

**CHAUDHARY BANSI LAL UNIVERSITY,
PREM NAGAR, BHIWANI**

**SCHEME AND SYLLABI OF EXAMINATIONS
FOR
FIVE-YEAR INTEGRATED B.SC. AND M.SC. IN
MATHEMATICS
WITH EFFECT FROM THE SESSION 2025-26
(As per NEP)**



**DEPARTMENT OF MATHEMATICS
Chaudhary Bansi Lal University,
Prem Nagar-127031, Bhiwani
HARYANA, INDIA**

Credit Structure for FiveYearIntegratedProgrammes

Structure of UG Program (First three years of Five Year Integrated Program)							
Semester	Core Courses (CC) / Major Courses	Minor (MIC)/ Minor Vocational (VOC) Courses	Multidisciplinary courses (MDC)	Ability Enhancement courses (AEC)	Skill Enhancement Courses (SEC)/ Internship /Dissertation/ Research Project	Value-Added Courses (VAC)	Total Credits
I	CC - U1 @ 4 credits	CC-M1 @ 4 credits	MDC1 @ 3 credits	AEC1 @ 2 credits	SEC1 @ 3 credits	VAC1 @ 2 credits	22
	CC – U2 @ 4 credits						
II	CC – U3 @ 4 credits	CC-M2 @ 4 credits	MDC2 @ 3 credits	AEC2 @ 2 credits	SEC2 @ 3 credits	VAC2 @ 2 credits	22
	CC – U4 @ 4 credits						
Students exiting the programme after second semester and securing 48 credits including 4 credits of summer internship will be awarded UG Certificate in the relevant Discipline/Subject							
III	CC – U5 @ 4 credits	CC-M3 @ 4 credits	MDC3 @ 3 credits	AEC3 @ 2 credits	SEC3 @ 3 credits		24
	CC – U6 @ 4 credits						
	CC – U7 @ 4 credits						
IV	CC – U8 @ 4 credits	CC-M4(VOC) @ 4 credits	-----	AEC4 @ 2 credits	-----	VAC4 @ 2 credits	24
	CC – U9 @ 4 credits						
	CC – U10 @ 4 credits						
	CC – U11 @ 4 credits						
Students exiting the programme after fourth semester and securing 96 credits including 4 credits of summer internship will be awarded UG Diploma in the relevant Discipline/Subject							
V	CC – U12 @ 4 credits	CC-M5(VOC) @ 4 credits	-----	-----	Internship1 @ 4 credits#	-----	24



	CC – U13 @ 4 credits						
	CC – U14 @ 4 credits						
	CC – U15 @ 4 credits						
VI	CC – U16 @ 4 credits	CC-M6(VOC)@ 4 credits	-----	-----	-----	-----	20
	CC – U17 @ 4 credits						
	CC – U18 @ 4 credits						
	CC – U19 @ 4 credits						
Students will be awarded 3-year UG Degree in relevant major Discipline/Subject upon securing 136 credits.							
Note:#Four credits of internship earned by a student during summer internship after 2nd semester or 4th semester will be counted in 5th semester of a student who pursue 3 year UG Programmes without taking exit option.							
Structure of PG Program (Last two years of Five Year Integrated Program)							
First year of two-year PG programme (NHEQF Level 6.0)							
Semester	Core Courses (CC) / Elective Courses	Minor Vocational (VOC) Courses/ Internship		Research Project / Dissertation	Research Thesis	Value-Added Courses (VAC)/ Indian Knowledge System (IKS)/ Employability and Entrepreneurship Skills Courses (EEC)	Total Credits
VII	CC-P1 @ 4 credits	CC-M7 (VOC) @ 4 credits OR Internship 2 @ 4 credits	-----	-----	-----	-----	24
	CC-P2 @ 4 credits						
	CC-P3 @ 4 credits						
	CC-P4 @ 4 credits						
	CC-P5 @ 4 credits						
VIII Option-I	CC-P6 @ 4 credits	CC-M8 (VOC) @ 4 credits OR Internship 3 @ 4 credits	-----	-----	-----	VAC/IKS @ 2 credits	26
	CC-P7 @ 4 credits						
	CC-P8 @ 4 credits						
	CC-P9 @ 4 credits						
	CC-P10 @ 4 credits						

