

FACULTY OF SCIENCES

SYLLABUS FOR THE BATCH FROM THE YEAR 2024 TO YEAR 2028

Programme Name	Programme Code
B.Sc.(Economics)	B.Sc.(ECO)
B.Sc.(Computer Science)	BCS
B.Sc.(Non-Medical)	BSNM

**(Subject: Mathematics)
(Semester I-II)**

Examinations: 2024-2028



**P.G.Department of Mathematics
Khalsa College, Amritsar**

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(b) Subject to change in the syllabi at any time.
(c) Please visit the College website time to time.

SYLLABUS FOR THE BATCH FROM THE YEAR 2024 TO YEAR 2028

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Syllabus of Mathematics

SEMESTER - I										
Course Code	Course Name	Credits			Total Credits	Max Marks				Page No.
		L	T	P		Th	P	IA	Total	
Major Courses										
MAT-111A	Algebra-I	2	-	-	2	37	-	38	50	3-4
MAT-111B	Calculus-I	2	-	-	2	37	-		50	5-6
MAT-111P	Algebra Laboratory	-	-	2	2	-	38		50	7
Total		4	-	2	6	74	38	38	150	

SEMESTER - II										
Course Code	Course Name	Credits			Total Credits	Max Marks				Page No.
		L	T	P		Th	P	IA	Total	
Major Courses										
MAT-121A	Algebra-II	2	-	-	2	37	-	38	50	8-9
MAT-121B	Calculus-II	2	-	-	2	37	-		50	10-11
MAT-121P	Calculus Laboratory	-	-	2	2	-	38		50	12
Total		4	-	2	6	74	38	38	150	

Khalsa College, Amritsar

(An Autonomous College)

Syllabus for

PROGRAMME: B.Sc.(Eco.)/B.Sc.(C.S.)/B.Sc.(N.M.)

SEMESTER-I

MATHEMATICS

COURSE CODE: MAT-111A

COURSE TITLE: Algebra-I

L	T	P	Credits
2	0	0	2

Time: 3 Hours

MAXIMUM MARKS: 50

THEORY:37

INTERNAL ASSESSMENT:13

Medium: English

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consists of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section-B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section-A will consists of eight short answer type questions, each of 1.5 marks. Students are to attempt any six.
3. Sections-B, C, D & E will consist of two questions each. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 7marks.

COURSE OBJECTIVES:

- Students will be able to solve problems based on matrix algebra.
- Students can have an idea to solve the problems on eigen values and eigen vectors of matrices.
- Students can solve the problems based on Cayley Hamilton theorem.

COURSE CONTENT:

Unit-I

Partitioning of Matrices, Matrices Partitioned conformably for Multiplication, Rank of a Matrix, Normal form, Row rank, Column rank of a matrix, Equivalence of column and row ranks, rank of product of matrices.

Unit-II

Linear independence of row and column vectors Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations.

Unit-III

Eigenvalues, Eigenvectors, Hermitian Matrix, Skew Hermitian matrix and unitary matrix and properties of Eigen value.

Unit-IV

Minimal and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix.

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BOOKS RECOMMENDED:-

1. Shanti Narayan and P.K. Mittal: Text Book of Matrices.
2. K.B. Datta : Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

REFERENCE BOOK RECOMMENDED:-

1. Tom M. Apostol: Calculus: An Indian Adaptation, Wiley India, 2023

COURSE OUTCOMES:

On completing the course, the students will be able to:

- solve problems based on matrices, vector spaces, eigen values and eigen vectors,
- recognize consistency and inconsistency of linear equations.

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Khalsa College, Amritsar
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Syllabus for
PROGRAMME: B.Sc.(Eco.)/B.Sc.(C.S.)/B.Sc.(N.M.)
SEMESTER-I
MATHEMATICS
COURSE CODE: MAT-111B
COURSE TITLE: Calculus-I

L	T	P	Credits
2	0	0	2

MAXIMUM MARKS: 50

THEORY:37

INTERNAL ASSESSMENT:13

Medium: English

Time: 3 Hours

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section-B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section-A will consist of eight short answer type questions, each of 1.5 marks. Students are to attempt any six.
3. Sections-B, C, D & E will consist of two questions each. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 7 marks.

COURSE OBJECTIVES:

- The content of this course is designed to make the students understand the concepts of limits and continuity of functions, the methods of differentiation of various types of functions.
- To understand the concept of hyperbolic functions
- To make students familiar with the concept of concavity and convexity.
- To have an idea about the applications of Leibnitz theorem, Taylor's theorem and Maclaurin's theorem.

