DETAILED CURRICULUM B. Sc. Sem. – I MATHEMATICS

SEMESTER PATTERN :

- The Course content has been designed on **Semester pattern**.
- The workload for Theory is allotted on Semester pattern.
- There shall be **02 Theory papers 0f 70 marks each** of 2.5 Hours duration.
- There shall be **Two Semesters** in an academic Year. (Semester-I & II)

SAMESTER-I

Paper No.	Name Of The Paper	Total Marks Ext.+Int = Total	Passing Standarad Ext.+Int = Total	Total Teaching Hours	Exam Hours	Credits
MAT-CC–103	CALCULUS -I	70+30=100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MAT-CC–104	MATRIX ALGEBRA & THEORY OF EQUATIONS	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04

INTERNAL:

Test	15 Marks
Assignment/Presentation	10 Marks
Seminar/Attendance	05 Marks
Total	**30 Marks**

DETAILED CURRICULUM B. Sc. Sem. I MATHEMATICS

Paper No: MAT- CC-103

Title of the Paper : CALCULUS -I

Credits: 04 Marks: 100

Marks: Semester End Examination: **70Marks**

Continous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks/ Weight
1	Revision of algebra of derivatives and its standard forms, Successive Derivatives, standard results for n^{th} derivative, Leibniz's Theorem and examples based on it. L'Hospital's Rules & Its Examples.	16	17
2	Definition of limit of a sequence, Convergence and divergence of an infinite series, Comparison test, Ratio test, Root test, Radius and interval of convergence of power series.	12	17
3	Revision of algebra of integration and its standard forms, Reduction Formulae for $\int \sin^n x\,dx$, $\int \cos^n x dx$, $\int \sin^m x \cos^n x dx$ and $\int \tan^n x\,dx$ $\int_0^{\frac{\pi}{2}} \sin^n x\,dx$, $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$, $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\,dx$, , Where $m,n \in N$ with $m,n \geq 2$.	16	18
4	Mean value theorems: Rolle's theorem, Lagrange's and Cauchy's mean values theorems, Taylor's theorem. Expansion in power series of $\sin x$, $\cos x$, $\log(1+x)$, e^x and $(1+x)^m$ (in appropriate domain)	16	18

Reference books:

- Differential Calculus by Shanti Narayan & Differential Calculus by Gorakh Prasad
- Integral Calculus by Shanti Narayan & Integral Calculus by Gorakh Prasad
- Calculus - Thomas and Finney , Pearson Education , Asian edition
- Calculus - Dr. Elliot Mendel son, Mc GrawHill Book co.
- A first course in calculus fifth edition By Serge Lang , Springer India
- Mathematical sciences(UGC CSIR) by Pawan Sharma, Neha Sharma and Suraj singh. (Arihant publication india)

DETAILED CURRICULUM B. Sc. Sem. I MATHEMATICS

Paper No: MAT-CC-103

Title of the Paper : MATRIX ALGEBRA & THEORY OF EQUATIONS

Credits: 04 Marks: 100

Marks: Semester End Examination: **70Marks**

Continous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks/ Weight
1	Matrices: matrix operations (Addition, Scalar Multiplication ,Multiplication, Transpose, Ad joint and their properties); Special types of matrices :Null, Identity ,Diagonal, Triangular, Symmetric, Skew-Symmetric, Hermitian, Skew-Hermitian , Orthogonal, Unitary, Normal, Idempotent, Nilpotent ,Involuntary	12	17
2	Algebra of determinants and its properties, Solution of the matrix Equation Ax = b; Row reduced Echelon form of matrix and Matrix inversion using it, Linear dependence and independence of rows and columns of a matrix. Row rank, column rank and rank of a matrix. Equivalence of row rank and column rank of matrix , Eigen values, eigenvectors and the characteristics equation of a matrix.	16	17
3	Cayley- Hamilton theorem and its use in finding inverse of a matrix. Application of matrices to a system of a linear equation. Theorems on system of consistency of linear equations, solution of system linear equation in three variables by Cramer's rule.	16	18
4	Relations between roots and coefficients of a polynomial equation in one variable. Transformation of equations, Descartes' rule of signs. Solution of cubic equations by Cardan method, Solution of Biquadratic equation by Ferrari method	16	18

Reference books:

- Matrix and linear algebra by K. B. Dutta Prentice Hall
- Higher Algebra by H. S. Hall and S. R. Knight H. M.
- Theory of matrices by Vatssa Wiley-Eastern & Element of co-ordinate Geometry by S. L. Loney and Elementary Treatise on Co-ordinate Geometry by R. J. T. Bell
- Higher Algebra by Barnard S. and Child J. M.

DETAILED CURRICULUM B. Sc. Sem. – II MATHEMATICS

SEMESTER PATTERN :

- The Course content has been designed on **Semester pattern**.
- The workload for Theory is allotted on Semester pattern.
- There shall be **02 Theory papers 70 marks each** of 2.5 Hours duration.

