Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Science (Honours) Physics
Semester-I
Session: 2021-22

Bachelor of Science (Honours) Physics Semester-I							
Course Code	Course Title	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
BOPL-1335	Mathematics-I	C	50	40	-	10	3

C-Compulsory

Bachelor of Science (Honours) Physics

Semester-I

Session: 2021-22

Course Title: Mathematics-I

Course Code: BOPL-1335

Course outcomes

After the completion of this course, students should be able to:

CO 1: Give argument related to limits, continuity and derivative of a function.
CO 2: Understand the concept of maxima and minima of a function of a single variable.
CO 3: Explain the significance of Roll's theorem, Mean Value theorem, and Taylor's and Maclaurin's theorem to find the expansions of functions.
CO 4: Demonstrate the geometrical meaning of integral calculus as an area and their uses in the determination of C.G & moments of inertia.
CO 5: Understand how to solve linear differential equations with constant coefficients and linear homogeneous and inhomogeneous differential equations of second order.

Bachelor of Science (Honours) Physics

Semester-I

Session: 2021-22

Course Title: Mathematics-I

Course Code: BOPL-1335

Examination Time: 3 Hours Max.Marks:50

Theory:40

CA:10

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT –I

Functions and Derivatives: Limits, continuity and derivative of function. Differentiation of standard functions, Successive differentiation. Geometrical significance of derivative. Maxima and Minima of a function of single variable. Partial differentiation. Chain rule of differentiation.

15 Lectures

UNIT –II

Differential Calculus: Statement of Rolle's theorem and Mean value theorem, Taylor's and Maclaurins theorems and their applications to formal expansion of functions. Tangents and normals. Basic idea about asymptotes.

15 Lectures

UNIT –III

Integral Calculus: Integration as inverse of differentiation. Indefinite integrals of standard forms. Method of substitution. Integration using partial fractions. Integration by parts. Reduction formulae. Definite integrals. Definite integral as limit of a sum and geometrical interpretation as an area.

15 Lectures

UNIT –IV

Differential Equations: Definition & formation of differential equations. Linear differential equation of first order and first degree. Linear homogenous and inhomogeneous differential equation of second order. Linear differential equations with constant coefficients.

15 Lectures

Text Book:

B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi.

Reference Books:

1. Shanti Narayan, Differential Calculus, Shyam Lal, New Delhi.
2. Shanti Narayan, Integral Calculus, S. Chand, Delhi.
3. M. Vygodsky, Mir, Mascow, Mathematical Hand Book.

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Science (Honours) Physics
Semester-II
Session: 2021-22

Bachelor of Science (Honours) Physics Semester-II							
Course Code	Course Title	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
BOPL-2335	Mathematics-II	C	50	40	-	10	3

C-Compulsory

Bachelor of Science (Honours) Physics

Semester-II

Session: 2021-22

Course Title: Mathematics-II

Course code: BOPL-2335

Course outcomes

After the completion of this course, students should be able to

CO 1: Manage to solve problems related to series solution of Bessel, Legendre and Hermite functions.

CO 2: Understand the concept of Partial differential equations& its applications to find the solution of Laplace, Wave & Diffusions equations.

CO 3: Apply Laplace transforms on periodic functions and differential equations with constant coefficients.

CO 4: Differentiate between Fourier Sine & Cosine series and Fourier Sine & Cosine transforms.

CO 5: Classify the difference between Laplace transforms and Fourier transforms.

Bachelor of Science (Honours) Physics

Semester-II

Session: 2021-22

Course Title: Mathematics-II

Course code: BOPL-2335

Maximum Marks: 50 (External 40 + Internal 10) Examination Time: 3 Hours

Pass Marks: 18 Total Teaching hours: 60

Instructions for the Paper Setters:

Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT –I

Second order Differential Equations: Linear differential equations with variable coefficients. Series Solution of Bessel, Legendre, Hermite, Laguerre and Hypergeometric differential equations by Frobenius method. Recurrence relations and orthogonality properties.

15 Lectures

UNIT –II

Partial Differential Equations: Definition and formation of first and second order partial differential equations, Laplace, Wave and diffusion equation in one and two dimensions, Solutions of these equations by separation of variables.

15 Lectures

UNIT –III

Laplace Transforms: Definition, elementary Laplace transforms, transforms of derivatives, integration of transforms, Laplace transform of periodic functions, solution of differential equations with constant coefficients using Laplace transforms.

15 Lectures

UNIT –IV

Fourier series and Transforms: Periodic functions, Drichlet's conditions, Fourier coefficients, Sine and Cosine series, half range expansions, exponential series, differentiation and integration of Fourier transform, Fourier Sine and Cosine transforms, Inversion formulae, Fourier transforms of derivatives.

15 Lectures

Text Book:

George Arfken, Mathematical Methods for Physicists, Academic Press, New York.

Reference Books:

1. M. Vygodsky, Mir, Mascow, Mathematical Hand Book.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi.
3. Pipes & Harvill, Applied Mathematics for Engineers and Physicists, McGraw Hill, London.
4. Sokolnikoff&Recheffer, Mathematics of Physics and Modern Engineering.

Scheme and Curriculum of Examinations of Three-Year Degree Programme
Bachelor of Science (Honours) Physics
Semester-III
Session: 2021-22

Bachelor of Science (Honours) Physics Semester-III							
Course Code	Course Title	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
BOPL-3333	Mathematics-III	C	50	40	-	10	3

C-Compulsory

Bachelor of Science (Honours) Physics
Semester–III
Session 2021-22
Course Title: Mathematics-III
Course Code: BOPL-3333

Course outcomes

After the completion of this course, students should be able to

CO 1: Understand the concept of complex numbers and De Moivre's theorem.

CO 2: Understand De Moivre's theorem.

CO 3: Understand the basic concept of lines, parabola, hyperbola and ellipse.

CO 4: Understand and demonstrate the concept of cone, cylinder and sphere.

CO 5: Understand the concept of tangent plane and normal plane to the surfaces.

Bachelor of Science (Honours) Physics
Semester–III
Session 2021-22
Course Title: Mathematics-III
Course Code: BOPL-3333

Examination Time: 3 Hours Maximum Marks: 50
Theory:40
CA:10

Instructions for the Paper Setters:
Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT –I

Complex numbers and their geometrical interpretation, De Moivre's theorem and its applications.

UNIT –II

Polar and Cartesian co-ordinates, Distance Formula, Section Formula of a line in different forms, Angle between two lines, Intersection of two lines, Standard equation of ellipse, parabola, hyperbola and their properties.

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UNIT –III

Sphere, Cone, Cylinder and simple properties of these surfaces, Equation of tangent and normal planes to above surfaces.

UNIT –IV

Double and Triple integrals, Evaluation of areas and volumes using double triple integrals, Change of order of integration in double integrals, Area in polar co-ordinates, Triple integrals in spherical and polar coordinates.

Reference Books:
1)Mathematics Textbook for class XI, NCERT , New Delhi, 2006 (Scope as in Chapters 6,11,12)
2)B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers , Delhi, 42^{th} , edition, 2012 (Scope as in chapters 3,7,19)

Scheme and Curriculum of Examinations of Three-Year Degree Programme
Bachelor of Science (Honours) Physics
Semester-IV
Session: 2021-22

Bachelor of Science (Honours) Physics Semester-IV							
Course Code	Course Title	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
BOPL-4333	Mathematics-IV	C	50	40	-	10	3

C-Compulsory

Bachelor of Science (Honours) Physics
Semester–IV
Session 2021-22
Course Title: Mathematics-IV
Course Code: BOPL-4333

Course outcomes

After the completion of this course, students should be able to

CO 1: Understand the concept of matrices, determinants.

CO 2: Solve system of linear equations and obtain eigen values, eigen vectors and Characteristic polynomial.

CO 3: Understand the concept of Vector Spaces, Linear Independence and Dependence.

