

B.A (MATHS)

Semester	Subject Code	Subject
Sem-I	BA(Maths)-101	PAPER-I: ALGEBRA
Sem-I	BA(Maths)-102	PAPER-II: CALCULUS AND TRIGONOMETRY
Sem-III	BA(Maths)-301	PAPER-I: ANALYSIS
Sem-III	BA(Maths)-302	PAPER-II: ANALYTICAL GEOMETRY
Sem-V	BA(Maths)-501	PAPER-I: DYNAMICS
Sem-V	BA(Maths)-502	PAPER-II: NUMBER THEORY

LESSON PLAN B.A (MATHS) SEMESTER - I

PAPER-I: ALGEBRA

Topic-I

Topic	Resources	Time
Rank of a Matrix	K.B. Dutta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi (2002). H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994. Shanti Narayan: Text Book of Matrix	Two Weeks
Body of the lesson: Linear independence of row and column vectors. Row rank, Column rank of a matrix, Equivalence of column and row ranks, Nullity of matrix		
Conclusion: Students will be able to learn the basics of rank of a matrix. Assignment on Question of Rank of a matrix.		

Topic-II

Topic	Resources	Time
Linear equations Cayley Hamilton theorem	K.B. Dutta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi (2002). H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994. Chandrika Parsad: Text book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad. Shanti Narayan: Text Book of Matrix	Three Weeks
Body of the lesson: Applications of matrices to a system of linear (both homogeneous and non-homogeneous) equations. Theorems on consistency of a system of linear equations. Eigen values, Eigen vectors, minimal and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix		
Conclusion: Students will be able to learn to solve linear (both homogeneous and non-homogeneous) equations.		

Topic-III

Topic	Resources	Time
Quadratic Forms	K.B. Dutta: Matrix and Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi (2002). H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994. Chandrika Parsad: Text book on Algebra	Three Weeks

	and Theory of Equations, Pothishala Pvt. Ltd., Allahabad. Shanti Narayan: Text Book of Matrix	
<p>Body of the lesson:. Quadratic Forms, quadratic form as a product of matrices. The set of quadratic forms over a field. Congruence of quadratic forms and matrices. Congruent transformations of matrices. Elementary congruent transformations. Congruent reduction of a symmetric matrix. 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.</p>		
<p>Conclusion: Students will learn classification of real quadratic forms in variables. Assignment on Quadratic Forms</p>		

Topic-IV

Topic	Resources	Time
Solution of cubic and biquadratic equations	H.S. Hall and S.R. Knight: Higher Algebra, H.M. Publications, 1994. Chandrika Parsad: Text book on Algebra and Theory of Equations, Pothishala Pvt. Ltd., Allahabad. Shanti Narayan: Text Book of Matrix	Four Weeks
<p>Body of the lesson:. 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</p>		
<p>Conclusion: Students will be able to solve various equations</p>		

**LESSON PLAN B.A.(MATHS) SEMESTER - I
PAPER-II: CALCULUS AND TRIGONOMETRY**

Topic-I

Topic	Resources	Time
Real number system	Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.	Three Weeks
Body of the lesson: Real number system and its properties, lub, glb of sets of real numbers,		
Conclusion: Students will be able to learn the basics of real number system and its properties . Assignment on lub and glb of real numbers and inequalities		

Topic-II

Topic	Resources	Time
Limit and Continuity	N. Piskunov: Differential and Integral Calculus, Peace Publishers, Moscow.. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.	Two Weeks
Body of the lesson: limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Uniform continuities		
Conclusion: Students will be able to learn the use of limit and continuity . Assignment on limit ,continuity and uniform continuity		

Topic-III

Topic	Resources	Time
Differentiation	N. Piskunov: Differential and Integral Calculus, Peace Publishers, Moscow. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.	Two Weeks
Body of the lesson: Differentiation of hyperbolic functions, Successive differentiation, Leibnitz theorem		
Conclusion: Students will be able to learn the use of Leibnitz theorem to find higher order derivatives Assignment on successive differentiation		

