Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2015
B' Grade (CGPA 2.62)

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 w.e.f. June 2020)

B.Sc.II - Mathematics :

Preamble :

B.Sc.II Mathematics is framed to provide the tools to get the easy and precise outcome to various applications of science and technology. Also logical development of the 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, Laplace transformation, differential calculus and differential equations various deductions of the theorems, corollaries and lemmas will be acquired by the students. Change is the universal truth of the nature and it can be presented with the help of dependent and independent variables in the form of functions and differential equations. So our aim is that students should learn various techniques to find solutions of differential equations. Students who opted S.Y.B.Sc. Mathematics have to complete 4 theory courses 2 each semester, two practicals entitled (Numerical Techniques in Laboratory) NTL-II courses (Annual). In the practical course of 100 marks students exercise the problem solving techniques for practical course I and II. The details are mentioned in the syllabus..

Objectives of the course : 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 inculcate conceptual understanding in basic phenomena, statements, theorems and development of appropriate problem solving skills suitable for applications and abstract algebraic techniques, sufficient logical connectivity is provided.

Following are the objectives-
i. To design the syllabus with specific focus on key Learning Areas.
ii. To equip student with necessary fundamental concepts and knowledge base.
iii. To develop specific problem solving skills.
iv. To impart training on abstract concepts, analysis, deductive tecchniques.
v. To prepare students for demonstrating the acquired knowledge.
vi. To encourage student to develop skills for developing innovative ideas.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology
Choice Based Credit System (CBCS)
(w.e.f.2020-21)
Draft Structure for B. Sc-II

Subject/ Core Course	Name and Type of the Paper		No. of papers/ Practical	Hrs/week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
Class :			**B.Sc.- II**	**Semester – III**						
Core (*Students can opt any Three subjects among the Four	C-5		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
subjects offered at B.Sc.I. Out of Three Subjects offered One	C-6		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
Subject will be the Core Subject **OR**	C-7		Paper-V	3.0	--	--	50	40	10	4.0
			Paper-VI	3.0	--	--	50	40	10	
		SEC-1								
		GE-3								
Grand Total				**18**	**--**	**--**	**300**	**240**	**60**	**12**
Class :			**B.Sc.- II**	**Semester – IV**						
Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject **OR** Students can opt any Two subjects among the Four Subjects offered at B.Sc.I. Out of Two Subjects One Subject will be the Core Subject and any One Subject among the other willbe Elective Subject	C-8		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
	C-9		Paper-VII	3.0	--	--	50	40	10	4.0
			Paper-VIII	3.0	--	--	50	40	10	
	C-10		Paper-VII	3.0	--	--	50	40	10	4.0
		Paper-VIII		3.0	--	--	50	40	10	
		SEC-2								
		GE-4								
		Environmental Studies		3.0	--	--	50	40	10	NC
Total (Theory)				**21**	**--**	**--**	**350**	**280**	**70**	**12**
Practical	C-5 & C-8	Pr. III&IV		--	--	8	100	80	20	4.0
	C-6 & C-9	Pr. III&IV		--	--	8	100	80	20	4.0
	C-7 & C-10	Pr. III&IV		--	--	8	100	80	20	4.0
	GE-3 & GE-4									
Total (Practical)						**24**	**300**	**240**	**60**	**12**
Grand Total				**39**		**24**	**950**	**760**	**190**	**36**

*Core SubjectsChemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology Core Subjects- (Additional)-Geochemistry/Biochemistry/ Meterology/Plant Protection

Summary of the Structure of B.Sc. Programme as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practicals	Total – credits
B.Sc.-II	III	300	12	--	--	12
	IV	350	12	300	12	24
Total		650	24	300	12	36

B.Sc. Programme :

Total Marks : Theory + Practical's = 650 +300 =950
Credits   : Theory + Practical's = 12 + 24   = 36
Numbers of Papers Theory: Ability Enhancement Course (AECC)   : 00
                                    Theory: Discipline Specific Elective Paper (DSE) : 00
                                    Theory: CC   : 06
                                    Skill Enhancement Courses   : 00
                                    GE   **:** 00
Total   : Theory Papers   :
               : Practical Papers   :

Abbreviations :
L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA : College Assessment
DSC / CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper
SEC : Skill Enhancement Course
GE : Generic Elective
CA: Continuous Assessment
ESE: End Semester Examination

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology
Syllabus for B.Sc.II-Mathematics
Semester System
Choice Based Credit System (CBCS) Pattern
To be implemented from Academic Year 2020 -21

1. Course Structure:

Sr. No	Semester	Paper No.	Title	No. of Lectures	Credit Point	Total Marks
1.	Semester-III	V	Differential Calculus	45	2	50
		VI	Laplace Transform	45	2	50
2.	Semester-IV	VII	Differential Equations	45	2	50
		VIII	Abstract algebra-I	45	2	50
3.	Semester III and IV (Annual)		Numerical Techniques in Laboratory[NTL-II A & B] Practical Course (Annual)		4	100
			Total Marks		12	300

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 (100)

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

    A. University Practical Examination (80) Marks: (UA)

        a) Problems from paper-V   15:

        b) Problems from paper-VI   15:

        c) Problems from paper-VII   15:

        d) Problems from paper-VIII   15:

        e) Journal   20:

    B. Practical : Internal Continuous Assessment (20 marks)

        Scheme of Marking: **10 Marks:** Internal Test on any four practicals,

                              10Marks: Home assignment/oral/Seminars/Conference /Industrial Visit/Group Discussion/Viva, etc.