CO 4: Understand the concept of Basis and Dimension.

CO5: Understand the concept of linear Transformation and its matrix representation.

Bachelor of Science (Honours) Physics
Semester–IV
Session 2021-22
Course Title: Mathematics-IV
Course Code: BOPL-4333

Examination Time: 3 Hours | Maximum Marks: 50
Theory: 40
CA :10

Instructions for the Paper Setters:
Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT –I

Matrices, Determinants and their properties, algebra of matrices, Eigen values and Eigen vectors, Unitary, Hermitian and Orthogonal matrices and their properties, Cayley-Hamilton theorem and its applications.

UNIT –II

Elementary operations on matrices, Rank of a matrix, Row Rank, Column rank and their equivalence, System of linear equations and conditions for consistency, Quadratic forms .

UNIT-III

Vector spaces, vector subspaces, linear spans, linear dependence and independence, basis and dimension, Linear transformation, Representation of linear transformation by matrices.

UNIT –IV

Infinite Series, Series of positive terms, alternate series, Behaviour of infinite series,Cauchy's convergence criterion, D' Alembert Ratio Test, Cauchy's root test, Rabbes test ,Gauss test, Cauchy's Integral test, Absolute and conditional convergence (Tests without Proof)

Reference Books:
1)B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, Delhi, 42nd edition, 2012 (Scope as in chapters 2,9)
2)S. Narayan, P.K Mittal, A textbook of Matrices, S.Chand Publications, New Delhi,11th edition, 2005 (Scope as in chapters 4,5)

Kanya MahaVidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-I
Session: 2021-22

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-I									
Programme Name	Course Code		Course Title	Course Type	Marks				Examination time (in Hours)
					Total	Ext.		CA	
						L	P		
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-1333 BECM-1333 BSNM-1333 BCSM-1333	(I)	Mathematics (Algebra)	E/C	50	40	-	10	3
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science	BARM-1333 BECM-1333 BSNM-1333 BCSM-1333	(II)	Mathematics (Calculus and Trigonometry)		50	40	-	10	3

C-Compulsory
E-Elective

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–I

Session: 2021-22

Course Title: Mathematics (Algebra)

Course Code: BARM/ BECM/ BCSM/ BSNM-1333(I)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Distinguish between solution of cubic equations and Bi-quadratic equations.

CO 2: Classify real quadratic form in variables, definite, semi- definite and indefinite real quadratic form.

CO 3: Understand the concept of matrix congruence of skew symmetric matrices and its reduction in real field.

CO 4: Solve system of linear equations and obtain Eigen values, Eigen vectors, minimal and characteristic equation of a matrix and to apply it in advanced dynamics and electric current.

CO 5: To find the relations between the roots and coefficients of general polynomial equation in one variable.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–I

Session: 2021-22

Course Title: Mathematics (Algebra)

Course Code: BARM/ BECM/ BCSM/ BSNM-1333(I)

Examination Time: 3 hrs. Max.Marks:50

Theory:40

CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

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Unit–I

Linear independence of row and column vectors. Row rank, Column rank of a matrix, Equivalence of column and row ranks, Nullity of matrix, Applications of matrices to a system of linear (both homogeneous and non–homogeneous) equations. Theorems on consistency of a system of linear equations.

Unit-II

Eigen values, Eigen vectors, minimal and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix. Quadratic Forms, quadratic form as a product of matrices. The set of quadratic forms over a field.

Unit–III

Congruence of quadratic forms and matrices. Congruent transformations of matrices. Elementary congruent transformations. Congruent reduction of a symmetric matrix. Matrix Congruence of skew–symmetric matrices. Reduction in the real field. Classification of real quadratic forms in variables. Definite, semi–definite and indefinite real quadratic forms. Characteristic properties of definite, semi–definite and indefinite forms.

Unit-IV

Relations between the roots and coefficients of general polynomial equation in one variable. Transformation of equations and symmetric function of roots, Descarte's rule of signs, Newton's Method of divisors, Solution of cubic equations by Cardon method, Solution of biquadratic equations by Descarte's and Ferrari's Methods.

Text Book:

Chandrika Parsad: Text book on Algebra and Theory of Equations, PothishalaPvt. Ltd., Allahabad.

Reference Books:

1.K.B. Dutta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi (2002).
2.Shanti Narayan and P.K. Mittal : Text Book of Matrices.
3.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-I
Session: 2021-22
Course Title: Mathematics (Calculus and Trigonometry)
Course Code: BARM/ BECM/ BCSM/ BSNM-1333(II)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand real number system, lub&glb of set of real numbers, limit of a function, basic properties of limit & to apply it in real world problem.

CO 2: Analyse continuous and discontinuous function, Apply concept of continuity in uniform continuity.

CO 3: Manage to solve problems related to successive differentiation, Leibnitz theorem, Taylor's & Maclaurin's theorem with various forms of remainders and to use these expansion to compute values of Sine, Cosine, tangent or log function.

CO 4: Understand the concept of De Moivre's theorem & its applications. Identify circular, hyperbolic function and their inverses and use these function to describe the shape of the curve formed by high voltage line suspended between two towers.

CO 5: Demonstrate exponential and logarithmic function of complex numbers, and to solve Gregory's series and summation of series.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–I

Session: 2021-22

Course Title: Mathematics (Calculus and Trigonometry)

Course Code: BARM/ BECM/ BCSM/BSNM-1333(II)

Examination Time: 3 hrs. Max.Marks:50 Theory :40

CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Real number system and its properties, lub, glb of sets of real numbers, limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Uniform continuities.

Unit-II

Differentiation of hyperbolic functions, Successive differentiation, Leibnitz theorem, Taylor's and Maclaurin's theorem with various forms of remainders, Indeterminate forms.

Unit-III

De–Moivre's Theorem and its applications, circular and hyperbolic functions and their inverses.

Unit-IV

Exponential and Logarithmic function of a complex numbers, Expansion of trigonometric functions, Gregory's series, Summation of series.

Text Books:

1.George B.Thomas and Ross L.Finney: Calculus and Analytic Geometry, 9thedition, Addison Wesley,1998(Relevant portions related to Unit-I &II)

2..S.L.Loney: Plane trigonometry part -II(relevant portions related to Unit-III & IV) Cambridge university press.

Reference Books:

1.Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.

2.N. Piskunov: Differential and Integral Calculus, Peace Publishers, Moscow.

3.Gorakh Prasad: Differential Calculus, PothishalaPvt. Ltd., Allahabad.

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-II
Session: 2021-22

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-II									
Programme Name	Course Code		Course Title	Course Type	Marks				Examination time (in Hours)
					Total	Ext.		CA	
						L	P		
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science	BARM-2333 BECM-2333 BSNM-2333 BCSM-2333	(I)	Mathematics (Calculus and Differential Equations)	E/C	50	40	-	10	3
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science	BARM-2333 BECM-2333 BSNM-2333 BCSM-2333	(II)	Mathematics (Calculus)		50	40	-	10	3

C-Compulsory
E-Elective

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)

Semester–II
Session: 2021-22
Course Title: Mathematics (Calculus and Differential Equations)
Course Code: BARM/BECM/ BCSM/BSNM-2333(I)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate Asymptotes, points of inflexion, multiple points on a curve & also to differentiate between concavity and convexity & hence tracing of curve.

CO 2: Understand the concept of linear differential equation with constant and variable coefficients & also the exact differential equations & to apply in a wide variety of disciplines like Bio, Eco, Physics & Engineering.

CO 3: Demonstrate the geometrical meaning of a differential equation & the orthogonal trajectories.

CO 4: Manage to solve the problem related to series solution of differential equations like Bessel and Legendre equation by Power series method.

