

Rayat Shikshan Sanstha's

Karmaveer Bhaurao Patil Mahavidyalaya, Pandharpur

(Autonomous)

NAAC Reaccredited 'A^{+}' grade, CGPA: 3.51

Granted under FIST-DST and the Best College

Affiliated to

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Syllabus as per National Education Policy 2020

(to be implemented from July-2023 onwards)

Program: B.Sc. I

Subject: Mathematics (Major)

Semester: I and II

Pattern: Choice Based Credit System (CBCS)

S.N.	Heading	Particulars
1	Title of Course	Mathematics
2	Eligibility for Admission	12th Science and Equivalent
3	No. of years/semester	One year/Two semester
4	Level	U.G.
5	Pattern	Semester
6	Medium	English
7	Status	Revised
8	To be implemented from Academic year	2022-2023

Preamble

B.Sc.-I 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 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 deductions of theorems, corollaries and lemmas will be acquired by students. Change is the Universal truth of the nature. So, our aim is that students should learn various techniques to find solutions. Students who opted F.Y. B.Sc. Mathematics have to complete two (2) theory courses, for each semester, one practical entitled "Numerical Techniques Laboratory-I" (NTL-I) based on DSC-IA and DSC-IB courses annually. In the practical course NTL-I, students exercise the problem-solving techniques. The details are mentioned in the syllabus.

1) 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 is provided.

2) 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 among the students.

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 will be able to apply his/her skills and knowledge that 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 global and local concerns that explore them many aspects of physical sciences.

Duration: The course shall be fulltime.

Structure of the Major Course (Level 4.5)

Semester- I

S.N.	Course Title	Theory			Practical		
		Course Code	No of hours per week	Credits	Course Code	No of Lectures per week	Credits
1	Algebra	MAT-101-MJ	4	4	MAT-103-MJP	4	2
	Calculus	MAT-102-MJ					

Semester- II

S.N.	Course Title	Theory			Practical		
		Course Code	No of hours per week	Credits	Course Code	No of Lectures per week	Credits
1	Geometry	MAT-151-MJ	4	4	MAT-153-MJP	4	2
	Differential Equations	MAT-152-MJ					

MAT: Mathematics, MJ: Major Theory, MJP: Major Practical

B.Sc.-I Semester-I

Theory Paper: 2 Credits (30 hours for each course)

Algebra
Calculus

Practical: 2 Credits (60 hours)

Mathematics Practical-I (Algebra +Calculus)

B.Sc. – I Semester – II

Theory Paper: 2 Credits (30 hours for each course)

Geometry
Differential Equations

Practical: 2 Credits (60 hours)

Mathematics Practical-II(Geometry +Differential Equations

Semester –I

Algebra				
Course Code	**Unit**	**Topics**	**Credits**	**Hours/ Week**
MAT-101-MJ	I	**Matrices and System of Linear Equations:** Matrices Linear Equations	**2**	**2**
	II	**Complex Numbers and Algebra:** Complex Numbers Introduction to Group		
Calculus				
MAT-102-MJ	I	Differentiation Function of two variables	**2**	**2**
	II	Reduction Formulae Vector Calculus		

Practical

MAT-103-MJP	Numerical Techniques Laboratory-I (NTL-I) based on Algebra+Calculus	**2**	**4**

Semester-II

Geometry				
Course Code	**Unit**	**Topics**	**Credits**	**Hours /Week**
MAT-151-MJ	I	Change of Axis and Polar Co-ordinates Plane	**2**	**2**
	II	Sphere		
Differential Equations				
MAT-152-MJ	I	Differential Equations of first order and first degree :[Part-I] Differential Equations of first order and first degree: [Part-II]	**2**	**2**
	II	Linear Differential Equations with Constant Co-efficients: [Part-I] Linear Differential Equations with Constant Co-efficients: [Part-II]		
Practical				
MAT-153-MJP		Numerical Techniques Laboratory-II (NTL-II) based on Geometry+Differential Equations)	**2**	**4**