There shall be **Two Semesters** in an academic Year. (Semester-I & II)

SAMESTER-II

Paper No.	**Name Of The Paper**	**Total Marks Ext.+Int*= Total**	**Passing Standarad Ext.+Int = Total**	**Total Teaching Hours**	**Exam Hours**	**Credits**
MAT-CC-203	CALCULUS -II	**70+30=100**	**28+12=40**	**15 WEEKS X 4 HOURS =60**	**2.5**	**04**
MAT-CC-204	THREE DIMENSIONAL GEOMETRY	**70+30 =100**	**28+12=40**	**15 WEEKS X 4 HOURS =60**	**2.5**	**04**

INTERNAL:

Test	15 Marks
Assignment/Presentation	10 Marks
Seminar/Attendance	05 Marks
Total	**30 Marks**

DETAILED CURRICULUM B. Sc. Sem. II MATHEMATICS

Paper No: MATCC-203

Title of the Paper : CALCULUS -II

Credits: 04 Marks: 100

Marks: Semester End Examination: **70Marks**

Continous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks/ Weight
1	Revision of Ordinary differential equation , Order and degree of differential equation, Variable separable equation, Homogeneous differential equation and Non- homogeneous differential equations. Differential Equations of First Order and First Degree: Definition and method of solving of Linear differential equations of first order and first degree	12	17
2	Definition and method of solving of Bernoulli's differential equation and Definition and methods of solving of Exact differential equation. Differential equations of first order and higher degree: Differential equations of first order and first degree solvable for x, solvable for y, solvable for p.	16	17
3	Clairaut's form of differential equation and Lagrange's form of differential equations. Linear differential equations of higher order Linear differential equations of higher order with constant coefficients. Operator D, Meaning of auxiliary equation, Roots of auxiliary equation and solution of auxiliary equation f(D)y = 0 for real roots and complex roots, Operator $^1/_D$. Solution of differential equations of the type f(D)y = X.	16	18
4	Meaning of complimentary function(C.F.) and Particular integral(P.I.). Methods to obtain Particular integral(P.I.) when $X = e^{ax}$, X = sin(ax+b), X = cos(ax+b), $X = x^m$, $X = e^{ax}V$. Linear differential equations with variable coefficients. Their applications, equation reducible to with constant coefficients. Second order linear differential equations.	16	18

Reference books:

- Differential Calculus by Shanti Narayan
- Differential Calculus by Gorakh Prasad
- Integral Calculus by Shanti Narayan
- Integral Calculus by Gorakh Prasad
- Calculus - JAMES STEWART , THOMSON BROOKS/COLE
- Calculus - T.M.Apostol
- Calculus - Thomas and Finney , Pearson Education , Asian edition
- Calculus - Dr. Elliot Mendel son, Mc GrawHill Book co.
- A first course in calculus fifth edition By Serge Lang , Springer India
- Differential Equations by D. A. Murray
- Ordinary Differential Equation – MD Rai Singhania (S. Chand Publication)
- Differential Calculus – Harikishan, Atlantic Publishers.
- Calculus – M. Spivak.
- Mathematical sciences(UGC CSIR) by Pawan Sharma, Neha Sharma and Suraj singh. (Arihant publication india)

DETAILED CURRICULUM B. Sc. Sem. II MATHEMATICS

Paper No: MATCC-204

Title of the Paper : THREE DIMENSIONAL GEOMETRY

Credits: 04 Marks: 100

Marks: Semester End Examination: **70Marks**

Continous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks/ Weight
1	Sphere, Intersection of a line and a sphere. Equation of tangent plane and normal. Plane section of sphere. Intersection of two spheres. Angle between two spheres. Orthogonal spheres.	12	18
2	Definition of a cone. Its vertex and guiding curve. Its equation with given vertex and guiding curve. Homogenous equation and cone with vertex origin. Right circular cone. Its equation with given vertex, axis and semi vertex angle. Definition of a cylinder. Its equation with generators intersecting a given curve and parallel to a line. Right circular cylinder. Its equation with given axis and radius.	16	18
3	Conicoids: Central and non-central conicoids, Ellipsoid, Hyperboloid of two sheets and one sheet. Elliptic paraboloid and hyperbolic paraboloid. Intersection of a line and a conicoid. Equation of tangent plane and normal of conicoids.	16	17
4	Polar co-ordinate. Polar co-ordinate and Cartesian co-ordinate system and mutual relation, equation of a line, a circle and conics in polar co-ordinates. Spherical and cylindrical co-ordinate in R^3. Their relation with Cartesian system.	16	17

Reference books:

- Co-ordinate geometry of Three dimensions : Shantinarayan
- Higher Algebra : Barnard S. and Child J. M.
- Element of co-ordinate Geometry : S. L. Loney
- Elementary Treatise on Co-ordinate Geometry : R. J. T. Bell

DETAILED CURRICULUM B. Sc. Sem. – III MATHEMATICS

SEMESTER PATTERN :

- The Course content has been designed on **Semester pattern**.
- The workload for Theory & Practical is allotted on Semester pattern.
- There shall be **02 Theory papers 70 marks each** of 2.5 Hours duration.
- Mathematics Practical Examination shall be of 100 **marks** of 06 **hours duration** in University Examination.
- There shall be **Two Semesters** in an academic Year. (Semester-III & IV)

SAMESTER-III

Paper No.	**Name Of The Paper**	**Total Marks Ext.+Int* = Total**	**Passing Standarad Ext.+Int = Total**	**Total Teaching Hours**	**Exam Hours**	**Credits**
MAT-CC-303	Advanced Calculus-I	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MAT-CC-304	Linear Algebra-I & Numerical Methods-I	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MAT-CC-305	Mathematics Practical (Based on MATCC-303 & MATCC-304)	100	40	15 WEEKS X 6 HOURS =90	6	06

INTERNAL:

Test	15 Marks
Assignment/Presentation	10 Marks
Seminar/Attendance	05 Marks
Total	**30 Marks**

