GAUHATI UNIVERSITY
Revised Syllabus of Mathematics (Major and General)
For
1st , 2nd, 3rd, 4th, 5th and 6th Semester
Course Structure: Mathematics (Major and General)

Semester	Major course content	Credit	Classes per week	Marks		General Course content	Credit	Classes per week	Marks
1st Semester	M 104- Algebra and Trigonometry	8	8	100		E-101 Classical Algebra and Trigonometry	6	6	75
	M 105- Calculus	8	8	100					
2nd Semester	M – 204 Co-ordinate Geometry	8	8	100		E-201 Abstract Algebra and Matrices	6	6	75
	M -205 Differential Equation	8	8	100					

Semester	Major course content	Credit	Classes per week	Marks		General Course content	Credit	Classes per week	Marks
3rd Semester	M 304 Abstract Algebra	8	8	100		E-303 Calculus: Methods and Applications	8	8	100
	M-305 Linear Algebra and Vector	8	8	100					
4th Semester	M -404 Real Analysis	8	8	100		E-403 Co-ordinate Geometry and Vector Analysis	8	8	100
	M- 405 Mechanics	8	8	100					

Semester	Major course content	Credit	Classes per week	Marks		General Course content	Credit	Classes per week	Marks
5th Semester	M-501 Real and Complex Analysis	6	6	75		E-503 Statics and Dynamics	8	8	100
	M- 502 Topology	6	6	75		E-504 Numerical Methods and Spherical Astronomy	8	8	100
	M-503 Spherical Trigonometry and Astronomy	6	6	75					
	M- 504 Rigid Dynamics	6	6	75					
	M-505 Probability	6	6	75					
	M-506 Optimization Theory	6	6	75					

Semester	Major course content	Credit	Classes per week	Marks		General Course content	Credit	Classes per week	Marks
6th Semester	M-601- Hydrostatics	6	6	75		E-603 Linear Algebra and Complex Analysis	8	8	100
	M-602 Numerical Analysis	6	6	75		E- 604 Advanced Calculus	8	8	100
	M-603 Computer Programming in C	4(Th) + 2 (Pr)	4(Th) + 2 (Pr)	75					
	M-604 Discrete Mathematics	6	6	75					
	M 605 Graph and Combinatorics	6	6	75					
	M- 606 Project	6	6	75					

1ˢᵗ Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-M104

Algebra and Trigonometry Marks: 100 (80 + 20 internal), Lectures 40

Unit 1: Relations ,Equivalence relations, mapping, binary composition.   10 marks

Unit 2: Groups, subgroups,cosets, Lagrange's theorem on order of a subgroup of a finite group, Euler's theorem, Fermat's theorem, subgroup generated by a set, cyclic groups, permutation groups, normal subgroups, quotient groups.   20 marks

Unit 3: Complex numbers as ordered pairs of real numbers, geometrical representation and polar form of complex numbers,modulus,argument and their properties, complex equations of straight line and circle.De'Moiver's theorem, expansion of cosx and sinx in positive integral powers of x, logarithm of a complex number, exponential and trigonometric functions of a complex variable, Euler's expansion of cosine and sine, hyperbolic functions, inverse functions, Gregory's series.   20 marks

Unit 4: Relation between the roots and coefficients of a general polynomial equation in one variable, transformation of equations,Descarte's rule of signs, symmetric functions of roots, solution of cubic equation by Cardon's method.   10 marks

Unit 5: Symmetric, skew symmetric, Hermitian and skew Hermitian matrices, elementary operations on matrices, adjoint and inverse of a matrix, rank of a matrix, invariance of rank under elementary operations, normal form, solution of a system of linear equations by matrix method.   20 marks

Text Books:

1. Higher Algebra (Classical)- S.K. Mappa,Asoke prakasan. (for unit2 and 3).

2. Higher Trigonometry—Das and Mukherjee:Dhur and Sons.

3. A Course in Abstract Algebra—Khanna and Bhambri(for unit1).

4. Matrices—F. Ayers, Schaum series (for unit4).

1st Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-M105
Calculus Marks: 100 (80 + 20 internal), Lectures 40
Unit 1:,.Successive differentiation, standard order on nth order derivatives and Leibnit'z
theorem, partial differentiation, partial derivatives of first and higher orders for functions
of two and three variables, Euler's theorem on homogeneous functions.   20 marks
Unit 2:,Tangents and normals—angle of intersection of two curves, length of tangent,
normal, subtangent and subnormal, pedal equations, angle between radius vector and
tangent, length of perpendicular from pole to the tangent, lengths of polar subtangent and
polar subnormal, pedal equation of a curve from its polar equation, concavity and points
of inflexion and their criteria.
Curvature—definition of curvature and radius of curvature, derivation of arc, formula for
Radius of curvature, circle of curvature.
Asymptotes—definition and working rules for determination of asymptotes(in case of
Cartesian equations).
Singular points, double points, cusp, node, conjugate point, multiple point, determination
Of multiple points of the curve f(x,y)=0.
Curve tracing—tracing of catenary,cissoid,asteroid, cycloid, folium of Descartes,
cardioide,lemniscate.   20 marks
Unit3: Integrals of the form

$$\int \frac{(px+q)}{\sqrt{ax^2+bx+c}}dx, \int (px+q)\sqrt{ax^2+bx+c}dx, \int \frac{dx}{(px+q)\sqrt{ax^2+bx+c}}$$.