OR							
VIII Option-II	CC-P6 @ 4 credits	CC-M8 (VOC) @ 4 credits OR Internship 3@ 4 credits		Research Project / Dissertation @ 12 Credits		VAC/IKS@ 2 credits	26
	CC-P7 @ 4 credits						
Students who exit after first year of two-year PG programme on completion of 48 credits will be awarded PG Diploma in concerned discipline. Student who has chosen option-II in VIII semester will have to select option-III in Second year of two-year PG programme							
Second year of two-year PG programme (NHEQF Level 6.5) (STUDENTS SHOULD SELECT ANY ONE OPTION FOR THE SECOND YEAR OF 2 YEAR PG PROGRAM)							
Only Course Work							
Option 1	IX	CC-P11 @ 4 credits	-----	-----	-----	EEC @ 2 credits	22
		CC-P12 @ 4 credits					
		CC-P13 @ 4 credits					
		DEC-P14 @ 4 credits					
		DEC-P 15 @ 4 credits					
	X	CC-P16 @ 4 credits	-----	-----	-----	-----	20
		CC-P17 @ 4 credits					
		CC-P18 @ 4 credits					
		DEC-P19 @ 4 credits					
		DEC-P20 @ 4 credits					
Coursework and Research							
Option II	IX	CC-P11 @ 4 credits	-----	-----	-----	EEC @ 2 credits	22
		CC-P12 @ 4 credits					
		CC-P13 @ 4 credits					
		DEC-P14 @ 4 credits					
		DEC-P15 @ 4 credits					
	X	-----	-----	-----	Research Thesis @ 20 credits	-----	20
Only Research							
Option III	IX	-----	-----	-----	Research Thesis @ 20 credits	EEC @ 2 credits	22

	X	-----	-----	-----	Research Thesis @ 20 credits	-----	20
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NOTE:

CC /MC	Core Course/Major Course: Credit of a Core Course/major course could be the combination of lecture credits, tutorial credits, and practical credits.
DEC	Discipline Specific Elective Course (DEC): Credit of a DEC could be the combination of lecture credits, tutorial credits, and practical credits.
CC-Mincluding VOC	Minor Course (CC-M) with minimum 24 Credits including Vocational Course (VOC)
MDC	Multidisciplinary Course: All students must undergo introductory level multidisciplinary courses relating to Natural Sciences, Physical Sciences, Humanities, Arts & Social Sciences, Commerce & Management, Interdisciplinary Studies during first three semesters. Students are not allowed to choose or repeat courses already studied at the higher secondary level (12th class) or opted as major and minor stream under this category.
AEC	Ability Enhancement Course: Ability Enhancement (Language) courses may be designed to achieve competency in the Modern Indian Language and English, with a special emphasis on language and communications skills.
SEC	Skill Enhancement Course: Skill Enhancement Courses may be primed to impart practical skills, hands-on training, soft skills, etc., to enhance the student's employability.
Internship	Internships will require 120 hours (1 credit: 30 hrs of engagement) of involvement working with local industry, government or private organizations, business organizations, artists, craft persons, and similar entities during summer vacation.
Research Project / Dissertation	Guidelines for Research Project / Dissertation will be followed as per ordinance of Five Year Integrated Programme of the University.
Research Thesis	Research Thesis for PG Degree will be completed in the ninth/tenth semester under the guidance of a faculty member. Guidelines for Research Thesis will be followed as per ordinance of Five Year Integrated Programme of the University.
VAC	All UG students must undergo at least three Value Added Courses (VAC)

Major and Minor courses in I & II Semesters will have Foundation or Introductory level courses. Major and Minor courses in III & IV semesters will be Intermediate Level Courses. Whereas Major and minor courses in V & VI shall be of higher level courses and in VII, VIII, IX & X semesters, advanced level courses will be offered.

Scheme and Syllabus of Five Year Integrated Programme in Mathematics:2025-26

Core Courses(CC) & Minor Courses (CC-M)			Credits Distribution			Total Credits	Workload			Total Workload	Marks				
	Nomenclature of Course	Course Code	L	T	P		L	T	P		Theory		Practical		Total Marks
											Internal	External	Internal	External	
	Semester I														
CC -U1	Algebra	25IMSMA101	3	0	1	4	3	0	2	3+2	20	50	10	20	100
CC -U2	Vector Calculus	25IMSMA102	3	1	0	4	3	1	0	3+1	30	70	-	-	100
CC-M1	Descriptive Statistics	25IMSST101	3	0	1	4	3	0	2	3+2	20	50	10	20	100
MDC1	From Available pool of Multidisciplinary Courses of the University/SWAYAM/ MOOCS from a subject of different discipline as per NEP.														
AEC1	From Available pool of Ability Enhancement Courses as per NEP														
SEC1	From Available pool of Skill Enhancement Courses as per NEP														
VAC1	From Available pool of Value Added Courses as per NEP														