DETAILED CURRICULUM B. SC. SEM. III MATHEMATICS

Paper No: MAT-CC-303

Title of the Paper: **Advanced Calculus-I**

Credits: 04 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks/ Weight
1	Increasing and decreasing functions, Concave upwards and concave downwards functions, Points of inflexion, Asymptotes parallel to co-ordinate axes, oblique type and algebraic methods, Rules for finding asymptotes. Multiple points, Types of double points. Real functions of several variables, Their limit and continuity	12	17
2	(Repeated limits and limits in R^2 to be explained),Partial derivatives of functions of n variable (For special case n = 2 notation, D12 and D21 to be explained) Partial differentiation of implicit function, Young's and Schwartz's theorem (without proof)	16	17
3	Differentiability, Chain rule, Partial derivatives of higher order, Condition for commutative property of variables in higher order partial derivatives, Derivatives of implicit functions. Euler's theorem on partial derives of homogenous functions. Extrema of functions of several variables, Lagrange's method of undetermined multipliers	16	18
4	Taylor's and Maclaurin's expansions for functions of several variables (Proof for cases of two variables only)Beta and Gamma functions, relation between Beta and Gamma functions, Duplication formula, Properties of Beta and Gamma Functions. Equation of Tangent plane and normal to surfaces, Equation of Tangent and normal plane to curve	16	18

DETAILED CURRICULUM B. SC. SEM. III MATHEMATICS
Paper No: MAT-CC-304
Title of the Paper: **Linear Algebra-I & Numerical Methods-I**
Credits: 04 Marks: 100
Semester End Examination of marks: **70Marks**
Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks/ Weight
1	Vector space: Definition and examples, Linear dependence, independence and their properties, Linear span, Subspace, Sum and direct sum of subspaces, Basis and finite dimension of vector space, Existence theorem for basis, Invariance of the number of the elements of a basis set	12	17
2	Existence of complementary subspace of subspace of finite dimensional vector space, Dimension of sum of subspaces W_1 and W_2 of vector space. Linear transformations ,properties of Linear transformations, The algebra of linear transformations, Rank and Nullity theorem and application of Rank and Nullity theorem , Inverse linear transformation, Eigen values and Eigen vectors of linear transformations	16	17
3	Forward differences, Backward differences, central differences, Shift operator and other difference operators , Reciprocal Factorial, Polynomial in factorial notation. Significant error, Relative error, Estimation of error, Application of error formula.	16	18
4	Gregory – Newton forward difference formula and Gregory –Newton backward difference formula ,Gauss's forward difference Formula and Gauss's backward difference formula. Derivatives using Newton forward difference formula and Derivatives using Newton backward difference formula.	16	18

Reference books for MATCC-303 & MATCC-304

1. Integral Calculus Shantinarayan S. Chand, New Delhi
2. Advanced Calculus, D V Widder , Prentice Hall , New Delhi
3. Advanced Calculus Vol : I & II, T M Apostol, Blaisdoll
4. Advanced Calculus, R C Buck, MacMillan
5. Linear Algebra , Ramchandra Rao, P. Bhimasankar, Tata MacGrawHill
6. Topics in Algebra, I N Herstein, Wiley Eastern Ltd
7. Linear Algebra, S K Berberion, Oxford University Press
8. Linear Algebra Problem Book, P R Holmos, Cambridge University Press
9. Linera Algebra, Sharma and Vashishtha, Krishna Prakashan, Meerut
10. Linear Algebra, Gupta K P, Pragati Prakashan, Meerut
11. Linear Algebra, G Paria, New Central book agency Ltd, Calcutta
12. Linear Algebra ,Schaum's Series (Tata McGraw-Hill Publication)

13. Linear Algebra , Kenneth M Hoffman ,Ray Kunze (PHI Publication)
14. Linear Algebra , Vivek sahai , Vikas Bist (Narosa Publication)
15. Surekh Bij Ganit, I H Sheth, University Granth Nirman Board (Gujarati)
16. Kalan Shashtra Part I , D H Pandya and N D Suthar, University Granth Nirman Board (Gujarati)
17. Kalan Shashtra Part II, A M Vaudya and V H Pandya, University Granth Nirman Board (Gujarati)
18. Numerical Analysis and Computational Procedures by S.A. Moolah, New Central Book Agency (P) Ltd., Calcutta.
19. UGC CSIR NET/SET mathematical sciences by PAWAN SHARMA(ARIHANT PUBLICATION INDIA LTD.).