CO 5: Apply reduction formula on different functions & to develop the concept of variation of parameter.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–II
Session: 2021-22
Course Title: Mathematics (Calculus and Differential Equations)
Course Code: BARM/BECM/ BCSM/BSNM-2333(I)

Examination Time: 3 Hours

Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Asymptotes, Tests for concavity and convexity, Points of inflexion, Multiple Points, Curvature, Tracing of Curves (Cartesian and Parametric coordinates only).

Unit-II

Integration of hyperbolic functions. Reduction formulae. Definite integrals. Fundamental theorem of integral calculus. Quadrature, rectification.

Unit– III

Exact differential equations. First order and higher degree equations solvable for x,y,p. Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories.

Unit-IV

Linear differential equations with constant and variable coefficients. Variation of Parameters method, reduction method, series solutions of differential equations. Power series method, Bessel and Legendre equations (only series solution).

Text Book:

Om P.Chug, Parmanand Gupta, R.S.Dahiya: Topics in Mathematics: Calculus and Differential Equations, Laxmi Publications Private Ltd.

Reference Books:

1. D.A. Murray: Introductory Course in Differential Equations. Orient Longman (India), 1967.
2. G.F. Simmons: Differential Equations, Tata McGraw Hill, 1972.
3. Gorakh Prasad: Integral Calculus, PothishalaPvt. Ltd., Allahabad.
4. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999. 52

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–II
Session: 2021-22
Course Title: Mathematics (Calculus)
Course Code: BARM/BECM/ BCSM/BSNM-2333(II)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of Double and Triple integrals, & application to evaluation of areas, volumes, surfaces of solid of revolution and to apply to find out area and volume of plane and solid figure.

CO 2: Differentiate between limit and continuity of function of two variables and apply this concept in partial derivatives & differentiability of real valued function of two variables.

CO 3: Manage to solve problems related to Maxima, Minima & Saddle points of functions of two variables.

CO 4: Classify Envelopes & Evolutes, Application of inverse & implicit function theorems.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–II
Session: 2021-22
Course Title: Mathematics (Calculus)
Course Code: BARM/BECM/ BCSM/BSNM-2333(II)
Examination Time: 3 Hours

Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit–I

Limit and Continuity of functions of two variables, Partial differentiation, Change of variables, Partial derivatives and differentiability of real–valued functions of two variables, Schwartz's and Young's Theorem, Statements of Inverse and implicit function theorems and applications.

Unit-II

Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians, Envelopes. Evolutes, Maxima, Minima and saddle points of functions of two variables.

Unit-III

Lagrange's undetermined multiplier method, Double and Triple Integrals, Change of variables, Change of order of integration in double integrals.

Unit-IV

Application to evaluation of area, volume, surface of solids of revolutions.

Text Book:

George B. Thomas and Ross L. Finney: Calculus and Analytic Geometry, 9th Edition, Addison Wesley, 1998

Reference Books:

1. Narayan, S. and P.K. Mittal: Integral Calculus. Sultan Chand & Sons.
2. Kreyszig, E.: Advanced Engineering Mathematics.
3. Narayan S. and P.K. Mittal : Differential Calculus, Sultan Chand & Sons.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

Scheme and Curriculum of Examinations of ThreeYear Degree Programme
Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-III
Session: 2021-22

Bachelor of Arts/ Bachelor of Science(Economics, Non-Medical, Computer Science) Semester-III									
Programme Name	Course Code		Course Title	Course Type	Marks				Examination time (in Hours)
					Total	Ext.		CA	
						L	P		
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-3333 BECM-3333 BSNM-3333 BCSM-3333	(I)	Mathematics (Analysis)	E/C	50	40	-	10	3
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-3333 BECM-3333 BSNM-3333 BCSM-3333	(II)	Mathematics (Analytical Geometry)		50	40	-	10	3

C-Compulsory
E-Elective

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester-III
Session: 2021-22
Course Title: Mathematics (Analysis)
Course Code: BARM/ BECM/ BCSM/ BSNM-3333(I)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate an understanding of limits and how they are used in sequences and series.
CO 2: To understand the concepts of Riemann sum, partitions, upper and lower sums, Riemann integrability of continuous functions and of monotone functions.
CO 3: To know and describe the converging behavior of improper integrals and Beta , Gamma functions.
CO 4: Distinguish between the absolute convergence and conditional convergence.
CO 5: To find the relation between Beta and Gamma functions.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–III

Session: 2021-22

Course Title: Mathematics (Analysis)

Course Code: BARM/ BECM/ BCSM/ BSNM-3333(I)

Examination Time: 3 hrs. Max.Marks:50

Theory:40

CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

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Unit-I

Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion.

Unit-II

Series of non-negative terms. Comparison tests. Cauchy's integral tests. Ratio tests. Cauchy's root test. Raabe's test, logarithmic test. Demorgan's and Bertrand's tests. Kummer's test, Cauchy Condensation test, Gauss test, Alternating series. Leibnitz's test, absolute and conditional convergence.

Unit-III

Partitions, Upper and lower sums. Upper and lower integrals, Riemann integrability. Conditions of existence of Riemann integrability of continuous functions and of monotone functions. Algebra of integrable functions.

Unit-IV

Improper integrals and statements of their conditions of existence. Test of the convergence of improper integral, beta and gamma functions.

Text Book:

Ajit Kumar and S. Kumaresan : A Basic Course in Real Analysis, CRC Press

Reference Books:

1. Malik, S.C.: Mathematical Analysis, Wiley Eastern Ltd. (1991).
2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics (1974).

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–III

Session: 2021-22

Course Title: Mathematics (Analytical Geometry)

Course Code: BARM/ BECM/ BCSM/ BSNM-3333(II)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Understand the concept of the geometry of lines and conics in the Euclidian plane.

CO 2: Develop geometry with a degree of confidence and will gain fluency in the basics of Euclidian geometry.

CO 3: Sketch conic sections; identify conic sections, their focal properties and classifications.

CO 4: Demonstrate the concept of parabola, ellipse, hyperbola, sphere and the general quadratic equation.

CO 5: Understand the concept of coordinate geometry on a wider scale with the help of shifting of origin and rotation of axis.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–III

Session: 2021-22

Course Title: Mathematics (Analytical Geometry)

Course Code: BARM/ BECM/ BCSM/ BSNM-3333(II)

Examination Time: 3 hrs.
Max.Marks:50

Theory:40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Transformation of axes, shifting of origin, Rotation of axes in two dimension and three dimension, the invariants, Joint equation of pair of straight lines, equations of bisectors

Unit-II

Parabola and its properties. Tangents and normal, Pole and polar, pair of tangents at a point, Chord of contact, equation of the chord in terms of mid point and diameter of conic.

Unit-III

Ellipse and hyperbola with their properties. Tangents and normal, Pole and polar. pair of tangents at a point, Chord of contact, Identifications of curves represented by second degree equation (including pair of lines).

Unit-IV

Intersection of three planes, condition for three planes to intersect in a point or along a line or to form a prism. Sphere: Section of a sphere by a plane, spheres of a given circle. Intersection of a line and a sphere. Tangent line, tangent plane, power of a point with respect to a sphere, radical planes.

Text Book:

S.L. Loney: The Elements of Coordinate Geometry, Macmillan and Company, London.

Reference Books:

1. Gorakh Prasad and H.C. Gupta: Text Book on Coordinate Geometry.
2. Narayan, S and P.K.Mittal.: Analytical Solid Geometry, Sultan Chand & Sons (2005).
3. Kreyszig, E.: Advanced Engineering Mathematics.
4. Thomos, G.B. and Finney, R.L.: Calculus and Analytic Geometry.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)
Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-IV
Session: 2021-22

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-IV									
Programme Name	Course Code		Course Title	Course Type	Marks				Examination time (in Hours)
					Total	Ext.		CA	
						L	P		
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-4333 BECM-4333 BSNM-4333 BCSM-4333	(I)	Mathematics (Statics and Vector Calculus)	E/C	50	40	-	10	3
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-4333 BECM-4333 BSNM-4333 BCSM-4333	(II)	Mathematics (Solid Geometry)		50	40	-	10	3

C-Compulsory
E-Elective

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–IV
Session: 2021-22
Course Title: Mathematics (Statics and Vector Calculus)
Course Code: BARM/BECM/ BCSM/BSNM-4333(I)

Course Outcomes

After passing this course, the students will be able:

CO 1: To apply parallelogram law of forces, triangle law of forces, Lami's theorem to real life problems.