NEP-2020 CBCS pattern (Commencing from July– 2023)

B.Sc.-I (Mathematics) (Honors) semester-wise Choice Based Credit System [CBCS] pattern to be implemented from July-2022. This syllabus of Mathematics carries 300 marks. In each Semester–I and II, Continuous Cumulative Evaluation (CCE) of 10 marks [5 marks for internal Exam+5 marks for home assignment] for each paper will be carried out. Semester End Examination (SEE) of 40 marks will be conducted at the end of each Semester for each theory paper. At the end of second semester, **Numerical Techniques Laboratory-I (NTL – I) based on DSC-IA and DSC-IB** (Algebra, Calculus, Geometry and Differential Equations) will be held. The distribution of marks is as follows.

Semester –I

(1) Course -I: ALGEBRA **(Marks 40+10 = 50)**

(2) Course -II: CALCULUS **(Marks 40+10 = 50)**

(3) Numerical Techniques Laboratory-I **(Marks 40 +10 =50**

Semester –II

(4) Course -III: GEOMETRY **(Marks 40+10 = 50)**

(5) Course -IV: DIFFERENTIAL EQUATIONS **(Marks 40+10 = 50)**

(6) Numerical Techniques Laboratory-II **(Marks 40 +10 =50**

Continuous Cumulative Evaluation (CCE) of 20 marks and Annual Practical Examination of 80 marks on all the above four papers will be conducted at the end of Semester-II.

Note:

1) Total teaching Hours for Paper –I / Paper –II and for Paper –III / Paper –IV are **TWO Hours per week for each semester.**

2) Total teaching hours for NTL -I are **four (4) per week for whole class as one batch.**

NEP-2020 Syllabus

B.Sc. Part-I Semester-I

Mathematics

Course Title: Algebra

Course Code: MAT-101-MJ

Theory: 30 Hours

Marks: 50 (Credits: 2.0)

Course Objectives:

- To find the rank of given matrix by using elementary row and column transformations.
- To verify Cayley Hamilton theorem for given matrix and find its inverse if it exists.
- To find the solution of given system of homogeneous or non-homogeneous linear equations by using matrices.
- To study roots of given polynomial equation by using Demoivre's theorem.
- To construct group by using its definition and basic properties.

Unit I: Matrices and System of Linear Equations: [10 Hours]

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, minors and cofactor.

Linear Equations: Application of matrices to a system of linear (Homogeneous and Non-homogeneous) equations, Eigen values and Eigen vectors.

Unit II: Complex Numbers and Algebra: [20 Hours]

Complex Numbers: Modulus and Argument of a Complex Number, polar co-ordinates and exponential co-ordinates, De Moivre's Theorem and its applications, Roots of Unity, Roots of Complex Number.

Transcendental Functions (Circular Functions and Hyperbolic Functions of a complex variable with their inverses).

Introduction of Group: Definition of a group and Basic properties with simple examples.

Course Outcomes:

Students will be able to

- find the inverse of matrix by using Cayley Hamilton theorem.
- solve the given system of homogeneous and non-homogeneous linear equations.
- apply Demoivre's theorem to find the roots of given polynomial equation.
- develop skill to construct groups by using different kinds of sets.

Recommended Books:

1) **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).

2) **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)

Referance Books:

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

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

B.Sc. Part-I Semester-I

Mathematics

Course Title: Calculus

Course Code: MAT-101-MJ

Theory: 30 Hours

Marks: 50 (Credits: 2)

Course Objectives:

- To characterize the given indeterminate form and find its solution by using L' Hospital's Rule
- To understand the applications of Taylor's theorem and Maclaurin's theorem to find series expansion of given functions.
- To understand basic concepts like partial derivatives, partial derivatives of higher order.
- To use reduction formulae for finding definite integral of trigonometric functions of higher order.