DETAILED CURRICULUM B. SC. SEM. III MATHEMATICS

Paper No: MATCC-305 Marks: 100

Title of the Paper: **Practical based on MATCC-303 & MATCC-304**

1. The necessary information for tracing a curves defined in cartesian equation or parametric equation .
2. Trace the curve : x= a (θ ± sin θ), y = a (1 ± cos θ) , where a > 0.
3. Trace the curve : (A) x = a $\cos^3\theta$, y = a $\sin^3\theta$, where a > 0. (B) x = a $\cos^3\theta$, y = b $\sin^3\theta$, where a > 0 b > 0.
4. Trace the curve : $y^2(a - x) = x^3$, where a > 0.
5. Trace the curve : $x^3 + y^3 = 3axy, a > 0$.
6. Trace the curve : $y = \frac{c}{2}(e^{x/c} + e^{-x/c})$, $c > 0$.
7. The necessary information for tracing a curves defined in polar equation .
8. Trace the curve : r = a (1 ± cos θ) , a > 0.
9. Trace the curve : r = a cos 3θ , a > 0.
10. Trace the curve : (A) r = 3 + cos θ (B) r = 3 + 4 cos θ.
11. Application of Partial Derivatives.
12. Application of Lagrange's' method of undermined multiplies.
13. Application of Euler's theorem.
14. Application of Tailor's and Maclaurian theorems.
15 To Expand linearly independent set up to a basis of a vector space
16 Verification on Dimension theorem.
17 Verifications on Rank-Nullity theorem.
18 To find the inverse of a linear transformations.
19 Application of Gregory- Newton's forward difference formula.
20 Application of Gregory- Newton's backward difference formula.
21 Application of Gauss's forward difference formula.
22 Application of Gauss's backward difference formula.
23 Derivatives using Newton's forward difference formula.
24 Derivatives using Newton's backward difference formula.

DETAILED CURRICULUM B. Sc. Sem. – IV MATHEMATICS

SEMESTER PATTERN :

- The Course content has been designed on **Semester pattern**.
- The workload for Theory & Practical is allotted on Semester pattern.
- There shall be **02 Theory papers 70 marks each** of 2.5 Hours duration.
- Mathematics Practical Examination shall be of 100 **marks** of 06 **hours duration** in University Examination.
- There shall be **Two Semesters** in an academic Year. (Semester-III & IV)

SAMESTER-IV

Paper No.	**Name Of The Paper**	**Total Marks Ext.+Int* = Total**	**Passing Standarad Ext.+Int = Total**	**Total Teaching Hours**	**Exam Hours**	**Credits**
MATCC-403	Advanced Calculus-II	70+30 =100	28+12=40	**15 WEEKS X 4 HOURS =60**	2.5	04
MATCC-404	Linear Algebra-II & Numerical Analysis-II	70+30 =100	28+12=40	**15 WEEKS X 4 HOURS =60**	2.5	04
MATCC-405	Mathematics Practical (Based on MATCC-401 & MATCC-402)	100	40	**15 WEEKS X 6 HOURS =90**	6	06

INTERNAL:

Test	15 Marks
Assignment/Presentation	10 Marks
Seminar/Attendance	05 Marks
Total	**30 Marks**

DETAILED CURRICULUM B. SC. SEM. IV MATHEMATICS

Paper No: MATCC-403

Title of the Paper: **Advanced Calculus-II**

Credits: 04 Marks: 100

Semester End Examination of marks: **70Marks**

Continuous Internal Evaluation: **30 Mark**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Gradient of scalar function, Divergence of a vector function in $R^3$and Curl of vector function R^3 and their properties. Curvature and radius of curvature , radius of curvature of a curve y = f (x) , radius of curvature of a curve f(x ,y) = 0, radius of curvature of a curve r = f (θ) , radius of curvature of a curve at origin , Singular points for plane curves especially points of inflexion and double points and its types.	12	18
2	Double integral, Repeated integral, integral on a non-rectangular region, Jacobian, Triple integrals : Definition and Examples ; only introduction and use for transformation from Cartesian to polar, spherical and cylindrical coordinates and vice-versa, Green's ,Stoke's and Gauss's Theorem	16	18
3	Introduction to partial differential equation , Linear and non-linear of PDE, formation of PDE , solution of PDE by direct integration, Lagrange's method to solve PDE of the form Pp + Qq = R ,	16	17
4	Classification of second order PDE, Classification of PDEs if u = ∅ (x , y, z), Characteristics equation and Characteristics curve of second order PDEs, PDEs with constant coefficients, method of finding CF of PDEs, Method of finding PI of PDEs, Complete solution of PDEs	16	17

DETAILED CURRICULUM B. SC. SEM. IV MATHEMATICS

Paper No: MATCC-404

Title of the Paper: Linear Algebra-II & Numerical Analysis-II

Credits: 04 Marks:100

Semester End Examination of marks: **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Definition of a Matrix of a linear transformation, Linear Transformation associated with a matrix, the dimension of L(U,V), and its determination, Rank and Nullity of a Matrix, invertibility of system of linear equations. Definition of inner product space, Norm, Orthogonality, Schwarz's & Triangular inequality, Parallelogram law, Orthonornal basis, Gram-Schmidt Orthogonalization Process and its examples.	12	18
2	Stirling's interpolation formula, Derivatives using Stirling's interpolation formula, Bessel's and Everett's formulae, Lagrange's formula. Divided difference, Newton's divided difference formula, inverse interpolation, its application.	16	18
3	General quadrature formula, Trapezoidal rule, Simpson's rule, Weddel's rule. Quadrature formula based on Lagrange's formula, Newton-Cotes formula, Numerical integration formula based on central difference formulae, Euler-Maclaurian sum formula.	16	17
4	Algebraic and transcendental equations, Numerical solution of differential equations of first order, method of bisection, method of iteration, Newton-Raphson formula, Newton's iterative formula, convergence of Newton-Raphson method, Rate of convergence of Newton-Raphson method, method of false position. Euler's method, Euler's modified method, Picard's method. Taylor's series method, Runge-Kutta method, Milne's method.	16	17

DETAILED CURRICULUM B. SC. SEM. IV MATHEMATICS
Paper No: MATCC-405 MARKS: 100
Title of the Paper: Practical based on MATCC-403 & MATCC-404