Integration of rational functions of sinx and cosx. Reduction formulae for integration of
the following functions:

$$x^n e^{ax}, x^m \sin nx, x^m \cos nx, x^n (\log x)^m, \frac{1}{(x^2+k^2)^n}, \sin^n x, \cos^n x, \sin^p x \cos^p x (p>0,q>0).,$$

$\tan^n x, \cos ec^n x, \cos^m x \cos nx$. Properties of definite integrals.   20 marks
Unit4: Rectification,Quadrature, volume and surface area of solids of revolution.
                                                                          20 marks

Text Books:
1.Differential Calculus—Shanti Narayan. S. Chand and Co.
2. Integral Calculus—Das and Mukherjee. S. Chand and Co

Reference Books;
1. Differential and Integral Calculus: Frank Ayers and E. Mendelson. Schaum's outline series.
2. **Integral Calculus(an Introduction to Analysis) Maity and Ghose. New central book Agency.**

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1st Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(General Course)
Paper-E101

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 Classical   Algebra and Trigonometry Marks:75 (60 + 15 internal), 30 Lectures

Unit-1(10marks) Inequalities involving arithmetic, geometric and harmonic means,
        Cauchy Schwarz inequality.

 Unit-2(15marks): (sequence and series): sequence of real numbers, bounded, convergent and non- convergent sequences. Uniqueness of the limit and boundedness of a convergent sequence. Cauchy sequence, Cauchy's general principle of convergence(proof of the necessary part
 only). Subsequences, Convergence and divergence of monotonic sequences. Algebraic operations of limit(statements of the theorems without proof). Sandwich theorem.
Infinite series, statements of basic properties of infinite series(without proof). Absolute
 and Conditional Convergence, Tests for convergence: Comparison test, Ratio test,Raabe's
 test, Leibnitz's test.

Unit-3(20marks): (Trigonometry): Geometrical Representation of Complex numbers—the
Argand plane. Polar   form of a complex number. Modulus, amplitude and their various
properties. Complex equations of straight line and circle. De Moiver's theorem. Expansion of
cosx and sinx in positive integral powers of x. Exponential and trigonometric function of a
complex variable. Euler's expansion for cosine and sine. Gregory's series. Hyperbolic functions.

Unit-4(15 marks):(Relation between roots and coefficients) : Relation between roots and
coefficients of a polynomial equation of degree n with special reference to
cubicequations.Symmetric functions of roots. Cardon's method of solution of a cubic equation.

Text Book:
1. S. K Mappa: Higher Algebra(Classical). Ashok Prakasan,Kolkata.
2. Das and Mukherjee: Higher Trigonometry(U N Dhar and Sons)
3. A. R. Basistha: Matrices: Krishna Prakasan Mandir, Meerut.

Reference Books :
1. Chandrika Prasad: A text book on Algebra and theory of equations-Pothisala Pvt. Ltd.
2. R.S.VERMA: Text book on trigonometry: Pothisala Pvt. Ltd.

2ⁿᵈ Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-M204

Co-Ordinate Geometry 100 (80 + 20 internal), Lectures 40
Unit 1:,.Transformation of coordinate axes, pair of straight lines.   15 marks

Unit 2: Parabola, parametric coordinates, tangent and normal, ellipse and its conjugate

diameters with properties, hyperbola and its asymptotes, general conics: tangent,

condition of tangency, pole and polar, centre of a conic, equation of pair of tangents,

reduction to standard forms, central conics, equation of the axes, and length of the axes,

polar equation of a conic, tangent and normal and properties.   25 marks

Unit 3; Plane, straight lines and shortest distance.   15 marks

Unit 4: Sphere, cone and cylinder, central conicoids, ellipsoid, hyperboloid of one and

two sheets, diametral planes, tangent lines, director sphere, polar plane, section with a

given centre, enveloping cone and cylinder.   25 marks

Text Books:

1. R. M. Khan—Analytical Geometry of two and three dimension and vector

    analysis. New Central Book agency.

2. R. J. T. Bell-- Analytical Geometry.

Reference Books;

1. Analytical Geometry by Askwith.

2. Analytical Geometry byB. Das

3. Analytical Geometry by Shanti Narayan.

4. Analytical Geometry by S. L. Loney.

5. Analytical Geometry by J.M.Kar.

6. Analytical Geometry Bansilal.

7. Coordinate Geometry of two dimension.

8. Solid Geometry by Zameeruddin and Khanna.

2ⁿᵈ Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-M205

Differential Equation 100 (80 + 20 internal), Lectures 40

Unit1: Origin of ordinary differential equations, degree and order of ordinary differential equations, equations of 1st order and 1st degree, 1st order and higher degree differential equations, method of solving higher degree equations solvable for x,y and p.Clairaut's form and singular solutions, orthogonal trajectories.   15 marks

Unit 2: Linear ordinary differential equations with constant coefficients, Exact ordinary Differential equations, homogeneous linear ordinary differential equations and Bernoulli's equations.   15 marks

Unit 3: Linear differential equations of 2nd order with variable coefficients, standard methods, transformation of the equation by changing the dependent variable, independent variable, method of variation of parameters.   15 marks

Unit 4: Simultaneous linear differential equations, total differential equations.   15 marks

Unit 5: (Partial differential equation): Partial differential equations of 1st order, Lagrange's solutions, some special types of equations which can be solved by methods other than he general method, Charpit's general method of solution.   20 marks

Text Books:

1.Differential Equation---Piaggio.

2 Theory and Problems of Differential equation—Frank Ayers. Schaum outline Series.

Reference Books.

1. An Introduction to ordinary differential Equation: E.A. Codington. Prentice Hall, India.

2. Elementary Differential Equation and Boundary Value Problem-W.R. Boyce and P.C.Diprima, John Wiley.

3. Ordinary and partial differential Equation: M.D. Raisinghania. S. Chand and Co.

2nd Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(General Course)
Paper-E201
Abstract Algebra and Matrices Marks:75 (60 + 15 internal), 30 Lectures

Unit 1(Group Theory): Definitions and examples of groups. Permutation groups. Cyclic groups. Subgroups, Cosets, Lagrange's theorem on the order of a subgroup of a finite group. Normal subgroups, Quotient groups. Idea of homomorphism and Isomorphism of groups.