CO 2: To understand that how one can resolve number of coplanar forces, parallel forces and concurrent forces acting at a body.

CO 3: To find the moments of number of coplanar forces acting at a particle

CO 4: To find the resultant of a force and couple acting on a body.

CO 5: To find the applications of CG of a rod, triangular lamina, solid hemisphere, hollow hemisphere, solid cone and hollow cone.

CO 6: To find the values of gradient, divergence and curl operator of given vectors.

CO 7: To find the application of Gauss theorem, Green's theorem and Stokes's theorem in real life problems.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–IV
Session: 2021-22
Course Title: Mathematics (Statics and Vector Calculus)
Course Code: BARM/BECM/ BCSM/BSNM-4333(I)
Examination Time: 3 Hours

Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Composition and resolution of forces (parallelogram law, triangle law, polygon law, Lami's Theorem(ג-µ) theorem). Resultant of a number of coplanar forces, parallel forces. Moments ,Varignon's Theorem of moments, Couples , Resultant of two Coplanar Couples, Equilibrium of two coplanar couples, Resultant of a force and a couple, Equilibrium of coplanar forces.

Unit-II

Friction, Laws of friction, Equilibrium of a particle on a rough plane. Centre of Gravity: Centre of gravity of a rod, triangular lamina, solid hemisphere, hollow hemisphere, solid cone and hollow cone.

Unit-III

Vector differentiation, Gradient, divergence and curl operators, line integrals, Vector identity, and Vector integration.

Unit-IV

Theorems of Gauss, Green, Stokes and problems based on these.

Text Books:

1. N.P.Bali: Statics, Laxmi Publications (P) Ltd.
2. Spiegal,M.R.: Vector Analysis, Schaum's outline Series, McGraw Hill.

Reference Books:

1. S.L. Loney: Statics, Macmillan and Company, London.
2. R.S. Verma: A Text Book on Statics, Optical Pvt. Ltd., Allahabad.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–IV
Session: 2021-22
Course Title: Mathematics (Solid Geometry)
Course Code: BARM/BECM/ BCSM/BSNM-4333(II)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Demonstrate the concept of cone, classification of cone, intersection of line and cone, reciprocal cone.

CO 2: Understand the concept of cylinder, enveloping cylinder and its limiting form.

CO 3: Describe the concept of conicoids or quadratic surface, its classification, trace different types of conicoids.

CO 4: Manage to find surface of revolution and concept of tangent and normal to the conicoid

CO 5: Identify the conicoids and representing it in the form of hyperboloid, ellipsoid, paraboloid.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science)
Semester–IV
Session: 2021-22
Course Title: Mathematics (Solid Geometry)
Course Code: BARM/BECM/ BCSM/BSNM-4333(II)

Examination Time: 3 Hours

Max.Marks:50
Theory :40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Cylinder as surface generated by a line moving parallel to a fixed line and through fixed curve. Different kinds of cylinders such as right circular, elliptic, hyperbolic and parabolic in standard forms

Unit-II

Cone with a vertex at the origin as the graph of homogeneous equation of second degree in x, y, z . Cone as a surface generated by a line passing through a fixed curve and fixed point outside the plane of the curve. Right circular and elliptic cones.

Unit-III

Equation of surface of revolution obtained by rotating the curve $f(x,y)=0$ about the z-axis in the form of $f(x^2+y^2, z) =0$.Equation of ellipsoid, hyperboloid and Paraboloid in standard forms.

Unit-IV

Surfaces represented by general equation of 2nd degree $S = 0$. Tangent lines, tangent planes and Normal Plane.

Text Book:

P.K.Jain& Khalil Ahmed: A text book of Analytical Geometry of three dimensions, Wiley Eastern Ltd. 1999.

Reference Books:

1. Narayan, S &P.K.Mittal : Analytical Solid Geometry, Sultan Chand & Sons(2005)
2. Kreyszig, E : Advanced Engineering Mathematics

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-V
Session: 2021-22

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-V									
Programme Name	Course Code		Course Title	Course Type	Marks				Examination time (in Hours)
					Total	Ext.		CA	
						L	P		
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-5333 BECM-5333 BSNM-5333 BCSM-5333	(I)	Mathematics (Dynamics)	E/C	50	40	-	10	3
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-5333 BECM-5333 BSNM-5333 BCSM-5333	(II)	Mathematics (Number Theory)		50	40	-	10	3

C-Compulsory
E-Elective

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–V

Session: 2021-22

Course Title: Mathematics (Dynamics)

Course Code: BARM /BECM / BCSM/ BSNM-5333(I)

Course Outcomes

After passing this course, the students will be able to:

CO 1: Identify the basic relations between distance, time, velocity and acceleration.

CO 2: Explain the relationship between forces and motion. Differentiate between balanced and unbalanced forces and Explain how unbalanced force affect motion.

CO 3: Understand Newton's Laws of Motion and Apply the laws to solve many problems.

CO 4: Discuss the motion of particles connected by a string, motion along a smooth inclined plane.

CO 5: Solve different types of problems with Variable Acceleration.

CO 6: Discuss Simple Harmonic Motion and Illustrate it with a variety of examples.

CO 7: Solve Pendulum, Damped and forced Oscillations oscillating system problems.

CO 8: Define Work, Power and Energy and Explain their relationship. Use measurement tools to apply the concepts of Work and power to solve real life problems.

CO 9: Define Energy and Identify the different types that exist

Bachelor of Arts /Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–V

Session: 2021 -22

Course Title: Mathematics (Dynamics)

Course Code: BARM/ BECM/ BCSM/ BSNM-5333(I)

Examination Time:3 Hours Max.Marks: 50

Theory:40

CA:10

Instructions for the paper setter:

Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

Rectilinear motion in a straight line with uniform acceleration, Newton's laws of motion. Motion of two particles connected by a string.

Unit-II

Motion along a smooth inclined plane. Variable acceleration. Simple Harmonic Motion.

Unit-III

Curvilinear motion of particle in a plane, Definition of velocity and acceleration, projectiles, velocity and direction of motion of a projectile after a given time, projectiles on an inclined plane. Oscillations: Free Vibrations, Simple Pendulum, Conical Pendulum.

Unit-IV

Work, Power and Energy: Kinetic and Potential energy, Conservative forces. Theorem of conservation of energy. Work done against gravity.

Text Book:

S.R.Gupta: A text book of Dynamics

Reference Books:

1. F. Chorlton: Dynamics.

2. S.L. Loney: An Elementary Treatise on the Dynamics of a Practice and of Rigid Bodies, Cambridge University Press, 1956.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–V

Session: 2021-22

Course Title: Mathematics (Number Theory)

Course Code: BARM/ BECM/ BCSM/ BSNM-5333(II)

Course Outcomes

Successful completion of this course will enable the students to:

CO 1: Prove results involving divisibility and greatest common divisors.

CO 2: Solve system of linear congruences.

CO 3: Find solutions of specified linear Diophantine equation.

CO 4: Apply Fermat's and Euler's theorem to prove relation involving prime numbers.

CO 5: Apply the Wilson's theorem to solve numerical problems.

CO 6: Solve system of equations using congruences.

CO 7: Understand and apply properties of phi functions in real world problems.

CO 8: Understand application of important arithmetic functions.