Topic-IV

Topic	Resources	Time
Taylor's and Maclaurin's theorem , Indeterminate forms	Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.	Two Weeks
Body of the lesson: Taylor's and Maclaurin's theorem with various forms of remainders, Indeterminate forms		
Conclusion: Students will be able to learn the use of Taylor's and Maclaurin's theorem with various forms of remainders, Indeterminate forms Assignment on Linear indeterminate forms		

Topic-V

Topic	Resources	Time
De-Moivre's Theorem Summation of series	Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 1999.	Four Week
Body of the lesson: De-Moivre's Theorem and its applications, circular and hyperbolic functions and their inverses. Exponential and Logarithmic function of a complex numbers, Expansion of trigonometric functions, Gregory's series, Summation of series.		
Conclusion: Students will be able to learn the use De-Moivre's theorem and its applications. Assignment on Questions related to above topics.		

**LESSON PLAN B.A(MATHS) SEMESTER -III
PAPER–I: ANALYSIS**

Topic-I

Topic	Resources	Time
Sequence	1.Malik, S.C.: Mathematical Analysis, Wiley Eastern Ltd. (1991). 2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics (1974). 3. Narayan, S.: Integral Calculus, Sultan Chand & Sons	Three Weeks
<p>Introduction: In this topic, we discuss the basic ideas involved in sequences and convergence. We start by defining sequences and follow by explaining convergence and divergence, bounded sequences, continuity, and subsequences. Relevant theorems</p>		
<p>Body of the lesson: Definition of a sequence. Theorems on limits of sequences. Bounded and monotonic sequences. Cauchy's convergence criterion.</p>		
<p>Conclusion : Students will be able to learn the use of Sequences , Convergence and divergence of sequences Assignment on convergence of sequence and subsequences, Cauchy sequences</p>		

Topic-II

Topic	Resources	Time
Series	1.Malik, S.C.: Mathematical Analysis, Wiley Eastern Ltd. (1991). 2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics (1974). 3. Narayan, S.: Integral Calculus, Sultan Chand & Sons	Three Weeks
<p>Introduction: It is a concept of convergence of series of real numbers and of continuous functions of a real variable.</p>		
<p>Body of the lesson: 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.</p>		
<p>Conclusion: Students will be able to calculate the sum of series with different tests .</p>		

Topic-III

Topic	Resources	Time
Riemann integrability	1.Malik, S.C.: Mathematical Analysis, Wiley Eastern Ltd. (1991). 2. Apostal, T.M.: Mathematical Analysis, Addison Wesley Series in Mathematics (1974). 3. Narayan, S.: Integral Calculus, Sultan Chand & Sons	Three Weeks
<p>Introduction: In this topic, students will learn what a Riemann sum is and be given a step-by-step procedure of how to formulate them. They will also learn how to calculate both upper and lower Riemann sums. A formal definition of a definite integral will be discussed and students will learn and use integral notation – integrand, limits of integration, variable of integration, and what it means for an integral to be Riemann integrable</p>		
<p>Body of the lesson: 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.</p>		
<p>Conclusion: The purpose of this lesson is to define definite integrals using Riemann sums. By doing this, students will truly understand how integrals work rather than just learning a formula. They will also learn many properties of the definite integral which will help them to perform their integrations faster.</p>		

Topic-IV

Topic	Resources	Time
Improper integrals	Shanti Narayan : A course of Mathematical Analysis. 2. Apostol, T.M. : Mathematical Analysis 2nd Edition 7.18(Th.7.30&7.31)	Three weeks
<p>Introduction: An improper integral is a <u>definite integral</u> that has either or both limits <u>infinite</u> or an <u>integrand</u> that approaches <u>infinity</u> at one or more points in the range of integration.</p>		
<p>Body of the lesson: Improper integrals and statements of their conditions of existence. Test of the convergence of improper integral, beta and gamma functions.</p>		
<p>Conclusion: Students will be able to calculate improper integral using different methods Assignment related to the topic.</p>		

