SHIVAJI UNIVERSITY, KOLHAPUR

CENTRE FOR DISTANCE EDUCATION

Master of Science Mathematics (M.Sc.) Course through Distance Mode

Vision - Developing human resource required for the Knowledge Society

Mission - Disseminate and facilitate Higher Education to marginalized and deprived masses

M.Sc (Mathematics) Programme Educational Objectives (PEO):

1) To develop employable abilities of the learner where mathematics plays important role.
2) TO motivate distance education M.Sc. (Mathematics) learner to take higher education.
3) To inspire learner to undertake research activity in Mathematics.
4) To make learners enough competent in basic functionalities.

Introduction :

In the post globalization period, there is a huge requirement of manpower having M.Sc. (Mathematics) degree to cater to the needs of manufacturing and service organizations. Further, the manpower which is already employed in manufacturing and service organizations, not having M.Sc. (Mathematics) degree are required to upgrade their qualification by possessing M.Sc. (Mathematics) degree through distance mode.

Master of Science Mathematics : M.Sc. (Mathematics) Distance Mode
Why M.Sc. (Mathematics) - Distance Mode ?

Some graduates, primary teacher, high-school teacher already in service and they want to higher qualification than current qualification for success in their life and this is due only through Distance.

Aims of the Programme :

To prepare a young generation of Teachers , Bank staff , government officers who are :

1. aware of the need of working systematically
2. aware of the scientific and technological developments.
3. capable of performing their work backed with theoretical and conceptual clarity.
4. capable of solving problems and taking appropriate decisions

Duration of the Course

The duration of the Course is 2 years and 3 months divided into 4 semesters.

Eligibility for Admission :

1) B.A / B.Sc. graduate with Mathematics as specialization subject. OR
2) B.A. /B.Sc. II with one subject Mathematics which of 55%.

Fees to be paid while registering for the first time for the First Year

(Sem.- I & Sem.- II) in June / July :

Sr. No.	Details	Amount (in Rs.)
1.	Registration Fee	1690
2.	S.I.M. Fee	2815
3.	Exam Fee (Oct/Nov 2019 Exam)	820
4.	Exam Fee (Mar/Apr 2020 Exam)	820
5.	Cost of Application Form	20
6.	Study Centre Fee	845
7.	Prospectus Charges	20
8.	E-Facility Fee	50
9.	Eligibility Fee	50
10.	Environment Studies Exam	0
11.	Dhwaj Nidhi	10
12.	Tution / Course Fee	0
	Total Amount	**7,140**

Eligibility Fees :

Sr. No.	Details	Amount
1.	Eligibility Fee (at the time of admission only)	
	• If candidate is from an institution affiliated to any other recognized Indian University	Rs. 100.00
	• If candidate is from an institution affiliated to any other recognized non-Indian University	Rs. 150.00

Fees to be paid while registering for the first time for the Second Year (Sem. III &Sem. IV) in June /July :

Sr. No.	Details	Amount (in Rs.)
1.	Registration Fee	1690
2.	S.I.M. Fee	2815
3.	Exam Fee (Oct/Nov 2019 Exam)	820
4.	Exam Fee (Mar/Apr 2020 Exam)	820
5.	Cost of Application Form	20
6.	Study Centre Fee	845
7.	Prospectus Charges	20
8.	E-Facility Fee	50
9.	Eligibility Fee	50

10.	Environment Studies Exam	0
11.	Dhwaj Nidhi	10
12.	Tution / Course Fee	0
	Total Amount	**7,140**

Note :

1. In case of change in fees, the revised fees will be charged at the time of admission.
2. Late Fee or Super Late Fee, as applicable, would be additional.
3. Additional fees for failed subject/s.

Standard of Passing :

a. In order to pass the course, a candidate has to clear all the 36 heads of passing by getting a minimum of 40% in each head.

b. Subject to the condition of clearing all 36 heads, in order to pass the course a candidate has to secure minimum of 40% in aggregate of all 36 heads.

c. Division will be as follows -

50% and above but less than 60%	-	III class
60% and above but less than 70%	-	II class
70% and above	-	I class with distinction

d. No class will be awarded to any part of examination.