Unit I: **[15 Hours]**

Differentiation: Indeterminate forms and L' Hospital's Rule, Successive differentiation, n^{th} derivatives of standard functions, Leibnitz's Theorem. Taylor's theorem (Only Statement), Maclaurin's Theorem (Only Statement), Series expansions of e^x, cosx, sinx, log(1+x)

Function of two variables: Limit and Continuity of function of two variables, Partial derivative, partial derivatives of higher order, Homogeneous functions, Euler's Theorem on Homogeneous functions.

Unit II: **[15 Hours]**

Reduction Formulae:

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

Vector Calculus: Scalar point function, Vector point function, Directional derivatives, Gradient and its properties, divergence and its properties, Curl and its properties.

Course Outcomes: Students will be able to

- solve given indeterminate form and find its solution by using L' Hospital's Rule.
- find the series expansion of given function by using Taylor's theorem and Maclaurin's theorem.
- determine the definite integration of trigonometric functions of higher order by using reduction formulae.
- to find higher order partial derivatives of given homogeneous function and apply Euler's theorem.
- To calculate divergence and curl of the given function.

Recommended Books:

1) **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 (NiraliPrakashan).

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

Reference Books:

1) **Differential Calculus** by Shanti Narayan.

2) **A text book of Vector Calculus** by Shanti Narayan.

B.Sc. Part-I Semester-I

Mathematics

Course Title: Mathematics Practical-I

Course Code: MAT-103-MJP

Numerical Techniques Laboratory-I (NTL–I)

Practical: 60 Hours

Marks: 50 (Credits: 2)

Total Practicals-15

Practical -1: Inverse of Matrix by Cayley-Hamilton Method.
Practical-2: Rank of Matrix
Practical -3: Solution of system of Linear Homogeneous Equations.
Practical -4: Solution of system of linear non-homogeneous Equations.
Practical -5: Eigen values and Eigen vectors.
Practical -6: Find polar form, exponential form, n^{th} roots of a complex number.
Practical -7: Examples on Demoivre's theorem
Practical -8: Examples of a group.
Practical -9: Examples on L'Hospital's Rule
Practical -10: Examples on Leibnitz's theorem.
Practical -11: Examples on Reduction formulae
Practical -12: Examples on Euler's theorem.
Practical -13: Numerical examples on gradient
Practical -14: Numerical examples on divergence
Practical -15: Numerical examples on curl.

B.Sc. Part-I Semester-II

Mathematics

Course Title: Geometry

Course Code: MAT-151-MJ

Theory: 30 Hours

Marks: 50 (Credits: 2)

Course Objectives:

- To develop geometric approach by studding concepts like Translations, Rotations, Translations and Rotations.
- To identify conics from general form of second-degree equations.
- To find equation of plane from given conditions.
- To determine the equation of sphere and find equation of tangent plane.

Unit I:

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

Plane: General equation of plane, Normal equation, Intercept form, Angle between two planes, Plane through three points, Plane through a given point, Sides of a Plane, Distance of a point from a plane, Family of planes. **[10]**

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

Course Outcomes:

Students will be able to

- Think geometrically about the concepts like Translations, Rotations, Translations and Rotations.
- Classify conics from general form of second-degree equations and find the equation of conics in polar co-ordinate system.
- To determine the equation of plane which satisfies the given conditions.
- To find the equation of sphere passing through given circle.

Recommended Books:

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

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

Reference Book:

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

B.Sc. Part-I Semester-II

Mathematics

Course Title: Differential Equations

Course Code: MAT-152-MJ

Theory: 30 Hours

Marks: 50 (Credits: 2)

Course Objectives:

- To solve Differential Equations of first order and first degree by using variable separable method.
- To find the solution of Homogeneous and non- homogeneous differential equations.
- To check whether given differential equation is exact or not and if not then, find its integrating factor.
- To determine the general solution of Linear Differential Equations with Constant Co-efficients for repeated non-repeated and complex roots.
- To obtain solution of equation $f(D)y = X$ where X is of the form e^{ax}, $\sin(ax)$, $\cos(ax)$, x^m, $e^{ax}V$.