1. Practical based on Green's Theorem.
2. Practical based on Stoke's Theorem.
3. Practical based on Gauss's Theorem.
4. Practical based on Complete solution of PDEs .
5. Practical based on Gram-Schmidt Orthogonalization Process.
6. Practical based on Stirling's interpolation formula.
7. Practical based on Bessel's formulae.
8. Practical based on Everett's formulae.
9. Practical based on Lagrange's formula.
10. Practical based on Divided difference.
11. Practical based on Newton's divided difference formula.
12. Practical based on Trapezoidal rule.
13. Practical based on Simpson's rule.
14. Practical based on Weddel's rule.
15. Practical based on method of bisection.
16. Practical based on method of iteration .
17. Practical based on Newton-Raphson formula.
18. Practical based on method of false position.
19. Practical based on Euler's method.
20. Practical based on Euler's modified method.
21. Practical based on Picard's method.
22. Practical based on Taylor's series method.
23. Practical based on Runge-Kutta method.
24. Practical based on Milne's method.

Reference books for MATCC-403 & MATCC-404

1. Linear Algebra: A Modern Introduction By David Poole
2. Matrix Analysis and Applied Linear Algebra By Carl. D. Meyer
3. Applied Linear Algebra and Matrix Analysis By Thomas S. Shores
4. Elementary Linear Algebra with ApplicationsBy Stanley I. Grossman
5. "An Introduction to Numerical Analysis" by K.E. Atkinson
6. "Numerical Methods" by Shishir Gupta, Shukhendu Dey
7. "Numerical Methods for Scientific and Engineering Computation" by Mahinder Kumar Jain
8. "Numerical Methods In Science And Engineering" by S. Rajasekaran
9. Numerical analysis by S.S.Shastri
10. Calculus, Volume 1**,** by Tom Apostol (Wiley).
11. Calculus, by Michael Spivak**.**
12. Calculus Made Easy**,** by Silvanus P. Thompson and Martin Gardner
13. Introduction to Calculus and Analysis, Volume II, by Richard Courant and Fritz John
14. Advanced Calculus, by R. Creighton Buck
15. UGC CSIR NET/SET mathematical sciences by PAWAN SHARMA(ARIHANT PUBLICATION INDIA LTD.).

DETAILED CURRICULUM B. Sc. Sem. – V MATHEMATICS

SEMESTER PATTERN :

- The Course content has been designed on **Semester pattern**.
- The workload for Theory & Practical is allotted on Semester pattern.
- There shall be **04 Theory papers of core course 70 marks each** of 2.5 Hours duration.
- There shall be **01 Theory paper of subject elective 70 marks** of 2.5 Hours duration.
- Mathematics Practical Examination shall be of **200 marks** of **12 hours duration** in University Examination.
- There shall be **Two Semesters** in an academic Year. (Semester-V & VI)

Paper No.	Name Of The Paper	Total Marks Ext.+Int* = Total	Passing Standarad Ext.+Int = Total	Total Teaching Hours	Exam Hours	Credits
MAT SEC-501	Operation Research	70+30 =100	28+12=40	15 WEEKS X 3 HOURS =45	2.5	03
MATCC-503	Group theory	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MATCC-504	Mathematical analysis - I	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MATCC-505	Advanced Numerical Methods and Laplace Transformation.	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MATCC-506	Complex analysis -I	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MATCC-507	Practical based on MATCC-503 to MATCC-506	100	40	15 WEEKS X 12 HOURS =180	12	12

INTERNAL:

Test	15 Marks
Assignment/Presentation	10 Marks
Seminar/Attendance	05 Marks
Total	**30 Marks**

DETAILED CURRICULUM B. SC. SEM. V MATHEMATICS

Paper No: MAT- SEC-501

Title of the Paper: Operation Research

Credits: 03 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	The linear programming problems, Formulation of LPP, matrix of the LPP. general form, canonical form, standard form of the LPP. Graphical method to solve LPP. somedefinitions and basic properties of convex sets, convex functions and concave functions. Theory and application of simplex method of solution of a LPP. Big M. Method, (penalty method).	15	18
2	The two phase method.(without alternative solution and unbounded solution). Principle of Duality in LPP. Primal LPP and its dual LPP. Fundamental theorem of duality.	10	17
3	The transportation problem. Mathematical and matrix form of T.P. balance and unbalance T.P. Initial solution by NWCM. LCM and VAM. Modi method and its solution.	10	18
4	Assignment problem, mathematical model of assignment problem, method for solving assignment problem and its examples. Game theory game pure strategies, game with mix strategies.	10	17

Reference books:

(1) Operation Research by J. K. Sharma
(2) Operation Research by Manmohan & Kantiswaroop.
(3) Operation Research (II**nd** edition) by R. Panneerselram.
(4) Operation Research by Nita Shah (III**rd** edition).

DETAILED CURRICULUM B. SC. SEM. V MATHEMATICS

Paper No: MAT-CC-503

Title of the Paper: **Group theory**

Credits: 04 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Definition of a Group and illustrations, Elementary property of a Group, Finite Groups and their tables, Definition of a Subgroup and illustrations. Group of co-sets and its properties.	12	17
2	Lagrange's theorem. Deduction of Lagrange's theorem. Permutation, cycle, transposition, Even and odd permutation, Inverse of permutation, Alternative group and its universal property.	16	17
3	Cyclic group and cyclic subgroup and its properties, Homomorphism, kernel of Homomorphism. Fundamental theorem of homomorphism, Isomorphism and its properties.	16	18
4	Cayle's theorem, Normal subgroup and its properties, Factor group and its properties.	16	18

Reference books:

(1) A first course in abstract – algebra John B. Fraleigh
(2) Topic in Algebra. I.N. Herstein willey Eastern Ltd. New Delhi
(3) Abstract algebra Dr. I. H. Sheth. Prentice Hall of India. New Delhi
(4) University Algebra, M. S. Gopalakrishna, willey easterm Ltd.
(5) Text book of morden abstract algebra, by shantinarayan, and S chand .