COURSE CONTENT:

Unit-I

Real number system and its order properties: lub, glb of sets of real numbers, Completeness property, Archimedean property, Dense property of Rational numbers, Limit of a function of real variable, Properties of Limits, Squeeze Theorem.

Unit-II

Continuous function and classification of discontinuities, Differentiability of a function of real variable, Concavity and Convexity of function, Point of inflexion.

Unit-III

Derivatives of Hyperbolic and Inverse Hyperbolic functions, nth order derivatives, Leibnitz theorem on nth derivative and its applications.

Unit-IV

Taylor's and Maclaurin theorem with Lagrange form of remainder, Application of Taylor's theorem in error estimation; Taylor's series expansions of $\sin x, \cos x, e^{\cos x}, \log x$ etc. Indeterminate forms and L'Hopital rule.

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BOOKS RECOMMENDED: -

1. S. Narayan and P. K. Mittal: Integral Calculus. Sultan Chand & Sons.
2. Gorakh Prasad, Differential Calculus (19th ed.). Pothishala Pvt. Ltd. Allahabad, 2016.

REFERENCE BOOKS RECOMMENDED: -

1. Tom M. Apostol, Calculus: An Indian Adaptation, Wiley India, 2023.
2. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum's outline series, Schaum Publishing Co. New York.

COURSE OUTCOMES: On completing the course, the students will be able to:

- acquaint with the concept of limits, functions and derivatives.
- know about concavity and convexity of the functions

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Syllabus for

PROGRAMME: B.Sc.(Eco.)/B.Sc.(C.S.)/B.Sc.(N.M.)

SEMESTER-I

MATHEMATICS

COURSE CODE:MAT-111P

COURSE TITLE: ALGEBRA LABORATORY

L	T	P	Credits
-	-	2	2

MAXIMUM MARKS: 50

PRACTICAL:38

INTERNAL ASSESSMENT:12

Medium: English

Time: 3 Hours

List of Practicals (using any package)

1. Introduction to the computer package in the practicals.
2. Matrix operations: addition, multiplication, inverse, transpose, determinant of matrix.
3. Find Rank of matrix: Row Rank, Column Rank.
4. Find row reduced echelon form
5. Create the coefficient matrix A and vector b. Solve for x using the inverse, using the builtin function.
6. Solving a linear system, using Gauss elimination numerically.
7. Finding eigenvalues and eigenvectors, numerically.

BOOKS RECOMMENDED:-

1. S.S. Sastry, Engineering Mathematics - Volume I (4th Edition), PHI, 2008.
2. S.S. Sastry, Engineering Mathematics - Volume II (4th Edition), PHI, 2008.

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Syllabus for

PROGRAMME: B.Sc.(Eco.)/B.Sc.(C.S.)/B.Sc.(N.M.)

SEMESTER-II

MATHEMATICS

COURSE CODE: MAT-121A

COURSE TITLE: Algebra-II

L	T	P	Credits
2	0	0	2

Time: 3 Hours

MAXIMUM MARKS: 50

THEORY:37

INTERNAL ASSESSMENT:13

Medium: English

INSTRUCTIONS FOR THE PAPER SETTERS:

1.The question paper will consists of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section-B, C, D and E from Unit-I, II, III and IV, respectively.

2.Section-A will consists of eight short answer type questions, each of 1.5 marks. Students are to attempt any six.

3. Sections-B, C, D & E will consist of two questions each. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 7 marks.

COURSE OBJECTIVES: Students will be able

- to solve problems based on matrix algebra.
- to have an idea about quadratic forms.
- to apply Cardan's and Descarte's methods for solving cubic and biquadratic equations.

COURSE CONTENT:

Unit-I

Quadratic Forms, quadratic form as a product of matrices. The set of quadratic forms over a field. Congruence of quadratic forms and matrices. Congruent transformations of matrices. Elementary congruent transformations. Congruent reduction of a symmetric matrix. Reduction in the real field.

Unit-II

Classification of real quadratic forms in n variables. Definite, semi-definite and indefinite real quadratic forms. Characteristic properties of definite, semi-definite and indefinite forms. Relations between the roots and coefficients of general polynomial equation of degree n in one variable. Vieta's Formula,

Unit-III

Fundamental Theorem of Algebra (Statement only) Transformation of equations, Equations of Squared differences, Solution of cubic equations by Cardan method.

Unit-IV

Discriminant of polynomial equation, Discriminant of Cubic equation, nature of roots of cubic, Solution of Biquadratic by Ferrari's Method with illustrations, Descartes's Rules of Signs with illustrations.