Semester -III
Paper –V (Differential Calculus)

Unit-1. Tangents and Normals:

Equations of tangents and Normals, Angle of intersection of two curves, Length of tangent, normal, subtangent, 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 subtangent and polar sub-normal, Pedal equations (polar form). **[13]**

Unit-2. Curvature :

Definition of Curvature, Length of arc as a function, Radius of curvature, Cartesian Equation, Parametric Equations, Polar Equations, Pedal Equations. **[12]**

Unit-3. Jacobians:

Definition of a Jacobian, Jacobian of a function of function, Jacobian of implicit function, Condition of dependent functions (statement only). **[08]**

Unit- 4. Maxima and Minima :

Definiton 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 of two variables and three variables. **[12]**

Recommended Book(Scope of Syllabus):

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

Unit 1 :7.2,7.3,7.4,7.5,7.6,7.7,7.8,7.9,7.10,7.11
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

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 Kolapur .

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.

Unit 1: 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 nth 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 2: The Inverse Laplace Transform. [15]

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 3: Application of Laplace Transforms. [15]

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

Recommended Books for Paper – VI (Integral Transform):
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, 1.8, 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, 2.3, 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 byDr. 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 Lapace Tranforms and Fourier series by Phill Dyke , Springer publication.

Semester – IV

Paper – VII (Differential Equations)

Unit 1:- Differential Equations of the first order and of degree higher than the first:
Equations that can be resolved into factors of the first degree, Equations solvable for x,
Equations solvable for y, Clairaut's equation, Equations reducible to clairaut's form. **[10]**

Unit 2 : 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. **[15]**

Unit 3 : Homogeneous linear equations :
  Homogeneous linear equations, Working rule for finding the solution, Equations reducible to
Homogeneous form. **[10]**

Unit 4. Simultaneous Equations
Nature of the solution of simultaneous equations, Rules of solving the Equation,

Unit 5. Total Differential Equations
  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. **[10]**

Recommended Book:
Differential Equation:
Ordinary and Partial Differential Equations: by *M.D.Raisinghania,S.Chand*
Co.Ltd.Ramanagar,New Delhi-110055(Edition2002)
Unit 1 (Part I):6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.9, 6.10, 6.11, 6.12.
Unit 2 (Part I):5.1, 5.2, 5.3, 5.6, 5.7.
Unit 3 (Part II):4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11.
Unit 4 (Part II) :5.1,5.2, 5.4,5.5,5.6,5.7.
Unit 5 (Part II):6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7.

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-III, Paper –V Differential Equation, Phadke
   Prakashan Kolapur .

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)

Unit-1: Introduction to Groups **[10]**
   Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry.

Unit -2: Equivalence, Congruence, Divisibility **[10]**
   Equivalence relation and partitions, Congruence and Division Algorithm, Integer Modulo n, Greatest Common Divisors, The Euclidean Algorithm, Factorization, Euler's Phi Function.

Unit-3: Groups **[10]**
   Elementary Properties of Groups, Generators, Direct products, Cosets, Lagrange's Theorem, Isomorphism, More on Isomorphism, Cayley's Theorem.

Unit-4: Group Homomorphism **[10]**
   Homomorphism of Groups, Kernels, Quotient Groups, The Fundamental theorem of Homomorphism.

Recommended books (Scope of Syllabus):

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

Unit – 3 : Chapter-IV : Art. 14,15,16,17,18,19,20 Ch- V :21,22,23

Unit – 4 : Ch- V :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-III, Paper VIII: Abstract Algebra -I, –, Phadke Prakashan Kolapur
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.

6. A Course in Abstract Algebra by Vijay K. Khanna and S.K. Bhambri, Vikas Publishing House Pvt. Ltd.

Numerical Technique in Laboratory -II [NTL - II]
(Differential Calculus , Laplace transforms, Differential Equation, Abstract Algebra)

[NTL – IIA]

Assignment No.1: Tangents and Normals

Assignment No.2: Curvature

Assignment No.3 : Jacobians

Assignment No. 4 : Maxima and Minima

Assignment No. 5: Laplace Transform

Assignment No. 6: Inverse Laplace Transform I

Assignment No. 7: Inverse Laplace Transform II

Assignment No. 8: Application of Laplace Transform

[NTL – IIB]

Assignment No. 9: Differential Equations of the first order and of degree higher than the first .

Assignment No. 10: Linear Equations of the second order (Part –I)

Assignment No. 11: Linear Equations of the second order & Homogeneous linear equations (Part –II)

Assignment No.12: Simultaneous Equations & Total Differential Equations

Assignment No.13: Introduction to Groups

Assignment No.14: Equivalence, Congruence, Divisibilty

Assignment No.15: Groups

Assignment No.16: Group Homomorphism

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: Real Analysis	Paper-VI: Laplace Transform
3)	Paper-VII: Differential Equation	Paper-VII: Differential Equation
4)	Paper-VIII : Abstract Algebra - I	Paper-VIII : Abstract Algebra - I
	Numerical Techniques in Laboratory [NTL-II A & B] Practical Course (Annual)	Numerical Techniques in Laboratory [NTL-II A & B] Practical Course (Annual)