

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Mathematics

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

(Syllabus to be implemented from June 2023)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

Syllabus for B. Sc. II- Mathematics

Choice Based Credit System (CBCS) Pattern

To be implemented from Academic Year 2023-24

1. Course Structure:

Sr. No	Semester	Paper No.	Title	No. of Lectures	Credit Point	Total Marks
1.	Semester-III	V	Differential Calculus	30	2	50
		VI	Laplace Transform	30	2	50
2.	Semester-IV	VII	Differential Equations	30	2	50
		VIII	Abstract algebra-I	30	2	50
3.	Semester III and IV (Annual)		Numerical Techniques in Laboratory[NTL-II A & NTL II B] Practical Course (Annual)		8	200
Total Marks					16	400

2. Distribution of each Theory paper (Marks 50)

University Assessment (UA) : 40 Marks

College Assessment (CA) : 10 Marks

Scheme of College Assessment

1. Unit Test : 05 Marks

2. Home Assignment : 05 Marks

3. Distribution of Practical Marks (200)

Practical examination will be at the end of fourth semester. The candidate has to perform practicals from each group.

A. University Practical Examination (160) Marks: (UA)

a) Problems from paper-V :35

b) Problems from paper-VI :35

c) Problems from paper-VII :35

d) Problems from paper-VIII :35

e) Journal :20

B. Practical : Internal continuous Assessment (40 marks)

Scheme of Marking: **20 Marks:** Internal Test on any four practical's,

20 Marks: Home assignment/ Oral/ Seminars/ Conference/ Industrial Visit/ Group discussion/ Viva, etc.

Semester – III
Paper-V: Differential Calculus

Unit – I A. Tangents and Normals:

Equations of tangents and Normals, Angle of intersection of two curves, Length of tangent, normal, sub tangent, subnormal at any point of a curve, Pedal equations or p, r equations (Cartesian form), Angle between radius vector and tangent, Length of the perpendicular from pole to the tangent, Length of polar sub tangent and polar sub-normal, Pedal equations (polar form), Other formulae. [8]

Unit – I B. Curvature:

Definition of Curvature, Length of arc as a function, Radius of curvature, Cartesian Equation, Parametric Equations, Polar Equations, Pedal Equations. [7]

Unit – II A. Jacobians:

Definition of a Jacobian, Jacobian of a function of function, Jacobian of implicit function, Condition of dependent functions (statement only). [7]

Unit – II B. Maxima and Minima:

Definition of Maximum value and minimum value of a function of one, two variables, Necessary condition for extreme values (Statements only), sufficient condition for extreme values (Statements only), Use of second order derivatives, Maxima and Minima of a function of two variables, Lagrange's Method of undetermined multipliers (for several independent variables). [8]

Recommended Book:

Differential Calculus by Shanti Narayan and P. K. Mittal S.Chand Publication Revised Edition 2005.

Unit 1: 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.13

Unit 2: 14.1, 14.2, 14.3

Unit 3: 12.1, 12.2, 12.3, 12.4

Unit 4: 9.1, 9.2, 9.3, 9.4, 9.6, 9.7

Reference Books

1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D., B. Sc. – II (Mathematics) Semester-III, Paper –V Differential Calculus, Nirali Prakashan Pune.
2. Dr. Jadhav B. P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare B. D., B.Sc. – II (Mathematics) Semester-III, Paper –V Differential Calculus, Phadke Prakashan Kolhapur .
3. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad
4. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow
5. P. N. Wartikar and J. N. Wartikar, A Text Book of Applied Mathematics, Vol. I, Poona Vidyarthi Griha Prakashan, Poona 30.
6. Tom M. Apostol, Calculus Vol I and II, Wiley Publication.

Paper-VI: Laplace Transform

Unit I: Laplace Transform.

[15]

Integral Transform (Definition), Laplace Transform (Definition), Linearity property of Laplace Transform, Piecewise continuous functions, Existence of Laplace Transform, Functions of exponential order, functions of Class A, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Laplace Transform of the derivatives of $F(t)$, Laplace Transform of the n^{th} order derivatives of $F(t)$, Initial value theorem, Final value theorem, Laplace Transform of Integrals, Multiplication by t , Multiplication by t^n , Division by t , Evolution of Integrals, periodic functions.

Unit II A:

The Inverse Laplace Transform.

[8]

Inverse Laplace Transform, Null Function, Linearity Property, Table of Inverse Laplace Transform, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Use of Partial function, Inverse Laplace Transform of the derivatives, Inverse Laplace Transform of Integrals, Multiplication by powers of p , Division by powers of p , Convolution (definition), Convolution theorem, Heaviside's expansion formula, Beta function.

Unit II B : Application of Laplace Transforms.

[7]

Ordinary Differential equations with constant coefficients, Ordinary Differential equations with variable coefficients, Partial differential equation.

Recommended Book:

Integral Transform by Vasistha A.R., Gupta R.K., Krishna Prakashan Media Pvt. Ltd. 11. Shivaji Road, Meerut India.

Unit 1: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.20, 1.21

Unit 2: 2.1, 2.2, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17

Unit 3: 3.1, 3.2, 3.4

Reference Books:

1. The Laplace Transform by Rainville E.D.
2. Integral Transform by Dr. J.R. Goyal and K.P. Gupta, Pragati Prakashan Meerut.
3. Differential equation by Sharma and Gupta, Krishna Prakashan Media Co. Meerut
4. Integral Transform and their Applications by Lokenath Debnath, CRC Press.
5. An introduction to Laplace Transforms and Fourier series by Phill Dyke, Springer publication.