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester–V

Session: 2021-22

Course Title: Mathematics (Number Theory)

Course Code: BARM/ BECM/ BCSM/ BSNM-5333(II)

Examination Time: 3 hrs. Max.Marks: 50

Theory: 40

CA:10

Instructions for the Paper Setter:

Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.

Unit-I

The division algorithm, The greatest common divisor, least common multiple, The Euclidean algorithm.

Unit-II

The Diophantine equation ax + by = c, Prime numbers and their distribution, the fundamental theorem of arithmetic, Basic properties of congruences.

Unit-III

Linear congruences, Special divisibility tests, Chinese remainder theorem, The Fermat's theorem, Wilson's theorem

Unit-IV

Euler’s Phi function, Euler's theorem, some properties of the Phi Function, σ and τ functions, Mobius Inversion formula, Greatest integer function

Text Book:

D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. (Scope in Chapters 2-5, 7) 2005.

Reference Book:

Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972.

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-VI
Session: 2021-22

Bachelor of Arts/ Bachelor of Science (Economics, Non-Medical, Computer Science) Semester-VI									
Programme Name	Course Code		Course Title	Course Type	Marks				Examination time (in Hours)
					Total	Ext.		CA	
						L	P		
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-6333 BECM-6333 BSNM-6333 BCSM-6333	(I)	Mathematics (Linear Algebra)	E/C	50	40	-	10	3
Bachelor of ArtsBachelor of Science (Economics) Bachelor of Science (Non-Medical) Bachelor of Science (Computer Science)	BARM-6333 BECM-6333 BSNM-6333 BCSM-6333	(II)	Mathematics (Numerical Analysis)		50	40	-	10	3

C-Compulsory
E-Elective

Bachelor of Arts/Bachelor of Science (Economics/Computer Science/Non-Medical)
Semester–VI
Session- 2021-22
Course Title: Mathematics (Linear Algebra)
Course Code: BARM/BECM/BCSM/BSNM-6333(I)

Course Outcomes

After the completion of this course, students should be able to:

CO 1: Express the algebraic concepts such as binary operation, groups, rings and fields.
CO 2: Define a vector space and subspace of a vector space.
CO 3: Check the linear dependence and linear independence of vectors.
CO 4: Describe the concepts of basis and dimension of vector spaces.
CO 5: Investigate properties of vector spaces and subspaces using linear transformation.
CO 6: Express linear transformations between vector spaces.
CO 7: Perform algebra operations between linear transformations.
CO 8: Find the matrix representing a linear transformation.

Bachelor of Arts/Bachelor of Science (Economics/Computer Science/Non-Medical)
Semester–VI
Session: 2021-22
Course Title: Mathematics (Linear Algebra)
Course Code: BARM/BECM/ BCSM/BSNM-6333(I)

Examination Time: 3 Hours Max. Marks: 50
Theory:40
CA:10

Instructions for the paper setters/examiners:
Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Definition of groups, rings and fields with examples. Definition of a vector space, subspaces with examples. Direct sum of subspaces. Linear span, Linear dependence, Linear independence of vectors. Linear combination of vectors.

Unit-II

Basis of a vector space, Finitely generated vector spaces. Existence theorem for basis. Invariance of the number of elements of the basis set. Dimension of sum of two subspaces. Quotient space and its dimension.

Unit-III

Linear transformation. Algebra of linear transformation. Rank-Nullity theorem, Isomorphism and Isomorphic spaces.

Unit-IV

Matrix of a linear transformation. Changes of basis, Linear operator.

Text Book:
Charles W.Curtis : Linear Algebra
Reference Books:
1.Surjit Singh: Linear Algebra, Vikas Publishing ,1997.
2.V. Krishnamurthy, V. P. Mainra and J.L. Arora: An Introduction to Linear Algebra, East West Press, 1976.
3.Shanti Narayan & P.K. Mittal: A Text Book of Matrices, 10th Edition (2002), S. Chand & Co.

Bachelor of Arts/Bachelor of Science (Economics/Computer Science/Non-Medical)
Semester–VI
Session: 2021-22
Course Title: Mathematics (Numerical Analysis)
Course Code: BARM/BECM/ BCSM/BSNM-6333(II)

After passing this course, the students will be able to:

CO 1. Perform computation for solving a system of equations.

CO 2. Understand its application in all branches of engineering.

CO 3. Know how to find the roots of transcendental equations.

CO 4. Learn how to interpolate the given set of values.

CO 5. Understand the curve fitting for various polynomials .

CO 6. Learn numerical solution of differential equations.

CO 7. Compute numerical integration and differentiation, numerical solution of ordinary differential equations.

Bachelor of Arts/Bachelor of Science (Economics/Computer Science/Non-Medical)
Semester–VI
Session: 2021-22
Course Title: Mathematics (Numerical Analysis)
Course Code: BARM/BECM/ BCSM/BSNM-6333(II)

Examination Time: 3 Hours Max. Marks: 50
Theory:40
CA:10

Instructions for the Paper Setter: Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.
The students can use only Non Programmable& Non Storage Type Calculator.

Unit-I

Error generation, propagation, error estimation and error bounds, Solution of non-linear equations, Bisection method, Iteration method, Newton's Method, Generalized Newton's Method, Method of false position, Muller's method, Rate of convergence of these methods.

Unit-II

Solution of linear system of equation; Direct method, Gauss elimination variant (Gauss Jordan and Crout reduction), Triangular Method, Iterative Method, Jacobi's Method, Gauss Seidel Method. Finite Differences: Forward, Backward, Central, Divided differences, shift operator, relationship between the operators and detection of errors by use of difference operator. Interpolation with divided difference, Newton's formula, Lagrangian Method.

Unit-III

Finite difference interpolation, Gauss formula, Stirling formula, Bessel's formula, Error Estimation Extrapolation. Numerical differentiation, Method based on interpolation. Numerical Integration, Trapezoidal rule, Simpson's rule, Weddle rule, Romberg Integration, Gaussian integration method, Gaussian legendre integration. Double numerical integration.

Unit-IV

Numerical solution of ordinary differential equations, Initial value problem, Taylor's method, Euler's methods, Picard's method, Milne's Method, Runge-Kutta Method. Predictor- Corrector's Method.

Text Book:

Iyenger, S. R. K., R. K. Jain, and Mahinder Kumar. Numerical Methods for Scientific and Engineering Computation. Delhi: New Age International Publishers, 2012.

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Commerce (Honours)
Semester -III
Session- 2021-22

Bachelor of Commerce in Honours Semester -III							
Course Code	Course Title	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
BCOL-3331	Analytical Skills	C	100	80	-	20	3

C-Compulsory

Bachelor of Commerce in Honours
Semester -III
Session: 2021-22
Course Title: Analytical Skills
Course Code: BCOL-3331

Course Outcomes

After the successful completion of this course students will be able to

CO 1: Analyze data being presented in the form of tables, venn diagrams, pie charts.

CO 2: Demonstrate procedural fluency with real number arithmetic operations and use these operations to represent real world scenarios and to solve stated problems.

CO 3: Demonstrate number sense and conversion between fractions, decimals and percentages.

CO 4: Draw conclusions or make decisions in quantitatively based situations that are dependent upon multiple factors.

CO 5: Use simple and compound interest to do business calculations such as value of money, maturity value, present value, future value and able to differentiate which math method should be used for different problems.

Bachelor of Commerce in Honours
Semester -III
Session: 2021-22
Course Title: Analytical Skills
Course Code: BCOL-3331

Examination Time: 3 Hours | Max. Marks: 100
Theory: 80
CA: 20

Instructions for the Paper Setter:

Eight questions of equal marks are to be set, two in each of the four sections (A-D). Questions of sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one from each section. The fifth question may be attempted from any section. Each question will carry 8 marks.

UNIT-I

Data Analysis:- The data given in a Table, Graph, Bar Diagram, Pie Chart, Venn diagram or a passage is to be analyzed and the questions pertaining to the data are to be answered.