DETAILED CURRICULUM B. SC. SEM. V MATHEMATICS

Paper No: MAT-CC-504

Title of the Paper: **Mathematical analysis - I**

Credits: 04 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Partitions and Riemann sums, Upper and lower R-Integrals, R-I ntegrability. The integral as limit some classes of integrable functions properties of integrable functions.	12	17
2	Continuity, Derivability of integral functions. Fundamental theorem of integral calculus, mean value theorems of integral calculus.	16	17
3	Definition and examples of metric space, neighborhood, Hausdroff properties for neighborhood, Definition interior point, limit point, Closed set and open set and its properties and examples. Definition of closure, boundary point, isolated point, dense set, perfect set and its properties and example	16	18
4	Cantor set and its properties and examples. Continuity in metric space, subspace of metric space Cauchy sequence in metric space ,complete metric space and its properties and examples.	16	18

Reference books:

1. Mathematical Analysis by S. C. Malik and Savita arora
2. D. Somasundraram B. Chaudhary, Narosa publishing house, A first course in mathematical Analysis.
3. R. R. Goldberge methods of Real Analysis. oxford and IBH (India)
4. Mathematical Analysis by J.M.Sharma
5. Mathematical Analysis by S.K.Chetierjea.

DETAILED CURRICULUM B. SC. SEM. V MATHEMATICS

Paper No: MAT-CC-505

Title of the Paper: **Advanced Numerical Methods and Laplace Transformation.**

Credits: 04 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Relationship between roots and coefficient equations with real coefficient and imaginary roots, Rational coefficient and irrational roots, symmetric functions of roots, transformation of equations, multiple roots.	12	17
2	Solution to numerical, Algebraic and transcendental Equations by Secant Method, Ramanujan's Method, Muller's Method, Graeffe's Root-Squaring Method, Lin-Bairstow's Method, Horner's method .	16	17
3	Simultaneous linear algebraic equations : Gauss Elimination method, Gauss Jordan method of factorization or triangularisation. Crout's method, inverse of matrix by crout's method, Jacobi method of iteration, Gauss seidel iteration method.	16	18
4	Definition of Laplace transformation, Linearity of Laplace transformation, First shifting theorem, properties and examples of Laplace transformation. Inverse Laplace transformation, Laplace transformation of derivatives of f(t), Laplace transformation of integrals of f (t),Convolution	16	18

Reference books:

1. Numerical methods By Dr. V. N. Vedamurthy, Dr. S. N. Iyengar
2. Numerical Analysis By. S. S. Sastry
3. Introduction to numerical Analysis By. C. E. Froberg Addision wasley, 1979
4. Numerical method, problem and solutions By M.F. Jain, S. R. K. Iyengar, R. K. Jain New age international Pvt. Ltd.

DETAILED CURRICULUM B. SC. SEM. V MATHEMATICS

Paper No: MAT-CC-506

Title of the Paper: **Complex analysis -I**

Credits: 04 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	De'Moivre's theorem and its applications, Roots of a complex number and complex equation.	12	18
2	Application of Expansion of $\sin^n\theta, \cos^n\theta$, $n \in N$ in terms of sine and cosine of multiples of θ. Expansion of $\sin n\theta$, $\cos n\theta$ and $\tan n\theta$ in terms of sine, cosine and tangent respectively.	16	18
3	Exponential, circular and hyperbolic functions for complex variables. Logarithmic functions	16	17
4	Inverse circular and inverse hyperbolic functions for complex variable. Functions of complex variables, limits, theorems on limit. Continuity and differentiability of complex functions.	16	17

Reference books:

1. Complex variables and applications IVth Edition : by R. V. Churchill and J. W. Brown
2. Theory of function of a complex variables by shantinaruyan. S Chand and Co.
3. Complex variables introduction and application. By mark Ablowitz and A.S.Fokas Cambridge. University press
4. Complex Analysis – S Ponnusamy (Narosa Publication)
5. Complex Variables – H.S. Kasana

DETAILED CURRICULUM B. SC. SEM. V MATHEMATICS

Paper No: MAT-CC-507 **MARKS: 200**

Title of the Paper: **Practical based on MAT-CC-503 to MAT-CC-506**

Credits: 12

Semester End Examination of **200 Marks**

(A)

1.Practical problem of infinite group.
2. Practical problem of finite group.
3. Practical problem of Lagrange's theorem.
4. Practical problem of even Permutation.
5. Practical problem of odd Permutation.
6. Practical problem of Inverse of permutation.
7. Practical problem of Cyclic group.
8. Practical problem of Alternative group.
9. Practical problem of Normal subgroup.
10. Practical problem of Factor group.

(B)

1. Practical problem of R-I ntegrability by first definition.
2. Practical problem of R-I ntegrability by second definition.
3. Practical problem of mean value theorems of integral calculus.
4. Practical problem of metric space.
5. Practical problem of Closed set and open set of metric space.
6. Practical problem of cantor set.
7. Practical problem of cantor set as perfect set.