20 marks

Unit 2(Ring Theory): Definition, examples and simple properties of Rings. Integral Domains, Fields and their elementary properties.

20marks

Unit 2(Matrices): Types of matrices, algebra of matrices,Adjoint and inverse of a matrix, its existence and uniqueness, rank of a matrix, invariance of rank of a matrix under elementary transformations(Proofs are not required), Solution of a system of linear equations by matrix method.

20 marks

Text Books:

1.V.K. Khannaand S. K. Bhambri: A course in Abstract Algebra. Vikash Pub. House.

2.S. Singh and Q. Zameerruddin: Modern Algebra. . Vikash Pub. House

3rd Semester

Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-M304

Abstract Algebra Marks:100 (80 + 20 internal), Lectures 40

Unit 1: Homomorphism of groups, Fundamental theorems of homomorphism, Caley's theorem.   20 marks

Unit 2: Rings Integral domains division rings and fields, subrings,characteristic of a ring, idempotent and nilpotent elements in a ring, principle ,prime, maximal ideals, simple rings, definition and examples of vector space and its subspaces.   20 marks

Unit 3: Inner automorphisms, automorphisms groups,conjugacy relation, normaliser, centre of a group, class equation and Cauchy's theorem, Sylow's theorems,(statement and applications).   20 marks

Unit 4: Ring homomorphisms,quotient rings, field of quotients of an integral domain, Euclidean rings, polynomial rings.   20 marks.

Text Books:

1.A Course in Abstract Algebra: Khanna and Bhambri, Vikas Pub. House.

2.Algebra Vol-1 and Vol-2: I.S. luther AndPassi. Narosa Pub.

3.A Text Book of Degree Mathematics Book II by P. Rajkhowa and N.R. Das. Asian Book Pvt. Ltd.

Reference Books:

1.Modern Algebra- Surjit Singh and Q. Zameeruddin, Vikas Pub. House.

2. Fundamentals of Abstract Algebra: Malik,Mordersonand M.K. Sen, Mc Graw Hill.

3. A First Course in Abstract Algebra: J.B. Fraleigh.

3rd Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-M305

Linear Algebra and Vector 100 (80 + 20 internal), Lectures 40
Linear Algebra:
Unit 1: Sums and direct sum of subspaces, linear span, linear dependence and

independence and their basic properties, basis, finite dimensional vector spaces, existence

theorem for bases, invariance of the number of elements of a basis, dimensions, existence

of complementary subspace of a subspace of finite dimension, dimension of sum of

subspaces, quotient spaces and its dimension.   15 marks

Unit 2: Linear transformations and their representation as matrices, the algebra of linear

transformations, the rank nullity theorem, change of basis, dual spaces.   10 marks

Unit 3: Eigenvalues ,eigenvector, characteristic equation of a matrix, Cayley Hamilton

theorem, minimal polynomial, characteristic and minimal polynomial of linear operators,

existence an uniqueness of solution of a system of linear equations.   15 marks

Vector:

Unit 4: Scalar triple product, vector triple product, product of four vectors.   10 marks

Unit 5: Continuity and derivability of a vector point function, partial derivatives of vector

point function, gradient, curl and divergence, identities.   20 marks

Unit 6: vector integration, line, surface and volume integrals, Green, Stokes and Gauss'

theorems.   10 marks

Text Books;

1.Linear Algebra by Hoffman and Kunze.
2. Linear Algebra by Lipschutz. Schauam Outline Series.
3. Vector Analysis by Spiegel. . Schauam Outline Series.

Reference Books:
1. Matrix and Linear Algebra by K. B. Datta, Prentice Hall of India.
2. Linear Algebra by Bhattacharya, Nag pal, Jain. Wiley.
3. Vector Analysis by M. D. Raisinghania, S. Chand And Co.

3rd Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(General Course)
Paper-E303

Calculus: Methods and applications Marks:100 (80 + 20 internal), Lectures 40

Unit1: Familiarity with the properties of continuous functions without proofs. Differentiation, successive differentiation,Lebnitz's theorem. Tangents and Normals.
                                                                                          10 marks
Unit2:Rolle's theorem, Lagrange's Mean Value theorem, meaning of the signof derivative, Cauchy's Mean Value theorem, Taylor's theorem, Maclaurin's theorem, Maclaurin's infinite power series for a given function; expansions of e^x ,sinx,cosx,
log(1+x)and allied functions. Indeterminate forms, Maxima and Minima(single variable).   **10 marks**
Unit3: Working knowledge of the limit and continuity of a functions of two or more variables. Partial differentiation. Euler's theorem on homogeneous functions(two variables), total differentiatials and differentiation of composite functions(statement of formulae without proof.). Maxima and minima of a function of two variables and working rules(without proof) for their determination.
                                                                                          10 marks
Unit4: Curvature of plane curves, Asymptotes, Working rules for finding asymptotes parallel to the co-ordinate axes
                                                                                          10 marks
Unit5: Unit5: Reduction formulae. Properties of definite integrals.   **10marks**

Unit6: Quadrature of plane areas, Rectification of plane curves   **5 marks**
Unit7: Differential equation of first order and first degree; solution by variable separable methods;homogeneous equations, linear equations and equations reducible to linear forms; exact differential equations; first order higher degree equations solvable for x, y andp;Clairaut's form and singular solutions.   **10 marks**

Unit8: Linear differential equation with constant coefficients ; homogeneous linear ordinary differential equations.   **10 marks**
Unit9: Simple applicationsof ordinary differential equations.   **5 marks**

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Text Books:
1.Piaggio: Differential equations.
2. B.C. Deka: Ordinary differential equation.
3. Raisinghania: Ordinary differential equation, S. Chand

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4th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-404