UNIT-II

Sequence and Series:- Analogies of numbers and alphabets completion of blank spaces following the pattern in A:b::C: d relationship odd thing out; Missing number in a sequence or a series.

UNIT-III

Arithmetic ability:- Algebraic operations BODMAS, Fractions, Divisibility rules, LCM&GCD (HCF).
Date, Time and Arrangement Problems: Calendar Problems, Clock Problems, Blood Relationship.

UNIT-IV

Quantitative aptitude:- Averages, Ratio and proportion, Problems on ages, Time, distance, speed.
Business computations: -Percentages, Profit &loss, Partnership, simple and compound interest.

Reference Books:

1. R S Agrawal, Quantitative Aptitude for Competitive Examination, S. Chandpublications.
2. R V Praveen, Quantitative Aptitude and Reasoning, PHIpublishers.
3. Abhijit Guha, Quantitative Aptitude for Competitive Examination, Tata McGraw Hill publications.

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Science (Bio-Technology)
Semester-II
Session: 2021-22

Bachelor of Science (Bio-Technology) Semester-II							
Course Title	Course Code	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
Biostatistics	BBTL-2333	C	40	32	--	8	3

C-Compulsory

Bachelor of Science (Bio-Technology)
Semester–II
Session 2021-22
Course Title: Biostatistics
Course Code: BBTL-2333
Course Outcomes

Upon completion of this course, students should be able to:

CO 1: Calculate summary statistics (mean, median, mode, range, standard deviation and variance) from the data.

CO 2: Familiar with the concepts of probability, conditional probability and Bayes theorem.

CO 3: Familiar with the concepts of correlation and regression, Scatter diagram, linear correlation, linear regression lines

CO 4: State the null hypothesis and alternative hypothesis (both one way and two ways) appropriate to a given scenario and determine if it is appropriate to use the Chi-Square test for testing the significance of fit between data and predicted data.

Bachelor of Science (Bio-Technology)
Semester–II
Session 2021-22
Course Title: Biostatistics
Course Code: BBTL-2333

Examination Time: 3 Hours

Max. Marks: 40
Theory: 32
CA:8

Instructions for the Paper Setter:

There will be five sections, namely A, B, C, D, E

Section –A: The examiner shall set 10 short answer type questions covering entire syllabus and the candidates will have to attempt 8 questions of 1 mark each. Answer to each question shall be approximately of 50 words.The total weight age of this section shall be 8 marks.

Section-B, C, D, and E: Eight questions of equal marks are to be set, two in each of the four sections (B-E). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt four questions, selecting at least one question from each section. Each question shall carry 6 marks. The total weightage of these sections shall be 24 marks.

The students can use only Non Programmable& Non Storage Type Calculator and statistical tables.

Unit-I

Elementary Statistics: Collection of data. Frequency distribution and its graphical representation. The mean, median, mode, standard deviation, variance, covariance of data.

Unit-II

Probability: Basic concepts, sample space and events, use of counting method in probability, addition law, Multiplication Law,Conditional Probability and Independent Events, Bayes theorem with application (without proof).

Unit-III

Introduction to Correlation & Regression: Scatter diagram, linear correlation, linear regression lines

Unit-IV

Hypothesis Testing: Sample Statistics and parameters, Level of significance, Concept of Null and Alternate Hypothesis, Normal test for single mean (Z-test), Chi-square test (Goodness of fit and association of attributes).

Text Books:

1. Mathematics Textbook for class XI, NCERT.
2. Mathematics, Textbook for class XII, NCERT.

Reference Books

1. S.C Gupta, V.K Kapoor, Fundamentals of mathematical statistics.
2. Mendenhall W. and Sincich T. (1995). Statistics for engineering and sciences (IVth edition). PrenticeHall. And sciences (IVth edition). Prentice Hall.
3. B.A./ B.Sc Part-I (12+3 System of Education) 225 Gupta S.P. (2000). Statistical methods. Sultan Chand and Company, New Delhi.

Scheme and Curriculum of Examinations of Three Year Degree Programme
Bachelor of Science (Economics) Semester-I
Session- 2021-22

Bachelor of Science(Economics) Semester-I							
Course Code	Course Title	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
BECL-1453	Quantitative Techniques-I	E	100	80	-	20	3

E-Elective

Bachelor of Science (Economics)
Semester-I
Session: 2021-22
Course title: Quantitative Techniques–I
Course Code: BECL-1453
Course Outcomes

After the successful completion of this course, the students will be able to

CO 1: Solve linear equations of two variables and its applications in economics, under the quadratic equations, arithmetic progression, geometric progression and their applications in economics.

CO 2: Develop understanding of elements of analytical geometry, straight lines, basic concepts of trigonometry and permutations and combinations.

CO 3: Differentiate between a constant and a variable, graph of linear and quadratic functions and its applications in economics.

CO 4: Recognize derivative of implicit functions, parametric functions, exponential functions, logarithmic functions and how to apply these derivatives in economics theory.

Bachelor of Science (Economics)
Semester-I
Session: 2021-22
Course title: Quantitative Techniques–I
Course Code: BECL-1453

ExaminationTime:3Hours Max.Marks: 100
Theory: 80
CA:20

Note: Instructions for the Paper–Setters/Examiners:
Eight questions of equal marks (16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

UNIT–I

Solution of Linear Equations: Solution of Simultaneous Linear Equations (upto two variable case), Applicationof Linear Equation in Economics; Solution of Quadratic EquationsSeries: Arithmetic Progression Series, Geometric Progression Series and their applications in economics.

UNIT–II

Elements of Analytical Geometry: Straight line; Basic concepts of trigonometry(with formulae); Concepts of combination and permutation, Elements of set theory, union, intersection, difference,symmetric difference, complementation, Venn diagrams.

UNIT–III

Difference between a constant and a variable, concept of functions, classifications of functions,graph of linear and quadratic functions (Economic applications).Limitsand continuity of a function. Concept of differentiation.

UNIT–IV

Derivatives of elementary functions excluding inverse trigonometric functions, Rules of derivatives; functions of functions rule; derivatives of implicit functions, parametric functions, logarithmic differentiation (Application in Economics).

Text Book:
R.S.Aggarwal, Mathematics for Economists.

Reference Books:
1. Monga, G.S., Mathematics and Statistics for Economics.
2. Yamane, Taro, Mathematics for Economists.
3. Allen, R.G.D., Mathematical Analysis for Economists.
4. Edward T Dowling, Introduction to Mathematical Economics.
5.Chiang, A.C., Fundamental Methods of Mathematical Economics, McGraw Hill, New York

Scheme and Curriculum of Examinations of Two Year Degree Programme
Master of Arts (Economics) Semester-I
Session- 2021-22

Master of Arts (Economics) Semester-I							
Course Code	Course Title	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
MECL-1453	Quantitative Methods for Economists-I	C	100	80	-	20	3

C-Compulsory

Master of Arts (Economics)
Semester-I
Session: 2021-22
Course Title: Quantitative Methods for Economists–I
Course Code:MECL-1453
Course Outcomes

CO 1: Recognize the concept of functions and rules of differentiation and apply this to find out revenue, cost, demand, supply function, elasticity and their types.

CO 2: Understand the rule of partial differentiation and interpretation of partial derivatives.

CO 3: Manage to solve the problem related to maxima and minima in single and multivariable functions for application in market equilibrium.

CO 4: Learn concepts of integration and its applications to consumer's surplus and producer's surplus.

CO 5: Determine the solution of simultaneous equation through crammer's rule and understand the concept of quadratic forms, Eigen roots and Eigen vectors.

CO 6: Recognize linear programming problem and its formulation and solution through graphical and simplex methods.

CO 7: Well understanding the concept of duality, concept of a game, saddle point solution and its simple applications in economics.