A.T.K.T Rules

1. For admission to M.Sc. Part-II a candidate must have cleared all papers of Sem.I and II or at least 06 papers of Sem. I and II combine.
2. The students who have completed first semester are allowed to continue for second semester and students who have completed third Semester are allowed to continue for Fourth Semester as per above rule

Pattern of Examination :

External Examination each paper of - 90 Marks Internal 30 Marks

The duration of external examination will be of 3 hours the assignments as prescribed by the Study Centre.

Contact Sessions :

The contact sessions shall be arranged at the end of week i.e. on Sunday or as per the convenience of the Study Centre and the registered candidates.

M.Sc. (Mathematics) Programme Outcomes (PO'S)

After completion of M.Sc. (Mathematics) programme, distance learner can able to,

1) Solve any mathematical problem by properly applying mathematical principles.
2) Apply their knowledge in their current profession.
3) Make their careers in analysis of mathematical data in government and non government organization.
4) Undertake research activity of new simplex methods in Mathematics.

Syllabus :

M.A. / M. Sc. Mathematics (Part I) (Semester I)

(Introduced from June 2013 onwards)

(i) Paper : MT 101

(ii) Title of Paper: Algebra – I

(iii) Course Outcomes:

To enable the student to;

1. study group theory in detail.
2. introduce the concept of modules
3. perform group action on a set.
4. analyze various theorems on a set and apply fundamental theorem of modules.

(iv)A brief note: - (Notations and concepts are taken from books given in basic reading; this should be taken in account for examination point of view).

(v) UNIT No. of Lectures

Unit I: Simple groups, simplicity of A_n ($n > 5$), Commutator subgroups, normal and subnormal series, Jordan-Holder theorem, Solvable groups, isomorphism theorems, Zassenhaus Lemma, Schreier refinement theorem.**15 Lectures.**

Unit II: Group action on a set, isometry subgroups, Burnside theorem, Syllow's theorems, p-subgroups, Class equation and applications. **15 Lectures**

Unit III: Ring of Polynomials, Factorization of polynomials over fields, irreducible polynomials, Eisenstein criterion, ideals in F[x], unique factorization domain, principal ideal domain, Gauss lemma, Euclidean Domain.**15 Lectures**

Unit IV: Modules, sub-modules, quotient modules, homomorphism and isomorphism theorems, fundamental theorem for modules. **15 Lectures**

(vi)Recommended Reading:

(In MLA/APA Style Sheet Format)

a) Basic Reading:- 1)A first course in Abstract Algebra by John Fraleigh

(3rd edition) Narosa publishing house, New Delhi

2) C. Musili, Rings and Modules, Narosa Publishing house.

3) Joseph A. Gallian, Contemporary Abstract Algebra, Narosa

Publication, Fourth Edition, 1999.

b) Additional Reading:- 1) "Basic Abstract Algebra" by Bhattacharya, Jain and Nagpal,

2nd edition, Narosa Publishing House, New Delhi.

2) Topics in Algebra, I. N. Herstein, Vikas Publishing House.

c) References :-

i)Books: Basic Algebra' by N. Jacobson, Hind Publishing Corporation 1984.

ii) Periodicals/Journals:

(NOTE :

i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 Hr per week is for problem solving/ tutorials/seminars.**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary) **Nil.**

NEW/REVISED SYLLABUS FOR

M.A. / M. Sc. Mathematics (Part I) (Semester I)

(Introduced from June 2013 onwards)

(i) Paper : MT 102

(ii) Title of Paper: Advanced Calculus

(iii) Course Outcomes:

To enable the student to;

1. study sequences of functions.
2. describe basic concept of convergence.
3. assess multivariable's for differential calculus.
4. solve extremism problems and formulate real valued functions of several variables.

(iv) A brief note:- Theorems and proofs are expected to be prepared from Mathematical Analysis by T.M.Apostol.