Real Analysis 100 (80 + 20 internal), Lectures 40

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Unit1: Characterization of the real number system R as a complete Archimedean ordered field, neighbourhoods, open set, closed set, limit point of a set Bolzano-Weierestress theorem for a set, nested interval theorem.
Sequence of real numbers, bounded and unbounded sequences, subsequences, limit of a sequence, Bolzano-Weierestress theorem for bounded sequences, limit superior and limit inferior, convergent and divergent sequence, Cauchy sequences, Cauchy's principle of convergence, convergence and divergence of monotonic sequences, algebraic operation on limits, sandwich theorem, Cauchy theorem on limit.   20 marks
Unit 2: Infinite series, convergence ,divergence and Cauchy's general principle of convergence, introduction and removal of brackets, multiplication of series and double series, comparison test, Cauchy's root test, D'Alembert's ratio test(with proof),statement (without proof) of Raabe's test, logarithmic test, Gauss test, Cauchy's condensation test, Cauchy's integral test for testing the convergence of series of positive terms, Abel's theorem, alternating series and Leibnitz's test, absolute and conditional convergence, statement and application of Riemann theorem and Dirichlet's theorem(without proof) on the rearrangement of terms of an infinite series.   25 marks
Unit 3: (,δ) definition of limit and continuity of a function of single variable, properties of continuous functions in closed interval, sequential continuity, inverse function and monotonic function, uniform continuity.   15 marks
Unit 4: Derivability of a function of single variable, algebra of derivatives, Darboux's theorem, intermediate value theorem for derivatives, Roll's theorem, mean value theorems, intermediate forms, Taylor's theorem, Taylor's and Maclaurin's infinite series, expansion of $e^x, \sin x, \cos x, \log(1+x) and (1+x)^m$,maxima-minima of a function of single variable and two variables (reducible to single variable).   20 marks

Text Books:
1. A Text Book of Degree Mathematics Book I by P. Rajkhowa and N.R. Das. Asian Book Pvt. Ltd.
2. Principles of Real Analysis by s.C. Malik , New age international.
3. A course of Mathematical Analysis by Shanti Narayan, S. Chand and Co.

Reference Books:
1.Differential calculus by Maity and Ghose,New central Book Agency, Calcutta.
2. Real Analysis by S. k. Mappa.
3. Principle of Mathematical Analysis by walter Rudin.

4th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-405

Mechanics 100 (80 + 20 internal), Lectures 40

Unit 1: Parallel forces, couples, reduction of coplanar forces, analytical condition of

equilibrium of coplanar forces, friction.   20 marks

Unit2: Centre of gravity of a plane area, arc and a sector of a curve, C.G of solids and

surface of revolution, C.G of areas bounded by a given curve.   10 marks

Unit3: Principle of virtual work-in two dimensions, forces in three dimensions.Poinsot's

central axis, wrenches, null lines and planes.   10 marks

Unit 4: Stable and unstable equilibrium.   10 marks

Unit5: Velocities and acceleration along radial and transverse directions and along

tangential and normal directions, motion in a straight line under variable acceleration,

simple harmonic motion and elastic string.   10 marks

Unit6: Motion on smooth and rough plane curves, motion in resisting medium, motion of

particles of varying mass.   10 marks

Unit7: Central orbit and Kepler's laws of planetary motion.   10 marks

Text Books:

1. Statics by S. L. Loney, C.U.P.
2. Dynamics by S. L. Loney, C.U.P.
3. Dynamics9 part1) Ramsey.

Reference Books:

1. Theoretical mechanics by Besant and Ramsey.
2. A Text Book on Statics by R.S. Verma.
3. Theoretical Mechanics, Schaum series.
4. Dynamics by M.Ray, S. Chand and Co.

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4th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(General Course)
Paper-E403

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Calculus: Coordinate Geometry and Vector Analysis Marks:100 (80 + 20 internal), Lectures 40

Two dimensional geometry:

Unit 1: Transformation of coordinate axes. Pair of straight lines.   **8 marks**
Unit 2: Circle: parametric form, tangent and normal, pole and polar,
orthogonal circle, condition of orthogonality of circles, equation of parabola and its parametric form, tangent and normal**.   **7 marks**
Unit 3: Ellipse ,tangent and normal, conjugate diameters, hyperbola and its
 asymptotes.   **10 marks**
Unit 4: General equation of second degree and the conditions for representing a pair of straight lines, parabola, an ellipse and a hyperbola, the equation of tangent, condition of tangency of a line, centre and reduction to standard forms. Polar equations of conics.
          10marks

Three dimensional geometry:

Unit 5: Plane, straight lines, in three dimensions, shortest distance.   **10 marks**
Unit 6: Sphere, circle in three dimensions.   **5 marks**
Unit 7: Cone and cylinder 9 Elementary concept only)   **10 marks**

Vector analysis:

Unit 8: Scalar triple product, vector triple product, Product of four vectors $(\mathbf{a}\times\mathbf{b}).(\mathbf{c}\times\mathbf{d})$,
$(\mathbf{a}\times\mathbf{b}) \times.(\mathbf{c}\times\mathbf{d})$,   **10 marks**

Unit 9: Vector point function,continuity and differentiation of vector point function. Partial derivatives of vectors, curl, grad, divergence and identities(Cartesian coordinates only)   **10marks**

Text Books:
1. S. L. Loney: the elements of coordinate geometry. Macmillan.
2. B. Das: Analytical coordinate geometry
3. J.M. kar: analytical geometry of the conic section.
4. N. Saran and S, N Nigam: Introduction to vector analysis.Pothisala Pub.
5. A.R. Vasishtha: Vector analysis. Krisna Prakasan.
6. M. D. Raisinghania:Vector Analysis. S. Chand and Co
7. Dass, Saxena, Raisinghania: Solid g

5th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(Major Course)
Paper-M501
Real and Complex Analysis   Marks : 75 (60 + 15 internal), Lecture : 30