LESSON PLAN B.A.(MATHS) Semester-III
PAPER-II: ANALYTICAL GEOMETRY

Topic-I

Topic	Resources	Time
Transformation of axes	1.Gorakh Prasad and H.C. Gupta: Text Book on Coordinate Geometry. 2. S.L. Loney: The Elements of Coordinate Geometry, Macmillan and Company, London. 3. Narayan, S.: Analytical Solid Geometry, Sultan Chand & Sons (2005).	Two Weeks
Body of the lesson: Transformation of axes, shifting of origin, Rotation of axes, The invariants, Joint equation of pair of straight lines, equations of bisectors		
Conclusion: Students will learn to shift the origin and rotation of axis		

Topic-II

Topic	Resources	Time
Parabola	1.Gorakh Prasad and H.C. Gupta: Text Book on Coordinate Geometry. 2. S.L. Loney: The Elements of Coordinate Geometry, Macmillan and Company, London. 3. Narayan, S.: Analytical Solid Geometry, Sultan Chand & Sons (2005).	Three Weeks
Body of the lesson: 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 midpoint and diameter of conic.		
Conclusion : Students will be able to learn about parabola. Assignment on the related topic.		

Topic-III

Topic	Resources	Time
Ellipse and hyperbola	1.Gorakh Prasad and H.C. Gupta: Text Book on Coordinate Geometry. 2. S.L. Loney: The Elements of Coordinate Geometry, Macmillan and Company,	Three Weeks

	London. 3. Narayan, S.: Analytical Solid Geometry, Sultan Chand & Sons (2005).	
Body of the lesson: Ellipse and hyperbola with their properties. Tangents and normal, Pole and polar. pair of tangents at a point, Chord of contact,		
Conclusion: Students will be able to learn various conics.		

Topic-IV

Topic	Resources	Time
Identifications of curves Change of axes	1.Narayan, S.: Analytical Solid Geometry, Sultan Chand & Sons (2005). 2. Kreyszig, E.: Advanced Engineering Mathematics. 3.Thomos, G.B. and Finney, R.L.: Calculus and Analytic Geometry.	One week
Body of the lesson : Identifications of curves represented by second degree equation (including pair of lines). Intersection of three planes, condition for three planes to intersect in a point or along a line or to form a prism. Change of axes, Shift of origin, rotation of axes.		
Conclusion: Students will be able to learn how to identify and rough sketch of the curves.		

Topic-V

Topic	Resources	Time
Sphere	1.Narayan, S.: Analytical Solid Geometry, Sultan Chand & Sons (2005). 2. Kreyszig, E.: Advanced Engineering Mathematics. 3.Thomos, G.B. and Finney, R.L.: Calculus and Analytic Geometry.	Two week
Body of the lesson : 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 w.r.t. a shpere, radical planes.		
Conclusion: Students will be able to learn sphere and radical planes Assignment related to the topic		

**LESSON PLAN B.A.(MATHS) SEMESTER -V
PAPER-I: DYNAMICS**

Topic-I

Topic	Resources	Time
Rectilinear motion with uniform acceleration	S.R.Gupta: A text book of Dynamics 2. F. Chorlton: Dynamics.	One Week
Body of the lesson: Rectilinear motion in a straight line with uniform acceleration		
Conclusion: Students will be able to learn to solve the problems of Rectilinear motion in a straight line with uniform acceleration		

Topic-II

Topic	Resources	Time
Newton's laws of motion	S.R.Gupta: A text book of Dynamics F. Chorlton: Dynamics.	Four Weeks
Body of the lesson: Newton's laws of motion. Motion of two particles connected by a string. Motion along a smooth inclined plane		
Conclusion: Students will be able to understand Newton's laws of motion Assignment on questions related to motion of two particles connected by a string, motion along a smooth inclined plane		