(v) UNIT No. of Lectures

Unit 1 : **Sequences of functions**: Pointwise convergence of sequaences of functions,Examples of sequences of real valued functions, Definition of uniformconvergence, Uniform convergence and continuity, Cauchy condition for uniform convergence, Uniform convergence and Riemann integration, Uniform convergence and differentiation, double sequence uniform convergence and double sequences, mean convergence.**15 Lectures**

Unit 2 Series of functions: Rearrangement of series, subseries, double series, Rearrangement theorem for double series, Multiplication of series, Power series, multiplication of power series, substitution theorem, reciprocal of power series, Real power series, The Taylor series generated by function, Bernstein's theorem, Binomial series, Abel's limit theorem, Taubers theorem. **15 Lectures**

Unit 3 Multivariable differential Calculus: The Directional derivatives, directional derivatives and continuity, total derivative, total derivatives expressed in terms of partial derivatives, The matrix of linear function, Jacobin matrix, Chain rule, mean value theorem for differentiable functions, A sufficient condition for differentiability, sufficient condition for equality of mixed partial derivatives, Taylor's formula for functions from R_n to R_1. The inverse function theorem (Statement only) The implicit function theorem (Statement only) and their applications. Extrema of real valued functions of one variable, Extrema of real valued functions of several variables. **15 Lectures**

Unit 4 Path and line integrals, Multiple integrals Double integral (Theorems without proof) Application to area and volume.(Theorems without proof)Greens theorem in the plane. Application of Green's Theorem.Change of variables, special cases of transformation formula.Surface integral, change of parametric representation. Other notations for surface integrals, stoke's Theorem Curl and divergence of a

Vector field. Gauss divergence Theorem**. 15 Lectures**

(vi) Recommended Reading :

a) Basic Reading :- 1) Mathematical Analysis, T. M. Apostal, Second Edition,

Narosa Publishing House.

2) Advanced Calculus Vol II by T. M. Apostol

b) Additional Reading :- 1) Principles of mathematical Analysis, Walter Rudin,

third Edition, McGraw Hill book company

b) References :- i) Books: Methods of Real Analysis, Richard Goldberg, Blaisdell

Publishing company

ii) Periodicals/Journals: NIL

NOTE : i) The details of field work, seminar, Group Discussion and Oral examination be given

wherever necessary.**1 Hr per week for problem solving/tutorial/seminar**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary)

Nil

NEW/REVISED SYLLABUS FOR
M.A. / M. Sc. Mathematics (Part I) (Semester I)
(Introduced from June 2013 onwards)

(i) Paper: MT 103

(ii) Title Of Paper: Real Analysis

(iii) Course Outcomes:

To enable the student to;

1. introduce basic concepts of real analysis.
2. illustrate different notions of real analysis.
3. compare different types of sets.
4. set relation between various analysis functions and apply limits and approximation of measurable functions.

(iv) UNIT No. of Lectures

UNIT-I: OpenSets, Closed Sets and Borel Sets, Lebesgue Outer Measure, The sigma

algebra of Lebesgue Measurable Sets, Countable Additivity, Continuity and Borel-Cantelli

Lemma, Non measurable Sets. **15 Lectures**

UNIT- II: Sums, Product and Composition of Measurable Functions, Sequential Pointwise limits and Simple Approximation. Littlewood's Three Principles, Egoroff's Theorem and Lusin's Theorem, Lebesgue Integration of a Bounded Measurable Function, Lebesgue Integration of a Non-negative Measurable Function. **15 Lectures**

UNIT–III: The General Lebesgue Integral, Characterization of Riemann and Lebesgue Integrability, Differentiability of Monotone Functions, Lebesgue's Theorem, Functions of Bounded Variations: Jordan's Theorem. **15 Lectures**

UNIT – IV: Absolutely Continuous Functions, Integrating Derivatives: Differentiating Indefinite Integrals, Normed Linear Spaces, Inequalities of Young, Holder and Minkowski, TheRiesz-Fischer Theorem. **15 Lectures**

(vi) Recommended Reading :

a) Basic Reading:-

1) Royden, H. L., Fitzpateick P.M., Real Analysis. (2009) 4rd edition. Prentice Hall of India, New Delhi

b) Additional reading:-

1) G.deBarra. Measure Theory and Integration. (1981)Wiley Eastern Ltd.