Unit I: **[15 Hours]**

Differential Equations of first order and first degree: [Part-I]

Introduction, variables separable form, methods for solution of variables separable type, homogeneous and non- homogeneous differential Equations.

Differential Equations of first order and first degree: [Part-II]

Exact differential equations, necessary and sufficient condition for exactness, Integrating Factor, linear differential equation, Bernoulli's equation.

Unit II: **[15 Hours]**

Linear Differential Equations with Constant Co-efficients:

Introduction, Complementary function and particular integral, General solution of $f(D)\,y = X$, solution of $f(D)y = 0$ for non-repeated and repeated real roots and complex roots.

Linear Differential Equations with Constant Co-efficients:

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

Course Outcomes:

Students will be able to

- obtain solution of differential equations of first order and first degree by using variable

separable method.

- determine the solution of homogeneous and non- homogeneous differential equations.
- solve the given exact differential equation.
- obtain the general solution of Linear Differential Equations with Constant Co-efficients f(D) y = X for repeated, non-repeated and complex roots.
- solve the equation f(D)y = X where X is of the form e^{ax}, sin(ax), cos(ax), x^m, $e^{ax}V$.

Recommended Books:

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

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

Reference Books:

1) **Differential equations** by G. S. Diwan, D. S. Agashe, Popular Prakashn , Bombay.

2) **Differential equations** by Sharma and Gupta Krishna Prakashan Media Co. Meerut.

B.Sc. Part-I Semester-II

Mathematics

Course Title: Mathematics Practical-II

Course Code: MAT-153-MJP

Numerical Techniques Laboratory-II (NTL–II)

Practical: 60 Hours

Marks: 50 (Credits: 2)

Total Practicals-15

Practical -1: Change of axis and invariants.
Practical -2: Examples on Translation
Practical -3: Examples on Rotations.
Practical -4: Conversion of Polar co-ordinates of points to Cartesian co-ordinates of points and equations
Practical -5: Conversion of Cartesian co-ordinates of points to Polar co-ordinates of points and equations
Practical -6: Family of Planes
Practical -7: Examples on tangent plane to sphere
Practical -8: Examples on radius and center of sphere
Practical -9: Examples on Homogeneous differential Equation

Practical -10: Examples on Non-Homogeneous differential Equations
Practical -11: Examples on Exact and linear differential Equations
Practical -12: Examples on Bernoulli's equations
Practical -13: Solution of f(D)y=X, where X= e^{ax} and x^m.
Practical -14: Solution of f(D)y=X, where X=sin(ax) and cos(ax)
Practical -15: Solution of f(D)y=X, where X= $e^{ax}V$.

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Syllabus as per NEP 2020
B.Sc.-I Semester-I
Mathematics Minors
Course Title: Business Mathematics-I
Course Code:
Total Credits: 2
Theory- 2 Credit [30 Hours]

Course Objectives:

1. To understand applications of matrices in business.
2. To solve LPP to maximize the profit and to minimize the cost.
3. To expose students to basic Mathematical concepts
4. To inculcate an analytical approach to the subject matter.

Unit I: Determinants and Matrices: **[15 Hours]**

1.1 Definition of second & Third order Determinant, calculation of values of determinants up to third order, Solution of system of linear equations by Cramer's rule

1.2 Properties of determinants (without proof)

Simple examples.