Unit1: Limit and continuity of a function of several variables, partial derivatives, differentiability, Young's and Schwarz's theorems, differentials of higher orders, differentiation of composite functions, change of variables , Taylor's theorem for two variables, implicit functions, only statement of implicit theorem on two variables with its applications, jacobians, maxima and minima, LaGrange's method of multipliers.
                                                                                                12 marks

Unit2: Riemann integral, integrability conditions, Riemann integral as a limit, some classes of integrable functions , the fundamental theorem of integral calculus, statement and application of M.V. theorems of integral calculus.   12 marks

Unit3: Improper integrals and their convergence, various forms of comparison tests, absolute and conditional convergence, Abel's and Dirichlet's tests, beta and gamma functions, Frullani's integral, integral as a function of parameter(excluding improper integrals), continuity, derivability and integrability of an integral as a function of a parameter.   12 marks

Unit4: Theorems on limit and continuity of a function of complex variable, uniform continuity, differentiability of a function of complex variable, analytic functions, Cauchy-Riemann equations, harmonic functions, differentials, derivatives of elementary functions, L'Hospital's rule , stereographic projection.   12 marks

Unit5: Rectifiable curves, integral along an oriented curve, fundamental Cauchy theorem, proof applying green's theorem, Cauchy integral formula, mobius transformation, fixed points, inverse points and critical mappings, conformal mappings.
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Text Books:
1. A course of Mathematical Analysis by Shanti Narayan, S. Chand and Co.
2. Mathematical analysis by S. C. Malik and S. Arora, New age international.
3. A text Book for Degre Mathematics PartI by P. Rajkhowa and N. R. Das, asian Books pvt. Ltd
4. Complex variable by Spiegel, Schaumoutline Series.

Reference Books:
1. A First course in mathematical Analysis by D. Soma Sundaram and B. Choudhury.
2. Complex Variable by J.N.Sharma,Krishna Prakasan.
3. Integra; calculus by Maity and Ghose,New central Book Agency, Calcutta

5th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M502

Topology   Marks : 75 (60 + 15 internal), Lecture : 30

Unit1: Definition and examples of metric spaces, neighbourhoods, limit points, interior points, open and closed sets, closure and interior, equivalent metrics, subspace of a metric space, Cauchy sequences, completeness, Cantor's intersection theorem.   20 marks

Unit2: Dense subsets, Baire's category theorem, separable, second countable and first countable spaces, continuous functions, extension theorem, uniform continuity,isometry and homeomorphism.   10 marks

Unit3:   Compactness, sequential compactness, totally bounded spaces, finite intersection property, continuous functions and compact sets, connectedness, components, continuous functions and connected sets.   10 marks

Unit4: Definition and examples of topological spaces, metric topology, closed sets, closure, Kuratoski closure operator and neighbourhood systems, dense subsets, neighbourhoods, interior, exterior and boundary, accumulation points and derived sets, bases and sub bases, subspaces and relative topology, continuous functions and homeomorphism.   10 marks

Unit5: Definition and examples of normed linear spaces, Banach spaces, inner product spaces and Hilbert space, some elementary properties.   10 marks

Text Books:

  1.Introduction to topology and modern analysis by G.F. Simmons.

  2. Functional analysis by B.V.Limaye.

Reference Books:

  1. Topology by Munkers, prentice Hall, of India.

  2. General Topology by Lipschutz, Schaumoutline series.

5th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M503

Spherical Trigonometry and Astronomy   Marks : 75 (60 + 15 internal), Lecture : 30

Unit1: Section of a sphere by a plane, spherical triangles, properties of spherical and polar triangles, fundamental formulae of spherical triangles, sine formula, cosine formula, sine-cosine formula, cot formula, Napier's rule of circular parts.   15 marks.
Unit2: The standard(or geometric) celestial sphere, system of coordinates, conversion of one coordinate system to the another system, diurnal motion of heavenly bodies, sidereal time, solar time(mean), rising and setting of stars, circumpolar star, dip of the horizon, rate of change of zenith distance and azimuth, examples.   15 marks
Unit3: Planetary motion: annual motion of the sun, planetary motion, synodic period, orbital period,Keplar's law of planetary motion, deduction of Keplar's law from Newton's law of gravitation, the equation of the orbit, velocity of a planet in its orbit, components of linear velocity perpendicular to the radius vector and to the major axis, direct and retrograde motion in a plane, laws of refraction: refraction for small zenith distance, general formula for refraction,Cassini's hypothesis, differential equation for refraction, effect of refraction on sunrise, sunset, right ascension and declination, shape of the disc of the sun.   15 marks
Unit4: Geocentric parallax, parallax of the moon, right ascension and declination, parallax on zenith distance and azimuth, stellar or annual parallax, effect of parallax on the star longitude, and latitude, effect of stellar parallax on right ascension and declination.
Lunar eclipses section of the shadow cone at moon's geocentric distance, condition of lunar eclipse in terms of it, solar eclipses, the angle subtended at the earth's center by the

centers of the sun and the moon at the beginning or end of a solar eclipse, condition of solar eclipse in terms of this angle, idea of ecliptic limits, frequency of eclipses.

15 marks

Text Book:
 1.Spherical Astronomy by W.M. Smart.

Reference Books:
 1. Spherical Astronomy by B. Sarma.
 2   Spherical Astronomy by S. Malik.
 3   Spherical Astronomy by G. Prasad
 4   Spherical Astronomy by Ball.

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5th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M504

Rigid Dynamics   Marks : 75 (60 + 15 internal), Lecture : 30

Unit1: Moments and products of inertia, parallel axes theorem, theorem of six constants,

the momental ellipsoid, equimomental systems, principle axes.   15 marks

Unit2: D'Alembert's principle, the general equation of motion of a rigid body, motion of

the centre of inertia and motion relative to the centre of inertia.   15 marks

Unit3: Motion about a fixed axis, the compound pendulum, centre of percussion.