2) Rana, I. K. An Introduction to Measure and Integration. (1997) Narosa Book Company.

c) References Books:

1) Berberian, S. K. Measure and Integration. (1965) McMillan, New York.

2) Jain, P. K. and Gupta, V. P. Lebesgue measure and Integration. (1986). Wiley Easter Limited.

3) Rudin W., Principles of Mathematical Analysis, (1964) McGraw-Hill Book Co.

Notes:i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 Hr per week for problem solving/tutorial/seminar**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary) **NIL**

NEW/REVISED SYLLABUS FOR

M.A. / M. Sc. Mathematics (Part I) (Semester – I)

(Introduced from June 2013 onwards)

(i)Paper: MT 104

(ii)Title of Paper: Differential Equations

(iii) Course Outcomes:

To enable the student to;

1. study concept on differential equations.
2. describe basic notations in DE.
3. discuss reasons in developing advanced mathematics.
4. solve initial value problems for n^{th} order equations and study convergence of the successive approximation.

(iv)A brief note :**Theorems and proofs are expected to be prepared from An introduction to ordinary differential equations by E.A. Coddington.**

(v) UNIT No. of Lectures

Unit – I : Linear Equations with constant coefficients: The second order homogeneous equation, Initial value problems for second order equations, Linear dependence and independence, A formula for the Wronskian, The non-homogeneous equations of order two, The homogeneous equations of order n. **15 Lectures**

Unit - II Initial value problems for the n_{th} order equations, The non-homogeneous equation of n_{th} order. Linear Equations with variable coefficients: Initial value problems for the homogeneous equations. Solutions of the homogeneous equations, The Wronskian and linear independence, Reduction of the order of a homogeneous equation, The non-homogenous equations, **15 Lectures**

Unit - III Greens function, Sturm Liouville theory, Homogeneous equations with analytic coefficients, The Legendre equations. Linear Equations with regular singular points: The Euler equations, Second order equations with regular singular points. **15 Lectures**

Unit – IV The Bessel equation, Regular singular points at infinity,Existence and uniqueness of solutions: The method of successive approximations, The Lipschitz condition of the successive approximation. Convergence of the successive approximation. **15 Lectures**

(vi) Recommended Reading :

(In MLA/APA Style Sheet Format)

a) Basic Reading:- 1) E.A.Coddington: An introduction to ordinary differential equations. (1974) Prentice Hall of India Pvt.Ltd. New Delhi.

2) G. Birkoff and G.G.Rota: Ordinary Differential equations, John

Willey and Sons

b) Additional Reading:- G.F. Simmons Differential Equations with Applications and

Historical note, MeGraw Hill, Inc. New York. (1972)

c) References

Books:- 1. E.A. Coddington and Levinson: Theory of ordinary differential equations

McGraw Hill, New York(1955)

2.E.D. Rainvills :Elementary differential equations,TheMacmillan company,

New York. (1964)

NOTE :

i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 Hr per week is for problem solving/ tutorials/seminars.**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary)

Nil.

NEW/REVISED SYLLABUS FOR

M.A. / M. Sc. Mathematics (Part I) (Semester I)

(Introduced from June 2013 onwards)

(i) Paper – MT 105

(ii) Title of Paper: Classical Mechanics

(iii) Course Outcomes:

To enable the student to;

1. study the mathematical artifact.
2. learn about various mathematical formulae.
3. solve problems of calculus of variations.
4. apply mathematical knowledge in real time and calculate coordinate and angles of a rigid body.

(iv) A brief note: - Theorems and proofs are expected to be prepared from books given basic readings.