1.3 Definition of a Matrix, Algebra of matrices, Equality of Matrices, Transpose of matrix, Inverse of matrix (by Adjoint method)

1.4 Solution of a system of linear equations having unique solution and involving not more than three variables (by Adjoint Method)

1.5 Special types of matrices

1.6 Applications of matrix to business problems.

Unit II: Linear Programming Problem (L.P.P.): **[15 Hours]**

2.1 Mathematical formulation of L.P.P. up to two variables

2.2 Graphical method of solution of L.P.P.

2.3 Commercial examples - Cases having no solution, Multiple solution, Unbounded solution.

References:

1] Business Mathematics- Kapoor V.K., Sancheti D.C.
2] Business Mathematics - Dr. Amarnath Dikshit & Dr. Jinendra Kumar

Jain.3] Business Mathematics - V. K. Kapoor (Sultan Chand & sons, Delhi.)
4] Business Mathematics - Bari (New Literature publishing company, Mumbai.)
5] Problems in Operation Research - P. K. Gupta and Man Mohan
6] Qualitative Methods and Operation Research - G. Gopikuttan (Himalaya Publishing House)
7] Commercial Arithmetic - P. S. Chiplunkar and C. G. Kulkarni, (NarendraPrakashan.)
8] Mathematics in Commerce and Economics, - Qazi Zameerudding and V. K. Khanna,
9] Commercial Arithmetic's- Sutar
10] Business Mathematics - Soni R.S.
11] Business Mathematics- Veena G.R. (New age international Publishers, New Delhi).
12] Business Mathematics – G.V. Kumbhojkar

Syllabus as per NEP 2020
B.Sc.-I Semester-II
Mathematics Minor
Course Title: Business Mathematics-II
Course Code:
Total Credits: 2
Theory- 2 Credit [30 Hours]

Course Objectives:

- To impart knowledge of basic Mathematical concepts
- To arouse the student's interest by showing the relevance and use of Mathematical knowledge.
- To study and critically analyze Mathematical reasoning to problems of business
- To build up arithmetical and numerical abilities.
- To enhance logical and quantitative thinking
- To understand useful functions in business

Unit I: Ratio, Proportion, Logarithms, Progression: **[15 Hours]**

1.1 Ratio

1.2 Proportion

1.3 Logarithms

1.4 Definition of A.P. & G.P.

1.5 To find Tn & Sn

1.6 Simple practical commercial problems.

Unit II: Limit of a function: **[15 Hours]**

2.1 Theorems on limits (without proof)

2.2 Simple examples on evaluation of limits

2.2.1 Direct type

2.2.2 Factorization

2.2.3 Simplification

2.2.4 Rationalization

2.3 Infinity type

2.4 A exponential type.

Reference Books:

1] Business Mathematics- Kapoor V.K., Sancheti D.C.

2] Business Mathematics - Dr. Amarnath Dikshit & Dr. Jinendra Kumar Jain.

3] Business Mathematics - V. K. Kapoor (Sultan Chand & sons, Delhi.)

4] Business Mathematics - Bari (New Literature publishing company, Mumbai.)

5] Commercial Arithmetic - P. S. Chiplunkar and C. G. Kulkarni, (NarendraPrakashan.)

6] Mathematics in Commerce and Economics - Qazi Zameerudding and V. K. Khanna,

7] Commercial Arithmetic's- Sutar

8] Business Mathematics - Soni R.S.

9] Business Mathematics- Veena G.R. (New age international Publishers, New Delhi).

10] Essence of Business Mathematics – R.K. Rajput, Discovery PublicationHouse, New Delhi-

11] Elements of Calculus - Bhagwat and

Pawate

12] Business Mathematics – G.V. Kumbhojkar

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Department of Mathematics

B.Sc. Part-I Semester – I

Open Elective (OE) Course

Course Title: Financial Mathematics-I

Course Code: MAT-105-OE

Course Objectives: Students will be able to,

1. understand that interest represents the cost of borrowing or the return on investment.
2. study the discounted value of a future payment or investment based on the interest rate and time period involved.
3. gain the knowledge of differences between simple interest and compound interest calculations and recognize the advantages of compounding in generating higher returns or higher costs over time.
4. learn to calculate the future value and present value of annuities, including both ordinary annuities and annuities due.

