 – 5.9

Unit-2: 6.1 – 6.5

Unit-3: 7.1 – 7.5,

Unit-4: 8.1 – 8.5

Reference Books:

1. Numerical methods in Engineering and Science with programs in C and C++ Ninth Edition by B. S. Grewal Khanna Publishers New Delhi.
2. Numerical analysis and Programming in C by Pundir and Pundir Pragati Prakashan.
3. A Book on C, Macmillan, by Berry, R.E. and Meekings.
4. C Programming language: An applied perspective, John Wiley & Sons.
5. Let us C by Yashwant Kanetkar BPB Publications, New-Delhi.
6. Programming in C by Schaum's Series, Tata MacGraw Hill. EEE.