(C)

1. Practical problem of Secant Method.
2. Practical problem of Ramanujan's Method.
3. Practical problem of Muller's Method.
4. Practical problem of Graeffe's Root-Squaring Method.
5. Practical problem of Lin-Bairstow's Method.
5. Practical problem of Horner's method.
6. Practical problem of Gauss Elimination method.
7. Practical problem of Crout's method.
8. Practical problem of inverse of matrix by crout's method.
9. Practical problem of Jacobi method of iteration.
10. Practical problem of Gauss seidel iteration method.
11. Practical problem of Linearity of Laplace transformation.
12. Practical problem of Inverse Laplace transformation.
13. Practical problem of Laplace transformation of derivatives of f(t).
14. Practical problem of Laplace transformation of integrals of f(t).

(D)

1. Practical problem of De'Moirve's theorem.
2. Practical problem of hyperbolic functions for complex variables.
3. Practical problem of Analytic functions in Cartesian form using definition of partial differentiation in terms of limit.
4. Practical problem of Analytic functions in polar form using definition of partial differentiation in terms of limit.
5. Practical problem of Harmonic functions using definition of partial differentiation in terms of limit.
6. Practical problem of conjugate Harmonic functions definition of partial differentiation in terms of limit.

DETAILED CURRICULUM B. Sc. Sem. – VI MATHEMATICS

SEMESTER PATTERN :

- The Course content has been designed on **Semester pattern**.
- The workload for Theory & Practical is allotted on Semester pattern.
- There shall be **04 Theory papers of core course70 marks each** of 2.5 Hours duration.
- There shall be **01 Theory paper of subject elective 70 marks each** of 2.5 Hours duration.
- Mathematics Practical Examination shall be of 200 **marks** of 12 **hours duration** in University Examination.
- There shall be **Two Semesters** in an academic Year. (Semester-V & VI)

Paper No.	Name Of The Paper	Total Marks Ext.+Int*= Total	Passing Standarad Ext.+Int = Total	Total Teaching Hours	Exam Hours	Credits
MAT-SEC-601	Graph theory	70+30 =100	28+12=40	15 WEEKS X 3 HOURS = 45	2.5	03
MAT- CC-603	Ring theory	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MAT-CC-604	Mathematical analysis - II	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MAT-CC-605	Discrete mathematics	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MAT-CC-606	Complex analysis -II	70+30 =100	28+12=40	15 WEEKS X 4 HOURS =60	2.5	04
MAT-CC-607	Practical based on MAT-CC-603 to MAT-CC-606	100	40	15 WEEKS X 12 HOURS =180	12	12

INTERNAL:

Test	15 Marks
Assignment/Presentation	10 Marks
Seminar/Attendance	05 Marks
Total	**30 Marks**

DETAILED CURRICULUM B. SC. SEM. VI MATHEMATICS

Paper No: MAT- SEC-601

Title of the Paper: **Graph theory**

Credits: 03 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	A simple graph, vertices, edges, loops, multiple edges, labeled graphs, unlabeled graphs. The union ,intersection and direct sum of two graphs.	10	17
2	A walk ,closed walk,The length of a walk, a path. Euler graphs, Hamiltonian paths and circuits, tree, binary tree, spanning tree.	15	18
3	Cutset, connectivity and separability, planar graph and their representations, Euler's formula, Kuratowski's graphs.	10	17
4	Vector space associated with a graph, circuit and cut set, subspace, orthogonal vectors. Vertex coloring proper coloring, chromatic index. A cyclic digraphs and De cyclization. Matrix representation of graph, Adjacency matrix, incidence matrix, path matrix, circuit matrix, cut-set matrix, Relationship of these matrices.	10	18

Reference books:

1. Graph theory with application to engineering and computer science. By. Narsingh Deo 1993. Prentice Hall of India Pvt. Ltd.
2. Introduction to graph theory Robin J. Wilson. Rongrman addition Wesley longman Limited, 4th edition.
3. Introduction to graph theory. Douglas B. west prentice Hall of India Pvt. Ltd.

DETAILED CURRICULUM B. SC. SEM. VI MATHEMATICS

Paper No: MAT-CC-603

Title of the Paper: **Ring theory**

Credits: 04 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Definition of ring and its basic properties. Sub ring, Boolean ring, The characteristic of a ring and its properties Solution of the equation $ax = b$ in a ring R	12	17
2	Homomorphism of ring. Zero divisors, Integral domain, fields, cancellation laws, properties and examples of integral domain.	16	18
3	Fermat's theorem and Euler's theorem and Euler's generalization. Ideals, maximal ideals, principal ideal	16	17
4	Rings of polynomials, degree of polynomials, product and sum of polynomials ,GCD of polynomials. Integral domain D[x], Division algorithm of F[x], irreducible polynomials and reducible polynomials. Quaternion and its examples	16	18

Reference books:

1. A first course in abstract – algebra John B. Fraleigh
2. Topic in Algebra. I.N. Herstein willey Eastern Ltd. New Delhi
3. Abstract algebra Dr. I. H. Sheth. Prentice Hall of India. New Delhi
4. University Algebra, M. S. Gopalakrishna, willey easterm Ltd.
5. Text book of morden abstract algebra, by shantinarayan, and S chand .
6. Contemporary Abstract Algebra – Joseph A. Gallian (Narosa Publication)