10 marks

Unit4: Motion of a body in two dimension under finite and impulsive forces.   10 marks

Unit5: Conservation of momentum and energy, generalized coordinates, LaGrange's

equations, initial motions.   10 marks

Text Books:

1.An elementary treatise on the Dynamics of a particle and of Rigid bodies by S. L.

Loney.

2. Dynamics partI by A. S. Ramsey

3. Theoretical Mechanics by Spiegel, Schaum Series.

4 Analytical Dynamics by F. Charlton.

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5th Semester

Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M505

Probability   Marks : 75 (60 + 15 internal), Lecture : 30

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Unit1: Random experiment, sample space , events, classical definition of probability and the theorems of total and compound probability based on this definition, axiomatic approach to the notion of probability, important theorems based on this approach, conditional probability and independent events, Bay's theorem.   15 marks

Unit2: Random variables, discrete and continuous probability distributions, probability function and distribution function, probability mass function and probability density function, joint distributions, marginal distribution, independent random variables, change of variables, conditional distribution.   15 marks

Unit3: Mathematical expectation, basic theorems on expectation(proofs required only in case of discrete random variables), variance and standard deviation, moments and moment generating functions, covariance conditional expectation and conditional variance, Chebyshev's inequality, law of large numbers.   15 marks

Unit4: Some important probability distributions: Binomial, Poisson and Normal.

15 marks

Text Books:

1.Probability and Statistics by Spiegel, Schaum outline Series.

2. Elements of Probability and Statistics by A. P. Baisnab and M.Das. Tata McGraw Hill.

Reference Books:

1. An introduction to probability theory and its applications by W. Feller.

2. Introduction to Mathematical Probability by J.V.Uspensky

3. Mathematical Statistics by Kapur and Saxena

5th Semester

Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M506

Optimization Theory Marks : 75 (60 + 15 internal), Lecture : 30

Unit1: Partitioning of matrices, simultaneous equations, basic solution, point sets, lines and hyper planes, convex sets and their properties, convex functions, convex cones.

10 marks

Unit2: General linear programming problems, mathematical formulation of a linear programming problem, linear programming problem in matrix notation, feasible solution, basic solution, degenerate basic solution, necessary and sufficient condition for the existence of non-degenerate basic solution, graphical method for the solution of a linear programming problem. 10 marks

Unit3: simplex method: fundamental theorem of linear programming problem, basic feasible solution from feasible solution, determination of improved basic feasible solution, optimality conditions, alternative optimal solution, conditions for alternative optimal solution, theory and application of the simplex method of solution of a linear programming problem, Charne's M-technique, two phase method. 20 marks

Unit4: Principles of duality in linear programming problem, fundamental duality theorem, simple problems. 10 marks

Unit5: The Transportation and Assignment problem. 10 marks

Text Books:

1. linear Programming by G. Hadley, Narosa pub. House.
2. Linear programming Methods and Applications by S.L.Gass, McGraw Hill,New York.
3. Linear Programming by R.K.Gupta.
4. Operation Research by Kanti Swaroop, P.K.Gupta and ManMohan, S.Chand and Co, New Delhi.

5ᵗʰ Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(General Course)
Paper-E503
Statics and Dynamics Marks:100 (80 + 20 internal), Lectures 40

Statics:

Unit 1: Parallel forces, Couple, System of coplanar forces and conditions of equilibrium.   **10 marks**

Unit 2: Centre of gravity of plane curves and areas, arc and sector of a circle and a parabola.
10 marks

Unit 3: Friction, laws of friction, cone of friction, angle of friction, limiting friction, equilibrium of a particle on a rough inclined plane.   **10 marks**

Unit 4: Machines, Mechanical advantage, velocity ratio, three systems of pulleys.

10 marks

Dynamics:

Unit 5: Components of velocity and acceleration along radial and transverse direction and along tangential and normal directions, angular velocity and its relation with linear velocity, relative velocity.   **8 marks**

Unit 6: Rectilinear motion with variable acceleration, vertical motion under inverse square law and other laws of forces.   **8 marks**
10 marks

Unit 7: Simple harmonic motion.   **5marks**

Unit 8: Motion of a projectile, range on an inclined plane.   **6 marks**

Unit 9: Impulse , impulsive forces, work and energy. Conservation of linear momentum and conservation of energy   **8marks**

Unit 10: Impact of elastic bodies(direct impact only)   **5 marks**

Text Books:
   1 S. L. Loney: Statics. Cambridge University Press.
   2 Das and Mukherjee: Statics. U N Dhar and Sons..
   3 R. S Verma. A text book of Statics.
   4. Das and Mukherjee: Analytical Dynamics. U N Dhar and Sons
   5 M. Rey:A Text Book on Dynamics. S Chand and Co.
   6 S. L. Loney: An elementary treatise on the Dynamics of a particle and Rigid
     bodies.   Macmillan C

5th   Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(General Course)
Paper-E504
Numerical Method and Spherical Astronomy Marks:100 (80 + 20 internal),
Lectures 40

Numerical Method:

Unit1: Finite Difference operators and their operations on functions of a single
variable.   **10 marks**
Unit2: Interpolation with equal intervals, Newton's forward and backward formula,
divided difference, Lagrange's interpolation formula.   **10 marks**
Unit 3: Roots of algebraic and transcendental equations (Geometric method of initial
approximation of roots) Bisection method, Iteration method, Newton –Raphson method
for non repeated roots.   **10 marks**
Text Books:
   1. Goyal Mittal; Numerical Analysis
   2. H. C Saxena; Finite difference and Numerical Analysis.S Chand and Sons.
   3. M.K Jain and Iyenger: Numerical Methods, problem and solutions.