Semester - I		
Name of the Course: Algebra	Course Code: 25IMSMA101	Credit: 4
Maximum Marks: Theory: 20(Internal)+50(External)=70 Practical: 10(Internal)+20(External)=30	Time of Examinations: 3 Hours	
Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.		
Course Learning Outcomes (CLO): CLO1 Determine the type of matrices and compute the elementary operations on the matrices. Compute the Eigen values, Eigen function, characteristic equation and minimal polynomial of a given matrix. CLO2 Use the concept of rank of matrices to solve systems of linear equations. CLO3 Familiar with transformation of equation which is very helpful to find the solution of the given problem. CLO4 Use the Descartes's rule of sign to find the nature of roots.		
Section – I Symmetric, Skew-symmetric, Hermitian and skew Hermitian matrices. Elementary Operations on matrices. Rank of a matrices. Inverse of a matrix. Linear dependence and independence of rows and columns of matrices. Row rank and column rank of a matrix. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Minimal polynomial of a matrix. Cayley Hamilton theorem and its use in finding the inverse of a matrix.		
Section-II Applications of matrices to a system of linear (both homogeneous and non– homogeneous) equations. Theorems on consistency of a system of linear equations. Unitary and Orthogonal Matrices, Bilinear and Quadratic forms.		
Section-III Relations between the roots and coefficients of general polynomial equation in one variable. Solutions of polynomial equations having conditions on roots. Common roots and multiple roots. Transformation of equations.		
Section-IV Nature of the roots of an equation Descarte's rule of signs. Solutions of cubic equations (Cardon's method). Biquadratic equations and their solutions.		
Practical/ Computational Work (Based on course Algebra) Practical: 10(Internal)+20(External)=30 There will be five questions in all, and the students must attempt any three questions. The question paper will set on the spot jointly by the internal and external examiners. Distribution of Marks will be as follows: i) Written Practical/ Lab work : 10 Marks ii) Viva-voce and practical record: 10 Marks		
List of Practicals Following is the list of programmes to be performed in the Lab using PYTHON/ MATLAB: 1. Practical based on addition, multiplication of Matrices. 2. Practical based on inverse, transpose. 3. Practical based on determinant, rank. 4. Practical based on eigenvectors, eigenvalues. 5. Practical based on Characteristic equation and verification of Cayley Hamilton equation. 6. Practical based on system of linear equations. 7. Practical based on System of Homogenous Equation. 8. Practical based on System of Non- Homogenous Equation. 9. Practical based on Solutions of cubic equations. 10. Practical based on Solutions of Biquadratic equations.		
References: 1. Dickson, Leonard Eugene (1922). First Course in The Theory of Equations. John Wiley & Sons, Inc. New York. The Project Gutenberg EBook.		

2. S. H. Friedberg, A. L. Insel and L. E. Spence, Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi.
3. Richard Bronson, Theory and Problems of Matrix Operations, Tata McGraw Hill.
4. H.S. Hall and S.R. Knight : Higher Algebra, H.M. Publications 1994.
5. Shanti Narayan : A Text Books of Matrices.
6. Chandrika Prasad : Text Book on Algebra and Theory of Equations. Pothishala Private Ltd., Allahabad.
7. S. H. Friedberg, A. L. Insel and L. E. Spence, Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi.
8. Richard Bronson, Theory and Problems of Matrix Operations, Tata McGraw Hill.
9. B. Kolman, David R. Hill, Introductory Linear Algebra An Applied First Course, 8th Edition, Prentice Hall.
10. Jim DeFranza and Dan Gagliardi, Introduction to Linear Algebra with Applications, McGraw Hill Education (India) Pvt Ltd, New Delhi.

Semester - I

Name of the Course: Vector Calculus	Course Code: 25IMSMA102	Credit:4
Maximum Marks: Theory: 30(Internal)+70(External)=100	Time of Examinations: 3 Hours	
Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.		
Course Learning Outcomes (CLO): CLO1 Find the derivative along a curve and directional derivatives. CLO2 Calculate and interpret gradient, divergence, curl and their related vector identities. CLO3 Be familiar with gradient, divergence, curl and laplacian operators in terms of orthogonal curvilinear coordinates. CLO4 Use theorems of Gauss, Green and Stokes to solve integrals.		
Section – I Scalar and vector product of three vectors, product of four vectors. Reciprocal vectors. Partial derivative, Vector differentiation. Scalar Valued point functions, Vector valued point functions, derivative along a curve, directional derivatives. Gradient of a scalar point function, geometrical interpretation of grad, gradient as a point function. Tangent planes and Normal lines.		
Section – II Divergence and curl of vector point function, characters of $\text{Div}\vec{f}$ and $\text{curl}\vec{f}$ as point function, examples. Gradient, divergence and curl of sums and product and their related vector identities. Laplacian operator. Double integrals, double integrals in polar co-ordinates, change of order, change in variable, Triple integrals, Triple integrals in Cylindrical co-ordinates and Spherical co- ordinates, Change of order in triple integral, Volume integral.		
Section – III Line integrals, independent of the path, Green Theorem and problem based on Green Theorem.		
Section – IV Surface integral, Stokes’ theorem and problem based on Stokes’ theorem, Gauss theorem and problems based on Gauss theorem.		
References: 1. Murraray R. Spiegel , Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York. 2. Murraray R. Spiegel , Vector Analysis, SchaumPublisghing Company, New York. 3. N. Saran and S.N. Nigam, Introduction to Vector Analysis, Pothishala Pvt. Ltd., Allahabad. 4. Shanti Narayna , A Text Book of Vector Calculus. S. Chand & Co., New Delhi 5. Dennis G. Zill .Advanced Engineering Mathematics. 6 th Edition. Jones & Bartlett learning		