DETAILED CURRICULUM B. SC. SEM. VI MATHEMATICS

Paper No: MAT-CC-604

Title of the Paper: **Mathematical Analysis -II**

Credits: 04 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Connectedness and compactness of metric space & its examples with their properties.	12	17
2	Topological space,open sets and closed sets closure, interior,limit pont,isolated point.	16	18
3	Definition of convergence of improper integrals of both kind. (Infinite region of integral & infinite integrand) Comparison test, Absolute convergence. Abel's test, Dirichlet's test.	16	17
4	Uniform convergence of sequence and series of functions test for uniform convergence M-test for sequence and M-test for convergence. Sets and operation on sets.Countable and uncountable sets, order axioms properties of ordered fields. Absolute values and its properties.	16	18

Reference books:

1. Mathematical Analysis by S. C. Malik and Savita arora
2. D. Somasundraram B. Chaudhary, Narosa publishing house, A first course in mathematical Analysis.
3. R. R. Goldberge methods of Real Analysis. oxford and IBH (India)
4. Mathematical Analysis by J.M.Sharma
5. Mathematical Analysis by S.K.Chetierjea.

DETAILED CURRICULUM B. SC. SEM. VI MATHEMATICS

Paper No: MAT-CC-605

Title of the Paper: **Discrete mathematics**

Credits: 04 Marks:100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Relations, Equivalence relations, Equivalence class and Partitions. Partial order relations (Posets), Hasse diagram.	12	17
2	Lattice as Posets, properties of lattices. Lattice as algebraic systems. Sub lattice Direct product of two lattices, complete lattice, Distributive lattice. Definition and example of Boolean algebra	16	18
3	Boolean algebra of circuit and switches, Direct product of two Boolean algebra. Homomorphism , Atoms of Boolean algebra. Stone's representation theorem.	16	17
4	The set A(x) of all the atoms of Boolean algebra, and its properties. Isomorphism of finite Boolean algebra. Boolean functions, Expressions, Min terms, Max terms, Expression as sum of product/ product of sum canonical form expression by cube array method.	16	18

Reference books:

1. Foundation of discrete mathematics. K.D. Joshi, New Age international Ltd. Publishers.
2. Elements of Diserete mathematics (IInd edition) by Liu. NC. graw hill. International edition.
3. Discrete mathematical structures with applications to computer science. By Trembley I.P. and Manohar R

DETAILED CURRICULUM B. SC. SEM. VI MATHEMATICS

Paper No: MAT- CC-606

Title of the Paper: Complex Analysis -II

Credits: 04 Marks: 100

Semester End Examination of **70Marks**

Continuous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Teaching Hours	Marks
1	Analytic functions, Cauchy Riemann equations in Cartesian form and in polar forms and its examples and its properties. Laplace equation in Cartesian form and in polar form.	12	17
2	Harmonic functions and conjugate Harmonic functions and relation between harmonic, conjugate harmonic and analytic functions.	16	18
3	Complex Line integral, properties and examples of Complex Line integral ,Cauchy integral Formula , Derivatives of Cauchy integral Formula. Residues : Cauchy's residues theorem, poles,	16	17
4	evaluation of improper real integrals and definite integrals of trigonometric functions. Mapping by elementary functions (Mobius transformations), $W = Z^2$, $W = 1/Z$, $W = e^Z$, $W = Z^n$ transformation linear fractional transformation, Bilinear transformation formation with properties conformal mapping and its examples.	16	18

Reference books:

1. Complex variables and applications IVth Edition : by R. V. Churchill and J. W. Brown
2. Theory of function of a complex variables by shantinaruyan. S Chand and Co.
3. Complex variables introduction and application. By mark Ablowitz and A.S.Fokas Cambridge. University press

DETAILED CURRICULUM B. SC. SEM. VI MATHEMATICS

Paper No: MAT-CC-607 MARKS:200

Title of the Paper: Practical based on MAT-CC-603 to MAT-CC-606

Semester End Examination of **MARKS:200** Credits: 12

(A)

1.Practical problem of Ring.
2. Practical problem of Integral domain.
3. Practical problem of Field.
4. Practical problem of Fermat's theorem.
5. Practical problem of Euler's theorem.
6. Practical problem of Ideals.
7. Practical problem of maximal ideals.
8. Practical problem of principal ideal.
9. Practical problem of sum and product of polynomials.
10. Practical problem of Quaternion.

(B)

1. Practical problem of Connectedness of matric space.
2. Practical problem of Compactness of matric space.
3. Practical problem of Topological space.
4. Practical problem of improper integrals-I.
5. Practical problem of improper integrals-II.
6. Practical problem of Uniform convergence of sequence of function.
7. Practical problem Uniform convergence of series of function.

(C)

1. Practical problem of Equivalence relations.
2. Practical problem of Partial order relations.
3. Practical problem of Hasse diagram of lattice.
4. Practical problem of Boolean algebra.
5. Practical problem of Boolean algebra of circuit and switches.
6. Practical problem of Boolean functions as sum of product canonical form .
7. Practical problem of Boolean functions as product of sum canonical form.

(D)

1. Practical problem of Analytic functions in Cartesian form.
2. Practical problem of Analytic functions in polar form.
3. Practical problem of Harmonic functions.
4. Practical problem of conjugate Harmonic functions.
5. Practical problem of Complex Line integral -I.
6. Practical problem of Complex Line integral -II.
7. Practical problem of Cauchy integral Formula -I.
8. Practical problem of Cauchy integral Formula -II.
9. Practical problem of Cauchy's residues theorem for improper real integrals.
10. Practical problem of Cauchy's residues theorem for trigonometric functions.
11. Practical problem of Bilinear transformation formation by cross Ratio.