   Spherical Astronomy:

Unit4: Spherical triangle and its properties, polar triangle and its properties, Sine and
cosine formulae, four parts formulae, sine-cosine formulae.   **10 marks**
Unit5: Celestial sphere—three coordinate systems and their relations,
examples.   **10 marks**
Unit6: Altitude of a body on the meridian, altitude of the celestial pole, rising and setting
of stars, circumpolar stars, signs of zodiac.   **10 marks**
Unit7: Planetary motion and Kepler's laws, deduction of Kepler lawsfrom Newton's law
of gravitation, the equation of Orbit, velocity of a planet in its orbit, examples.

Unit8: Parallex: geometric and annular parallex. **10 marks**

Text Books:
1.Gorokh Prasad : Astronomy.
2. K.K.De; A Text Book on Astronomy.(Book Syndicate pvt Ltd. Calcutta.).
3. S. Malik.: Spherical Astronomy, Kedar Nath, Ram Nath, Meer

6th Semester

Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M601

Hydrostatics Marks : 75 (60 + 15 internal), Lecture : 30

Unit1: Pressure equation, condition of equilibrium, lines of force, homogeneous and heterogeneous fluids, elastic fluids, surface of equal pressure, fluid at rest under action of gravity, rotating fluids. 15 marks

Unit2: Fluid pressure on plane surfaces, centre of pressure, resultant pressure on curved surfaces. 15 marks.

Unit3: Equilibrium of a floating body, curves of buoyancy, surface of buoyancy, stability of equilibrium of floating bodies, meta centre, work done in producing a displacement, vessel containing a liquid. 15 marks

Unit4: Gas law, mixture of gases, internal energy, adiabatic expansion, work done in compressing a gas, isothermal atmosphere, connective equilibrium. 15 marks

Text Books:

1.A Treatise on Hydromechanics partI Hydrostatics by W.H.Besant and A.S.Ramsey.

2. Hydrostatics by J.M.Kar, K.P.Basu pub. Co. Calcutta.

3. Hydrostatics by M.Ray, S.Chand and Co.

6th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M602

Numerical Analysis Marks : 75 (60 + 15 internal), Lecture : 30
Unit1: Normalized floating point representation of real numbers and operations using it,
normalization and its consequence, errors in arithmetic operations, absolute and relative
error, truncation and round off errors, approximation and significant figures.   10 marks
Unit2: Calculus of finite difference: different interpolation formulae with remainder
terms, finite difference operators and their operations on function of a single variable,
interpolation with equal and unequal intervals,Newton;s formulae, Lagrange's formula,
Gauss, Bessel and sterling's formula,Hermite interpolation.   20 marks
Unit3: Numerical differentiation and integration: Numerical differentiation with the help
of different interpolation formulae, general quadrature formula, trapezoidal rule,
Simpson's one third and three eighth rule, Weddel's rule, Newton-Cote's formula, Gauss
quadrature formula,Chebycheve's formula.   20 marks
Unit4: Solution of polynomial and transcendental equations: Bisection method, secant
method, regula falsi method, Newton-Raphson method, rate of convergence and
comparison of methods.   10 marks
Text Books:
1. Numerical methods by S. Balachandra Rao and C.K.Santha, Univ. Press.
2. Numerical Analysis, Schaum Outline Series.
3. Numerical Analysis by Kunz.
Reference Book:

1.Numerical methods for Mathematics, Science and Engineering by J.H. Mathews.

6th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M603

Computer Programming in C Marks: 75 (40Theory + 20 Practical and 15 internal),

Lecture: 30

Unit1: Brief introduction of central processing, main memory, secondary memory, input/output devices, operating system and its need, representation of numbers and characters in computer, machine level language and high level language, compiler,interpreter,assembler,linker, loader, editor, debugger, algorithm, flowchart and computer programmes, decision table and trees, efficiency and analysis of algorithm. Introduction to C-requirement of programming language to solve problems.   10 marks
Unit2: Elementary data types⊗variables, constants and identifiers, integer, character, floating point and string constants, variable declaration,initializationof variables during declaration, constant data types),Syntax and semantics, reserved words, expression in C(operator precedence and associatively, unary, binary and ternary operators, C arithmetic operators, assignment operators, relational operators, logical and bitwise operators, L-value and R-value, expression statement, cast and size of operator, automatic type conversion.   10 marks
Unit3:Conditional Statement:if,if-else,switch.Iterative statement: while, do while. For. Arrays and pointers(preliminary ideas).
Other statements: break, continue, go to, return, null statement, block statement
                                                                                          10 marks
Unit4:Function (function declaration, calling a function by value, call by reference and its absence in C),storage class(automatic register,static,external);recursion and how it works(use of machine stack for storing return address, parameters and local variables),conversion of recursive programmes to non-recursive version.   10marks

Programmes for practical (Internal)   **20 marks**
To evaluate an arithmetic expression, to find gcd,factorial, Fibonacci number, prime number generation, reversing digits of an integer, finding square root of a number, roots of a quadratic equation, sum of different algebraic and trigonometric series, base conversion, towers of Hanoi, test for Palindrome, addition subtraction and multiplication of matrices, to find the greatest and smallest of a finite number of numbers, interpolation and solution of transcendental equation.

Text books:
1.E. Balaguruswamy-Programming in ANSI C, Tata McGraw Hill.
2. E. Balaguruswamy-Programming with C, Schaum Series.
3.Let us C-Y. Kanetkar, B.P. Publication.