Master of Arts (Economics)
Semester-I
Session: 2021-22
Course Title: Quantitative Methods for Economists–I
Course Code:MECL-1453

Examination Time: 3 Hrs | Max.Marks: 100
Theory: 80
CA:20

Instructions for the Paper–Setters/Examiners:

Eight questions of equal marks(16 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any section. The students can use only Non Programmable& Non Storage Type Calculator.

Unit– I

Concept of function and types of functions; Rules of differentiation; Application to revenue, cost, demand, supply functions; Elasticities and their types; production function; Rules of partial differential and interpretation of partial derivatives; homogeneous functions and Euler's theorem.

Unit– II

Problem of maxima and minima in single and multivariable (upto 3) functions; Unconstrained and constrained optimization in simple economic problems; Simple applications in market equilibrium; Concept of integration; Simple rules of integration; Application to consumer's surplus and producer's surplus.

Unit– III

Determinants and their basic properties; Solution of simultaneous equations through Cramer's rule, Concept of matrix–their types, simple operations on matrices, matrix inversion and rank of a matrix; Concept of quadratic form, Eigen roots and Eigen vectors; Introduction to input–output analysis

Unit– IV

Linear Programming –Formulation and solution through graphical and simplex method. Statement of basic theorems of linear programming; Formulation of the dual of primal and its interpretation; Shadow prices and their uses; Concept of duality; Concept of a game; Strategies – simple and mixed; Value of a game; Saddle point solution; Simple applications.

Text Book:

S.C.Aggarwal,R.K.Rana,Leena Gupta, Mathematics for Economists,VK Publishers.

Reference Books:

1. Chiang, A.C., Fundamental Methods of Mathematical Economics, McGraw Hill, New York.
2. Allen, R.G.D., Mathematical Analysis for Economists, Macmillan Press and ELBS, London.
3. Yamane, Taro, Mathematics for Economists Prentice Hall of India, New Delhi.
4. Vygodsky, G.S., Mathematical Handbook (Higher Mathematics), Mir Publishers, Moscow.
5. Kothari, C.R., An Introduction to Operations Research, Vikas Publishing House, New Delhi.
6. Mustafi, C.K., Operations Research: Methods and Practice, Wiley Eastern, New Delhi.
7. KantiSawrup, Gupta,P.K. and Manmohan: Operations Research.

Scheme and Curriculum of Examinations of Two Year Degree Programme
Master of Science (Chemistry) Semester-II
Session: 2021-22

Master of Science (Chemistry) Semester-II								
Course Title	Program Name	Course Code	Course Type	Marks				Examination time (in Hours)
				Total	Ext.		CA	
					L	P		
Mathematics for Chemists	Master of Science (Chemistry)	MCHL-2336	E	25	20	--	5	3

E- Elective

Master of Science (Chemistry) Semester-II
Session 2021-22
Course Title: Mathematics for Chemists
Course Code-MCHL-2336
Course Outcomes

After the successful completion of this subject, the students should be able to:

CO 1: Understand the trigonometric functions with the help of unit circle and application of trigonometric identities.

CO 2: Demonstrate the concept of matrices and type of matrices and how to calculate transpose, adjoint and inverse of matrices. Manage to solve problems related to addition, subtraction and multiplication .

CO 3: To understand the concept and solve system of linear equations.

CO 4: Solve Complex problems related to derivative of sum, difference, product and quotient of functions and also to find derivative of trigonometric functions, inverse trigonometric functions, logarithmic functions and exponential functions.

CO 5: Recognize Integration as an inverse of differentiation and to calculate area under curve and understand integrals as limit of sum and its geometrical interpretation.

Master of Science (Chemistry) Semester-II
Session 2021-22
Course Title: Mathematics for Chemists
Course Code-MCHL-2336

Examination Time: 3 Hours | Max. Marks: 25
Theory: 20
CA: 5

Instructions for the Paper Setters:
Eight questions of equal marks are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.

Unit-I

Trigonometry and Determinants:

Definition of sin, cos, tan, cot, sec, cosec functions with the help of unit circle, values of sin x, cos x for x = 0, π/6, π /3, π /2. Trigonometric identities (without proofs) and their applications. Definition and expansion properties of determinants, product of two determinants of 3rd order.

Unit-II

Matrices:

Introduction to various forms of Matrices, row, column, diagonal unit, Submatrix, square, equal matrices, null, symmetric and skew symmetric matrices, transpose of a matrix, adjoint and inverse of matrices. Addition, multiplication, characteristic equation of a matrix, statement of Cayley Hamilton theorem. Rank of matrix, condition of consistency of a system of linear equations. Eigen vectors and Eigen values of matrices.

Unit-III

Differential Calculus

Differentiation of standard functions, theorems relating to the sum, difference, product and quotient of functions (without proofs), derivative of trigonometric functions, inverse trigonometric functions, logarithmic functions and exponential functions, differentiation of implict functions, logarithmic differentiation

Unit-IV

Integral Calculus

Integration as an inverse of differentiation, area under a curve, indefinite integrals of standard forms, method of substitution, method of partial fractions, integration by parts, definite integrals,definite integrals as limit of a sumand geometrical interpretation.

Text Books:

1. Mathematics Textbook for class XI, NCERT

2 Mathematics Textbook for class XII, NCERT

Reference Books:

1. Joseph B. Dence , Mathematical Techniques in Chemistry.

2. Margenau and Murphy, The Mathematics of Physics and Chemistry.

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Scheme and Curriculum of Examinations of Two Year Degree Programme
Master of Science (Zoology) Semester-II
Session: 2021-22

Master of Science (Zoology) Semester-II							
Course Title	Course Code	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
Biostatistics	MZOL-2334	C	50	40	--	10	3

C-Compulsory

Master of Science (Zoology)
Semester–II
Session 2021-22
Course Title: Biostatistics
Course Code: MZOL-2334
Course Outcomes

After the Successful Completion of the subject students will be able to

CO 1: Know how to collect, analyze and interpret data and use this data to find out different measures of central tendency, dispersion, skewness, kurtosis and moments.

CO 2: Define event, outcome, trial, simple event, sample space and calculate the probability of events for more complex outcomes related to conditional, additive and multiplicative law of probability.

CO 3: Able to use and stimulate random variable, distribution function, probability mass function and probability density function using calculus to answer the quantitative questions about the outcome of probabilistic systems.

CO 4: Understand the concept of mathematical expectation and use it to find out the mean, variance, standard deviation, kurtosis etc. of different probability distributions like Binomial, Poisson and Normal etc.

CO 5: Use Correlation to identify the strength and direction of a linear relationship between two variables and using Regression to predict how much a dependent variable changes based on adjustments to an independent variable and also apply Karl Pearson Correlation coefficient and Spearman's Rank Correlation and Least Square technique for Regression lines.

CO 6: Understand how to develop Null and Alternative Hypothesis and examine the process of Hypothesis testing with reference to one or two tailed test at a given level of significance.

CO 7: Manage to solve problems using t, Z and Chi-Square test.

CO 8: To describe the use of ANOVA for one way and two way classified data with one observation per cell.

Master of Science (Zoology)
Semester–II
Session 2021-22
Course Title: Biostatistics
Course Code: MZOL-2334

Examination Time: 3 Hours | Max.Marks: 50
Theory: 40
CA: 10

Instructions for the Paper Setter:
Eight questions of equal marks (8 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section.
The students can use only Non Programmable& Non Storage Type Calculator and statistical tables.