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BOOKS RECOMMENDED:-

1. Shanti Narayan and P.K. Mittal: Text Book of Matrices.
2. K.B. Datta : Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

REFERENCE BOOK RECOMMENDED:-

1. Tom M. Apostol: Calculus: An Indian Adaptation, Wiley India, 2023

COURSE OUTCOMES:

On completing the course, the students will be able to:

- understand the relation between roots and coefficients.
- solve cubic and biquadratics equations.
- have an idea about the nature of roots without solving the equation.

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Syllabus for

PROGRAMME: B.Sc.(Eco.)/B.Sc.(C.S.)/B.Sc.(N.M.)

SEMESTER-II

MATHEMATICS

COURSE CODE: MAT-121B

COURSE TITLE: Calculus-II

L	T	P	Credits
2	0	0	2

MAXIMUM MARKS: 50

THEORY:37

INTERNAL ASSESSMENT:13

Medium: English

Time: 3 Hours

INSTRUCTIONS FOR THE PAPER SETTERS:

1. The question paper will consist of five sections namely Section-A, which will be from entire syllabus (equally distributed from each unit), Section-B, C, D and E from Unit-I, II, III and IV, respectively.
2. Section-A will consist of eight short answer type questions, each of 1.5 marks. Students are to attempt any six.
3. Sections-B, C, D & E will consist of two questions each. Students are to attempt any four questions in total by selecting one question from each section. Each question carries 7 marks.

COURSE OBJECTIVES:

- The content of this course is designed to make the students understand the concept of Asymptotes.
- To study the concept of De Moivre's.
- To make students familiar with the concept of Integration of hyperbolic functions and Definite integral.
- To have an idea about the applications of Reduction formulae.

Unit-I

Asymptotes, Horizontal Asymptotes, Vertical Asymptotes, Oblique Asymptotes, Asymptotes of general Rational Algebraic Curve with illustrations, Intersection of curve and its Asymptotes

Unit-II

De Moivre's theorem (for integer and Rational index) and its applications, primitive nth roots of unity

Unit-III

Integration of hyperbolic functions, Properties of definite integral.

Unit-IV

Reduction formulae of type

$\int \tan^n x dx, \int \cot^n x dx, \int \sec^n x dx, \int \operatorname{cosec}^n x dx, \int x \cos^n x dx, \int \cos^m x \sin^n x dx,$

Reduction formulae using Rule of Smaller index +1 of the type $\int_0^{\pi/2} \sin^n x \cos^n x dx,$

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

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2. Gorakh Prasad, Differential Calculus (19th ed.). Pothishala Pvt. Ltd. Allahabad, 2016.

REFERENCE BOOKS RECOMMENDED: -

1. Tom M. Apostol, Calculus: An Indian Adaptation, Wiley India, 2023.
2. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum's outline series, Schaum Publishing Co. New York.

COURSE OUTCOMES: On completing the course, the students will be able to:

- acquaint with the concept of Asymptotes and De Moiver's
- solve problems on hyperbolic functions and Reduction formula.

Khalsa College, Amritsar

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Syllabus for

PROGRAMME: B.Sc.(Eco.)/B.Sc.(C.S.)/B.Sc.(N.M.)

SEMESTER-II

MATHEMATICS

COURSE CODE: MAT-121P

COURSE TITLE: CALCULUS LABORATORY

L	T	P	Credits
0	0	2	2

MAXIMUM MARKS: 50

PRACTICAL:38

INTERNAL ASSESSMENT:12

TIME: 3Hrs

MEDIUM: English

List of Practicals (using any package)

1. Plotting graphs of elementary functions e^{ax+b} , $\sin(bx+c)$, $\log(ax+b)$, $1/(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $|ax+b|$ and to illustrate the effect of a and b on the graphs.
2. Plotting the graphs of the polynomial of degree 4 and 5, the derivative graph, the second derivative graph
3. Tracing of conics in Cartesian coordinates and using the general equation of second degree in x and y.
4. Tracing of conicoids: Ellipsoid, Hyperbolic paraboloid, Elliptic paraboloid, Hyperboloid of one and two sheets etc.
5. Graphs of hyperbolic functions.
6. Approximation of limit.
7. Approximations of derivatives.

BOOKS RECOMMENDED:-

1. S.S. Sastry, Engineering Mathematics - Volume I (4th Edition), PHI, 2008.
2. S.S. Sastry, Engineering Mathematics - Volume II (4th Edition), PHI, 2008.