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6th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M604

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Discrete Mathematics Marks : 75 (60 + 15 internal), Lecture : 30
Unit1:Divisibility theory: Peano's axiom, well ordered principle, mathematical induction, division algorithm, the basis representation theorem, prime numbers, unique factorization theorem.   10 marks
Unit2: (Congruence's): Basic properties of congruence's, residual systems, linear congruence's and their solutions, special divisibility tests, the Chinese remainder theorem and its applications, Fermat's Little theorem and Wilson's theorem. Polynomial congruence's.   10 marks

Unit3: Diophantine equation: linear Diophantine equation, the equation $x^2+y^2=z^2$ and $x^4+y^4=z^4$. Fermat's last theorem, representation of a number by two or four squares.   10 marks
Unit4: Number theoretic function: Euler's phi function, Euler's theorem, combinatorial study of the Euler's phi function, the function τ and σ, basic theorems on $\tau(n)$ and $\sigma(n)$, the Mobious function, multiplicative arithmetic function, inversion formula, greatest integer function.   10 marks

Unit5:Propositional Calculus: operation on statements, truth function, laws of propositional logic, Boolean algebra of statement bundles, adequate system of connectives, binary connectives 'Nor' and 'and'.   10 marks.
Unit6: Boolean Algebra: disjunctive normal form(DNF), Complement of Boolean expression in DNF, construction of a Boolean function corresponding to a Boolean expression, conjunctive normal form(CNF), Complement of Boolean expression in CNF, transformation of normal form to the other form, applications.   10 marks

Text Books:

1 Elementary Number Theory-David .M .Burton, University Book stall, New Delhi.
2. Introduction to Discrete Mathematics- M.K.Sen, Allied publisher.
3.Discrete Mathematics: Applied Combinatories and Graph Theory-Michal Towusend.

Reference Books:
1. Number Theory- G.E. Andrews, Hindustan Pub. Co.
2. Basic Number Theory-S.B.Malik, Vikash pub. House.
3. A first Course in Number Theory-K.C.Chowdhury, Asian Books Pvt. Ltd.
4. Elements of discrete Mathematics-C.L.Liu Mc Graw Hill, Comp.c. Series

6th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course (Major Course)
Paper-M605

Graph and Combinatorics Marks : 75 (60 + 15 internal), Lecture : 30

Unit: 1 : Elementary combinatorics, Rules of sum and product, two models of counting, sample and distribution model of counting. Examples and solution. Integer solution of an equilateral problem.   20 marks

Unit 2: Varities of Graphs, Walks and connectedness, degrees, problem of Ramsey, intersection graphs, operations on graphs.   10 marks

Unit 3 : Block, Cut points. Bridges, Block graphs, Cut point graphs, Trees, Characterization of trees.   10 marks

Unit 4: Connectivity and Line connectivity, Graphical variation of Menger's theorem.
                    10 marks

Unit 5: Travessavility : Eulerian graphs, Hamiltonian graphs and their characterizations
                    10 marks

Text Books:
1. Introduction to discrete Mathematics- M.K. Sen. Allied Publishers
2. Discrete Mathematics/; Applied Combinatorics and Graph Theory- Michael Towusend.
3. Basic Graph Theory: K.R. Parthasarathi
4. Elements of discrete mathematics- C.L. Liu, Mc Graw Hill (International Edition), Computer Science Series.

6ᵗʰ Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(General Course)
Paper-E603
Linear Algebra and Complex analysis Marks:100 (80 + 20 internal), Lectures 40
Linear Algebra:

Unit1: Definition and examples of vector spaces, elementary properties of $R^n and C^n$ as vector spaces, subspaces of a vector space, union, intersection and sum of two subspaces, subspace generated by a subset of vector space   **10 marks**

Unit2: Definition, example and elementary properties of linearly dependent and independent set, basis and dimension of a vector space, examples of finite dimensional and infinite dimensional vector space, finitely generated space   **10 marks**

Unit 3: Linear mapping—definition and examples, algebraic properties of
 linear mappings.   **10 marks**

Unit 4: Elementary transformation. Reduction to echelon and normal form, determination of the rank of a matrix by elementary transformation.   **10 marks**

Unit 5: Eigenvalues ,eigenvectors, characteristic equation, statement of Cayley-Hamilton theorem, verification of Cayley-Hamilton theorem and determination of the inverse of a matrix with the help of it.   **10 marks**

Text Books:

  1A. R. Vasistha Modern Algebra: krisna Prakasan.

  2A. R. Vasistha Matices : krisna Prakasan.

  3.Bhattacharya and Jain : linear Algebra.

  4. H.C Saxena and M. D Raisinghania; Matrices, S. Chand and Co..

Complex Analysis;

Unit1: Complex variable and single valued function of a complex variable,, the elementary functions, limit and continuity and theorems on them, uniform continuity, derivatives, analytic functions, Cauchy –Riemann equations 9 proof of only necessary part), harmonic function. **15 marks**

Unit2: Rectifiable curves, integral along a oriented curve, fundamental Cauchy theorem, Cauchy integral formula. **15 marks**

Text Books;

1.Spiegel: Complex variable-Schaum Series

2-J. N. Sarma: Functions of a Complex variable

6th Semester
Revised Syllabus of Mathematics
For
Three year Degree Course
(General Course)
Paper-E604
Advanced Calculus Marks:100 (80 + 20 internal), Lectures 40

Unit1: Metric space, definition and examples, R, R^2, R^3, R^n as metric spaces, Neighbourhoods, open spheres, open sets, limit points, closed spheres, closed sets, closure and interior of a set, Bolzano- Weirstrass theorem for bounded infinite sets of **R**,Cauchy sequences in a metric space, definition and simple examples of complete metric spaces. **20 marks**

Unit2: Riemann integral up to Fundamental theorem of integral calculus **20 marks**

Unit3: Elementary idea of improper integrals, Beta and Gamma functions**. 20 marks**

Unit 4: Definitions of double and triple integrals, working knowledge about the methods of their calculations including change of variables(Theorems to be assumed without proof), application of Beta and Gamma functions in determination of area and volume. **20 marks**

Text Books;

1.Seymour. lipschutz: General Topology Schaum Outline Series..

2-Shanti Narayan:A Course of Mathematical analysis. S. Chand and Co.

3. Spiegel; Advanced Calculus. Schaum Outline Series.

4.S. C. Malik. Principles of Mathematical Analysis. New Age International.