UNIT-I

Statistical Method: Collection of data. Frequency distribution and its graphical representation. Measures of central tendency, dispersion, moments ,skewness and kurtosis .
Probability: Random experiments, sample space, events. Mathematical definition of probability of an event. Use of permutations and combinations in calculations of probability, Conditional probability, Additive and multiplication law of probability

UNIT-II

Random variables and its pmf, pdf, cdf, mathematical expectation and variances, Distribution of binomial, Poisson and normal variables and (without derivation)

UNIT-III

Correlation and Regression: Relationship between variables, covariance, Karl-Pearson's correlation coefficient, Spearman's rank correlation coefficient, interpretation of correlation coefficients, Least square technique for regression lines (without proof), regression coefficients, relationship between correlation analysis and regression analysis.

UNIT-IV

Hypothesis Testing: Sample statistics and parameters, population null hypothesis, level of significance. Definitions of Chi-square test, , Application of X2-test as a goodness of fit and association of attributes, t-test as a test of single and difference of means and F-test as a test of equality of population variances in testing of hypothesis.
Analysis of Variance: Analysis of variance for one-way classified data.

Text Books:
1. Mathematics, Textbook for class XI, NCERT.
2. Mathematics, Textbook for class XII, NCERT.
3. S.C Gupta, V.K Kapoor, Fundamentals of mathematical statistics

Reference Books
1. Batschelet, Mathematics for Life Sciences.
2. S. Sokal, R. and James F. Introduction to Biostatistics.

Master of Science (Botany) Semester-II
Session- 2021-22

Master of Science (Botany) Semester-II							
Course Code	Course Title	Course Type	Marks				Examination time (in Hours)
			Total	Ext.		CA	
				L	P		
MBTL-2336	Theoretical Biology	C	50	40	-	10	3

C-Compulsory

Master of Science (Botany)
Semester–II
Session: 2021-22
Course Title: Theoretical Biology
Course Code: MBTL-2336

Course outcomes

After the successful completion of this subject, the students should be able to:
CO 1: Understand linear function, power function and periodic function.
CO 2: Recognize algebraic, exponential, logarithmic function and will come to know how to calculate their differentiation and apply derivatives of sum, difference, product and quotient of two functions.
CO 3: Recognize Integration as an inverse of differentiation and to calculate area under curve and understand integrals as limit of sum and its geometrical interpretation.
CO 4: Understand the concept of mathematical expectation and use it to find out the mean, variance, standard deviation, kurtosis etc. of normal probability distribution.

CO 5: Use Correlation to identify the strength and direction of a linear relationship between two variables and using Regression to predict how much a dependent variable changes based on adjustments to an independent variable and also apply Karl Pearson Correlation coefficient and Spearman's Rank Correlation and Least Square technique for Regression lines.

CO 6: Manage to solve problems using t and Chi-Square test.

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Master of Science (Botany)
Semester–II
Session: 2021-22
Course Title: Theoretical Biology
Course Code: MBTL-2336

Examination Time: 3 Hours | Max. Marks: 50
Theory: 40
CA: 10

Instructions for the Paper Setters:
Eight questions of equal marks (08 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each section. The fifth question may be attempted from any Section. The question paper must contain 30% of the article/theory from the syllabus.
The students can use only Non Programmable& Non Storage Type Calculator and statistical tables.

UNIT-I

1. Linear Function: y=ax and y=ax+b
2.Power Function: $y=ax^n$.
3.Sine and cosine, trigonometric relations.
4. Exponential and Logarithmic Functions: Exponential function $y=aq^x$, logarithmic function.

UNIT-II

5.Differentiation and Integration: differentiation of some important functions (Linear function, Power function, Logarithmic, Exponential, Trigonometric functions), product rule and quotient rule of differentiation, chain rule of differentiation.
6.Integration: Rules of integration (Linear function, Power function, Logarithmic, Exponential, Trigonometric Functions), integration by substitution, integration of product of two functions.

UNIT-III

7.Probability: Random experiment, sample space events, mathematical definition of probability, addition and multiplication law of probability.

UNIT-IV

8.Statistics: Mean, standard deviation, Normal Distribution, Simple linear regression and correlation.
9.Hypothesis testing: Sample Statistics and parameters, standard error, Z-test, t-test as a test of single mean, chi square test as a goodness of fit and association of attributes (For uniformity , ratio and proportion)

Text Books:

1. Hussain I. et. al. Mathematics, A textbook for class XI, NCERT.
2. Joshi, D.D. et. al. Mathematics, A textbook for class XII, NCERT.
3. S.C Gupta, V.K Kapoor, Fundamentals of Mathematical Statistics

Reference Books:

1.Batschelet, E. (1971). Introduction to Mathematics for Life Scientists. Springer-Verlag, Berlin. 2nd edition
2. Ludwig, J and Reynolds, J.F. (1988). Statistical Ecology. John Wiley & Sons, New York.

Master of Science (Botany) Semester-II
Session- 2021-22

Master of Science (Botany) Semester-II								
Course Code	Course Title	Course Type	Hours/week	Marks				Examination time (in Hours)
				Total	Ext.		CA	
					L	P		
MBTP-2078	Botany Practicals II	C	6	75	-	60	15	3

C-Compulsory

Master of Science (Botany) Semester-II
Session: 2021-22
Botany Practicals II
MBTP-2078
(Based on MBTL-2074, MBTL-2075 and MBTL-2336)

Course Outcomes:

After passing this course the student will be able to:

CO1: Understand structures of various cell organelles.

CO2: Examine cell divisions in plant cells.

CO3: Perform different experiments based on plant ecology.

CO4: Analyze nutrients and pigment contents in plants using various techniques.

CO5:Learn application of Statistics in Life Science.

CO6: Analyze and interpret the observations Statistically

Master of Science (Botany) Semester-II
Session: 2021-22
Botany Practicals II
MBTP-2078
(Based on MBTL-2074, MBTL-2075 and MBTL-2336)

Max. Marks-75
Time: 6 hrs **Theory-60**
CA-15

Instructions for the paper setter: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Suggested Practicals

Based on MBTL-2074:

1. Understanding the cytology laboratory- components of compound/electron microscope.
2. Examination of electron micrographs of eukaryotic cells with special reference to organelles.
3. Examination of various stages of mitosis and meiosis using appropriate plants material (e.g. onion root tips, onion flower buds).
4. Calculation of Mitotic and meiotic index from dividing root tip cells and pollen grains.
5. Study on cyclosis in *Tradescantia* and *Hydrilla* leaves.
6. Observations on Barr bodies in Squamous epithelium.
7. Preparation of Feulgen stained chromosomes in root tip cells.
8. Effect of colchicine on chromosome movements during mitosis.
9. Use of fluorescent dye to visualize cell components.

Based on MBTL-2075:

1. To determine minimum size and number of quadrats required for reliable estimate of biomass in grassland.
2. To find out association between grassland species using chi square test.
3. To analyse plant communities using Bray-Curtis ordination method.
4. To determine soil moisture content, porosity, bulk density of different soil samples collected from different locations.
5. To study chlorophyll content of SO_2 fumigated and unfumigated plant leaves.
6. To determine Na, K concentration of water sample using flame photometer.
7. To determine water holding capacity of different soil samples.
8. To determine percent organic Carbon and organic matter in different soil samples.
9. To estimate chlorophyll content in SO_2fumigated and unfumigated plant leaves.
10. To estimate rate of CO_2 evolution from different soil using soda lime or alkali absorption method.
11. To determine sulphate content of water samples.
12. To determine O_2 content of water samples.

Based on MBTL-2336:

1. To Study the Exponential Growth of Microbes with the help of Graph.
2. To Find the rate of change of Bacterial Growth w.r.t time, nutrient etc.
3. To Study the Application of Probability in Life Sciences / Genetics.
4. To Analyse the Biostatistical data using mean and Standard deviation.
5. To Find Correlation and Regression between two Variables of Biostatistical data.
6. Application of t-test as a Single mean in Life Sciences.
7. Application of χ^2-test as a Goodness of fit in Life Sciences.
8. Application of χ^2- test in association of attributes in Life Sciences.
9. Application of Z- test as test of single Mean in Life Sciences in Botany.