Credits (Total Credits 4)	**SEMESTER – I** **Financial Mathematics-I**	**No. of hours per unit**
Unit – I	**Simple Interest**	**(15)**
	Total interest, Rate of interest, Term of maturity, Current Value, Future value, Simple Discount, Ordinary Interest and Exact Interest, Focal date and Equation of Value, Equivalent time, Partial Payments, Dollar Weighted method.	
Unit – II	**Bank Discount**	**(15)**
	Discount formula, Discount term and Discount rate, Difference between Simple discount and Bank discount, Comparison between Discount rate and Interest rate, Discounting Promissory note, Discounting treasury bill.	
Unit – III	**Compound Interest**	**(15)**
	Compounding formula, Current value, Discount factor, Rate of Compound interest, Compounding term, the rule of 72 and other rules, Effective interest rate, Types of compounding, Continuous compounding, Equations of value for compound interest, Equated time for compound interest.	

Unit – IV	**Annuities**	**(15)**
	Definition and basic concepts of annuities, Types of Annuities, Future value of an ordinary annuity, Current value of an ordinary annuity, Payment, term and Interest of an ordinary payment, Annuity due: Future and Current Values, Payment and term of an annuity due, Deferred annuity, Future and current values of deferred annuity, Perpetuities.	

Course Outcomes: Students should be able to,

1. apply the concept of simple interest to real world scenarios, such as calculating interests on loans, investments or savings accounts.
2. interpret bank discount calculations to assess the attractiveness of different financial instruments or investment opportunities.
3. evaluate the validity of compound interest calculations and identify any errors or inconsistencies.
4. design situations where annuity calculations can be used to analyze and compare different financial options or retirement strategies.

Reference Books:

1) Alhabeeb M. J., Mathematical Finance, John Wiley and Sons, Inc., Publication, 2012. (Unit II)
2) Hull, John C. Options, Futures and Other Derivatives, Pearson Education, New York, 9th ed., 2017.
3) Ross, Sheldon M., An Introduction to Mathematical Finance: Options and Other Topics, Cambridge University Press, 2013.
4) Baxter, Martin and Andrew Rennie, Financial Calculus: An Introduction to Derivative Pricing, Cambridge University Press, 2nd ed., 2003.
5) Kosowski, Robert L., Salih N. Neftci and Marek Rutkowski, Principles of Financial Engineering, Academic Press, London,3rd ed., 2015.

B.Sc. Part-I Semester – II

Open Elective (OE) Course

Course Title: Financial Mathematics-II

Course Code: MAT-155-OE

Course Objectives: Students will be able to,

1. understand the fundamental concepts, principles and practices related to borrowing and lending money.
2. learn about the fundamental concepts and terminology related to mortgages such as interest rates, loan terms, down payments and amortization.
3. gain knowledge of how mortgage repayments are structured over time through amortization.
4. study the meaning of leasing and how it functions as a contractual arrangement between a lessor and lessee.

Credits (Total Credits 4)	**SEMESTER – II** **Financial Mathematics-II**	**No. of hours per unit**
Unit – I	**Credit and Loans**	**(15)**
	Types of Debt, Dynamics of Interest- Principal Proportions, Premature Payoff, Assessing Interest and Structuring Payments, Cost of Credit, Finance charge and Average Daily Balance, Credit limit vs. Debt limit.	
Unit – II	**Mortgage**	**(15)**
	Analysis of Amortization, Effects of Interest rate, Term and Down Payment on Monthly Payment, Graduated Payment Mortgage, Mortgage Points and the Effective Rate.	
Unit – III	**Mortgage Loan**	**(15)**
	Mortgage Loan, Repayment Penalty on Mortgage Loan, refining a Mortgage Loan, Wraparound and Balloon Payment Loans, Sinking Funds, Comparison between Amortization and Sinking Fund Methods.	
Unit – IV	**Leasing**	**(15)**
	The Lessee: The cost of buying on credit, The cost of leasing, The Lessor.	