Semester - I

Name of the Course: Descriptive Statistics	Course Code: 25IMSST101	Credit:4
Maximum Marks: Theory: 20(Internal)+50(External)=70 Practical: 10(Internal)+20(External)=30	Time of Examinations: 03 Hours	
Note: Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing four short answer type questions from all sections. Further, examiner will set two questions from each section and the candidates will be required to attempt one question from each Section. All questions will carry equal marks.		
Course Learning Outcomes(CLO): CLO1: Acquired the Knowledge of Statistics and Importance in Various Area. Acquired the Knowledge to Represent Data in Tables and Graphs CLO2: Acquired the Knowledge of Various Types of Data, Measures of Central Tendency and Dispersion CLO3: Acquired the Knowledge of Correlation, Regression Diagnostics, Partial and Multiple Correlations CLO4: Acquired the Knowledge of Independence and Association between Two Attributes		
Section – I Introduction of Statistics: Nature, scope, and importance of statistics; Types of data; Classification and tabulation of data. Graphical representation of data: Bar Charts, Histograms, frequency polygon, frequency curve and ogives. Pie-Chart, Stem- and- Leaf and Box plots.		
Section – II Measures of Central Tendency: Introduction and significance; Mean, median, mode, geometric mean, harmonic mean; Properties and applications of central tendency; Merits and demerits of each measure; Relationship between mean, median, and mode.		
Section – III Partition Values: Quartiles, deciles and percentiles. Measures of Dispersion: Absolute and relative measures of range, quartile deviation, mean deviation, variance and standard deviation; coefficient of variation. Characteristics for an Ideal Measure of Dispersion.		
Section – IV Moments, Skewness and Kurtosis: Raw and central Moments; derivation of their relationships, effect of change of origin and scale on moments, Sheppard’s correction for moments (without derivation), Charlier’s checks; Measures of Skewness and Kurtosis.		
Practical/ Computational Work (Based on course Descriptive Statistics) Practical: 10(Internal)+20(External)=30 There will be five questions in all, and the students must attempt any three questions. The question paper will set on the spot jointly by the internal and external examiners. Distribution of Marks will be as follows: i) Written Practical/ Lab work : 10 Marks ii) Viva-voce and practical record: 10 Marks List of Practicals Following is the list of programmes to be performed in the Lab using MS-excel: 1. Diagrammatic Representation of Statistical Data Problems Based on Simple and Subdivided Bar Diagrams, Pie Diagram. 2. Graphical Representation of Statistical Data through Histogram, Frequency Polygon and Frequency Curve.		

3. Representation of statistical data through Box plot.
4. Computation of Measures of Central Tendency mean, median and mode
5. Partition Values: Quartiles, deciles and percentiles
6. Various Measures of Dispersion. Use of an Appropriate Measure and Interpretation of Results.
7. Moments
8. Measures of Skewness
9. Measures of Kurtosis.

References:

1. Gupta, S.C. and Kapoor, V.K. (2020): Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. Mukhopadhyay, P. (2020): Mathematical Statistics, Books and Allied Private Limited, Kolkata.
3. Kapoor, J.N. and Saxena, H.C. (2020): Mathematical Statistics, Sultan Chand & Sons, New Delhi.
4. Ross, S.M. (2017): Introductory Statistics, Academic Press, Elsevier.
5. Gun, A.M., Gupta, M.K. and Dasgupta, B. (2016): Fundamentals of Statistics, Vol. I, The World Press Private Limited, Kolkata.
6. Gupta S. C. (2024): Fundamentals of Statistics, Himalaya Publishing House.
7. R. Vidya: Descriptive Statistics, NPTEL Swayam Portal
(URL: https://onlinecourses.swayam2.ac.in/cec21_ma01/preview)