Topic-III

Topic	Resources	Time
Variable acceleration. Simple Harmonic Motion	S.R.Gupta: A text book of Dynamics F. Chorlton: Dynamics. S.L. Loney: An Elementary Treatise on the Dynamics of a Particle and of Rigid Bodies, Cambridge University Press, 1956.	Two Weeks
Body of the lesson: Rectilinear motion in a straight line with Variable acceleration. Simple Harmonic Motion		
Conclusion: Students will be able to learn the topics of variable acceleration Assignment on questions of Simple Harmonic Motion		

Topic-IV

Topic	Resources	Time
Projectiles	S.R.Gupta: A text book of Dynamics F. Chorlton: Dynamics.	Three Weeks
Body of the lesson: Curvilinear motion of particle in a plane, Definition of velocity and acceleration, projectiles		
Conclusion: Students will be able to understand Curvilinear motion of particle in a plane		

Topic-V

Topic	Resources	Time
Oscillations Work, Power and Energy	S.R.Gupta: A text book of Dynamics 2. F. Chorlton: Dynamics. 3. S.L. Loney: An Elementary Treatise on the Dynamics of a Practice and of Rigid Bodies, Cambridge University Press, 1956.	Three Week
Body of the lesson: Oscillations: Free Vibrations, Simple Pendulum, Conical Pendulum. Work, Power and Energy: Kinetic and Potential energy, Conservative forces. Theorem of conservation of energy. Work done against gravity.		
Conclusion: Students will be able to learn the concept of Oscillations and Work, Power and Energy Assignment on questions of Oscillations and Work, Power and Energy		

**LESSON PLAN B.A (MATHS) SEMESTER-V
PAPER–II: NUMBER THEORY**

Topic-I

Topic	Resources	Time
The division algorithm The Euclidean algorithm	D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972	Three Weeks
Body of the lesson: Divisibility & its properties, use of principle of mathematical induction, The division algorithm, The greatest common divisor: Definition & various properties, Euclid's lemma least common multiple, The Euclidean algorithm, the method of calculating gcd		
Conclusion: Students will be able to learn the basics of the basic concepts of divisibility & greatest common divisor Assignment on greatest common divisor, least common multiple		

Topic-II

Topic	Resources	Time
Prime numbers, Linear congruences	D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972	Three Weeks
Body of the lesson: The Diophantine equation $ax + by = c$ & the method of solving Diophantine equation, Prime numbers and their distribution, Euclid's theorem, Bertrand's conjecture, Goldbach's conjecture, The fundamental theorem of arithmetic, Basic properties of congruences, Linear congruences, Special divisibility tests, Residue modulo n , complete residue system, reduced residue modulo n , congruent & incongruent solutions, method of solving linear congruences		
Conclusion: Students will be able to learn prime numbers & various properties and method of solving linear congruences		

Topic-III

Topic	Resources	Time
Linear congruences	D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972	Two Weeks
Body of the lesson: Chinese remainder theorem, The Fermat's theorem, Wilson's theorem, solving various congruences with the help of above theorems		
Conclusion: Students will be able to solve various congruences Assignment on Linear congruences		

Topic-IV

Topic	Resources	Time
Arithmetic functions	D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972	Two Weeks
Body of the lesson: σ and τ functions, , Mobius function, Mobius Inversion formula, Greatest integer function, Multiplicative function, E. Merter's Lemma		
Conclusion: Students will be able to learn various arithmetic functions Assignment on arithmetic functions		

Topic-V

Topic	Resources	Time
Euler's Phi function	D. Burton: Elementary Number Theory, Sixth Edition, McGraw-Hill. Niven and Zuckerman: An Introduction to Number Theory, Wiley 1972	Two Week
Body of the lesson: Euler's function, Euler's Phi function, Euler's theorem, some properties of the Phi Function, solving linear congruences using Euler's theorem , Gauss theorem		
Conclusion: Students will learn solve some congruences using Euler's theorem Assignment on Euler' function .		