Course Outcomes: Students should be able to,

1. apply credit management strategies to improve creditworthiness such as reducing debt and making timely payments.

2. evaluate mortgage offers from different lenders considering factors like interest rates, fees and terms.
3. assess the advantages and disadvantages of various mortgage debt strategies.
4. develop a leasing strategy for a business considering factors such as cash flow, tax implications and equipment obsolescence.

Reference Books:

1) Alhabeeb M. J., Mathematical Finance, John Wiley and Sons, Inc., Publication, 2012. (Unit III)
2) Hull, John C. Options, Futures and Other Derivatives, Pearson Education, New York, 9th ed., 2017.
3) Ross, Sheldon M., An Introduction to Mathematical Finance: Options and Other Topics, Cambridge University Press, 2013.
4) Baxter, Martin and Andrew Rennie, Financial Calculus: An Introduction to Derivative Pricing, Cambridge University Press, 2nd ed., 2003.
5) Kosowski, Robert L., Salih N. Neftci and Marek Rutkowski, Principles of Financial Engineering, Academic Press, London,3rd ed., 2015.

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B.Sc. (Mathematics) (Part-I) (Semester- I)
Indian Knowledge System (IKS)
Course Title: Vedic Mathematics
Course Code: MAT-110-IKS
Total Credit:1 [15 Hours] (Theory)

Course Objectives: Students will be able to,

1. gain knowledge of history of Indian Mathematics from Vedic era.
2. study ruler-compass constructions in Vedic geometry.
3. understand the importance of decimal number system.
4. learn speed up calculations in arithmetic, algebra and trigonometry.

Unit-I Background: Culture and Language **[5 Hours]**

The Indus valley civilisation, The Vedic Period, The Oral tradition, Grammar, The Sulbasutra, The theorem of the diagonal.

Unit-II Vedic Geometry **[5 Hours]**

Rectilinear Figures and their transformations, Circle from square: the direct construction, The inverse formula: Square from circle, generalities, Measures and Numbers, Geometry

Unit-III Decimal Numbers **[5 Hours]**

Background, Numbers and Based numbers, The Place Value Principal and its Realisations, Other Realisations, The Choice of a Base.

Course Outcomes: Students should be able to,

1. describe Vedic period and tradition in Mathematics.
2. sketch geometrical constructions using simple methods.
3. examine place value principal realisations and other realisations.
4. test various Vedic arithmetic methods for speed up calculations.

Reference Books:

1) P. P. Divakaran, The Mathematics of India: Concepts, Methods, Connections, Hindustan Book Agency, 2018.Rep Springer New York, 2018. (Ch.1,2,3,4,5)
2) Shri. B. K. Tirthaji, V. S. Agarwal, Vedic Mathematics or Sixteen Simple Mathematical formulae from Vedas, Orient Book Distributors,1981.

3) B. Datta and A. N. Sing, History of Hindu Mathematics, Reprint, Bharatiya Kala Prakashan, Delhi, 2004.
4) C. N. Srinivasiengar, History of Indian Mathematics, The World Press, Calcutta, 1967.
5) C. S. Seshadri, Studies in History of Indian Mathematics, Hindustan Book Agency, Delhi, 2010.

B.Sc. (Mathematics) (Part-I) (Semester- I)
Indian Knowledge System (IKS) Practical
Course Title: Vedic Mathematics
Course Code: MAT-111-IKSP
Total Credit:1 [30 Hours] (Practical)

Practical:

1) The Vedic Period, The Oral tradition
2) Rectilinear Figures and their transformations
3) Practical on Circle from square, Square from circle
4) Practical on Measures and Numbers
5) Practical on the Place Value
6) Practical on Realisations
7) Practical on Principal and its Realisations
8) Practical on Choice of a Base.

Karmaveer Bhaurao Patil Mahavidyalaya * Pandharpur

Chairman
B.O.S. in Mathematics
Karmaveer Bhaurao Patil Mahavidyalaya,
Pandharpur (Autonomous)