Semester-IV
Paper -VII: Differential Equations

Unit I A: Differential Equations of the first order and of degree higher than the first: Equations solvable for p, Equations solvable for x, Equations solvable for y, Clairaut's equation, Equations reducible to Clairaut's form. [8]

Unit I B: Linear Equations of the second Order:

General form of the second order linear equation, complete solution when one integral belonging to complementary function is known, Rules of getting an integral belonging to complementary function, Removal of the First order Derivative, Transformation of the linear equation of second order by changing the independent variable. [7]

Unit II A: Homogeneous linear equations:

Homogeneous linear equations, working rule for finding the solution, Equations reducible to Homogeneous form. [8]

Unit II B: Simultaneous Equations and Total Differential Equations

Nature of the solution of simultaneous equations, Rules of solving the Equation. Total Differential Equation, Necessary and sufficient condition for the integrability of total differential equation (proof of Necessity only), Condition for exactness, Criterion for exactness, Method of Solving the Equation. [7]

Recommended Books:

Differential Equation: Ordinary and Partial Differential Equations: by M. D. Raisinghania, S.Chand Co. Ltd. Ramanagar, New Delhi-110055 (19th Edition)

Unit 1 (Part I): 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11

Unit 2 (Part I): 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10, 10.11

Unit 3 (Part I): 6.1, 6.2, 6.3, 6.4, 6.9, 6.10, 6.11

Unit 4 (Part II): 2.1, 2.2, 2.4, 2.5, 2.6, 2.7

Unit 5 (Part II): 3.2, 3.3, 3.4, 3.5, 3.6, 3.7

Reference Books:

1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D., B. Sc. – II (Mathematics) Semester-IV, Paper –VII Differential Equation, Nirali Prakashan Pune.
2. Dr. Jadhav B.P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare. B. D., B. Sc. – II (Mathematics) Semester-IV, Paper –VII Differential Equation, Phadke Prakashan Kolhapur.
3. Differential Equation by Murrey.
4. Differential Equation by Diwan and Agashe.
5. Differential Equation by Sharma-Gupta, Krishna Prakashan Media (Pvt.) Ltd, Meerut.

**Paper-VIII:
Abstract Algebra-I**

Unit-I A:

Introduction to Groups

[8]

Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry.

Unit-I B:

Equivalence, Congruence, Divisibility

[7]

Equivalence relation and partitions, Congruence and Division Algorithm, Integer Modulo n , Greatest Common Divisors, The Euclidean Algorithm, Factorization, Euler's Phi Function.

Unit-II A:

Groups

[8]

Elementary Properties of Groups, Generators, Direct products, Cosets, Lagrange's Theorem, Isomorphism, More on Isomorphism, Cayley's Theorem.

Unit-II B:

Group Homomorphism

[7]

Homomorphism of Groups, Kernels, Quotient Groups, the Fundamental theorem of Homomorphism.

Recommended Book:

Modern Algebra-An Introduction, by John R. Durbin, John Wiley & Sons, Inc. Fifth Edition

Unit 1: Chapter-II: Art. 5, 6, 7, 8

Unit 2: Chapter-III: Art. 9, 10, 11, 12, 13

Unit 3: Chapter-IV: Art. 14, 15, 16, 17, 18, 19, 20

Unit 4: Chapter-V: Art. 21, 22, 23

Reference Books:

1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D., B. Sc. – II (Mathematics) Semester-IV, Paper –VIII: Abstract Algebra-I, Nirali Prakashan Pune.
2. Dr. Jadhav .B.P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare. B. D. B. Sc. – II (Mathematics) Semester-IV, Paper VIII: Abstract Algebra-I, Phadke Prakashan Kolhapur.
3. A First Course In Abstract Algebra J. B. Fraleigh, Pearson Education 7th edition
4. University Algebra N.S. Gopalkrishnan.
5. Abstract Algebra David S. Dummit & Richard M. Foote Wiley & Sons, Inc.
6. Fundamentals of Abstract Algebra D. S. Malik & N. Mordeson & M. K. Sen Mc. Graw Hill International Edition.
7. A Course in Abstract Algebra by Vijay K. Khanna and S.K. Bhambri, Vikas Publishing House Pvt. Ltd.

Numerical Technique Laboratory [NTL - II]
(Differential Calculus, Laplace Transforms, Differential Equations, Abstract Algebra)

[NTL – II A]

- Assignment 1 - Tangents and Normals
- Assignment 2 – Curvature –I
- Assignment 3 – Curvature –II
- Assignment 4 – Jacobians
- Assignment 5 – Maxima and Minima I
- Assignment 6 – Maxima and Minima II
- Assignment 7 – Laplace Transform
- Assignment 8– Inverse Laplace Transform I
- Assignment 9 - Inverse Laplace Transform II
- Assignment 10 - Application of Laplace Transform

[NTL – II B]

- Assignment 11 - Differential Equations of the first order and of degree higher than the first.
(Part–I)
- Assignment 12 - Differential Equations of the first order and of degree higher than the first.
(Part–II)
- Assignment 13 - Linear Equations of the second order
- Assignment 14 - Homogeneous linear equations
- Assignment 15- Simultaneous Equations
- Assignment 16- Total Differential Equations
- Assignment 17 - Introduction to Groups
- Assignment 18- Equivalence, Congruence, Divisibility
- Assignment 19 - Groups
- Assignment 20 - Group Homomorphism

With effect from June-2023
Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper-V: Differential Calculus	Paper-V: Differential Calculus
2)	Paper-VI: Laplace Transform	Paper-VI: Laplace Transform
3)	Paper-VII: Differential Equations	Paper-VII: Differential Equations
4)	Paper-VIII: Abstract Algebra-I	Paper-VIII: Abstract Algebra-I
	Numerical Techniques in Laboratory [NTL-II A and NTL-II B] Practical Course (Annual)	Numerical Techniques in Laboratory [NTL-II A and NTL-II B] Practical Course (Annual)