(v) UNIT No. of Lectures

UNIT – I: Mechanics of a particle, Mechanics of a system of particles, conservation theorems, conservative force with examples, constraints, Generalised coordinates, D' Alembert's Principle, Lagrange's equations of motion, the forms of Lagrange's equation for non conservative system and partially conservative and partially non-conservative system, Lagrangian for charged particle in electromagnetic field, Kinetic energy as a homogeneous function of generalised velocities, Non-conservation of total energy due to the existence of non-conservative forces. Cyclic co-ordinates and generalised momentum, conservation theorems, motion of a particle under central force and first integral. **15 Lectures**

UNIT – II Functionals, basic lemma in calculus of variations, Euler- Lagrange's equations, first integrals of Euler- Lagrange's equations, the case of several dependent variables Undetermined end conditions, Geodesics in a plane and space, the minimum surface of revolution, the problem of Brachistochrone, Isoperimetric problems, problem of maximum enclosed area, shape of a hanging rope.Hamilton's Principle for conservative and non-conservative systems, Derivation of Hamilton's principle from D'Alembert's principle, Lagrange's equations of motion for

conservative and non-conservative systems from Hamilton's principle. Lagrange's equations of motion for nonconservative systems (Method of Langrange's undetermined multipliers),

15 Lectures

UNIT – III Hamiltonian function, Hamilton's canonical equations of motion, Derivation of Hamilton's equations from variational principle, Physical significance of Hamiltonian, the principle of least action, Jacobi's form of the least action principle, cyclic co-ordinates and Routh's procedure. Orthogonal transformations, Properties of transformation matrix, nfinitesimal rotations. **15 Lectures**

UNIT – IV The Kinematics of rigid body motion: The independent co-ordinates of a rigid body, the Eulerian angles, Euler's theorem on motion of rigid body, Angular momentum and kinetic energy of a rigid body with one point fixed, the inertia tensor and moment of inertia, Euler's equations of motion, Cayley- Klein parameters, Matrix of transformation in Cayley- Klein

parameters, Relations between Eulerian angles and Cayley- Klein parameters. **15 Lectures**

(vi) Recommended Reading :

a) Basic Reading :- 1) Goldstein, H. Classical Mechanics. (1980), Narosa

PublishingHouse, New Delhi.

2) Weinstock: Calculus of Variations with Applications to

Physics and Engineering (International Series in Pure and

Applied Mathematics). (1952), Mc Graw Hill Book

Company, New York.

b) Additional Reading :- 1) Whittaker, E. T. A treatise on the Analytical Dynamics

of particles and rigid bodies. (1965),

Cambridge University Press.

2) Rana, N.C. and Joag, P. S. Classical Mechanics. (1991)

Tata McGraw Hill, New Delhi.

c) References :-

i) Books 1) Bhatia, V. B. Classical Mechanics with Introduction to Non-linear

Oscillation and Chaos.(1997), Narosa publishing House.

2) Gupta, A. S. Calculus of Variations with Applications (1997), Prentice Hall

of India.

3) Gelfand, I. M. and Fomin, S. V. Calculus of Variations (1963), Prentice

Hall of India.

4) Mondal, C. R. Classical Mechanics (2001), Prentice Hall of India.

ii) Periodicals/Journals: Nil

NOTE :

The details of fieldwork, seminar, Group Discussion and Oral examination be given

wherever necessary. **1 Hr per week for problem solving/tutorial/seminar**

ii) General/Specific instructions for Laboratory safety should be given wherever

necessary)

NEW/REVISED SYLLABUS FOR

M.A. / M. Sc. Mathematics (Part I) (Semester II)

(Introduced from June 2013 onwards)

(i) Paper – MT- 201

(ii) Title of Paper: Linear Algebra

(iii) Course Outcomes:

To enable the student to;

1. explain basic notations in linear algebra.
2. analyze results in developing advanced mathematics.
3. calculate Eigen values and Eigen vectors.
4. describe similarity of linear transformations and compare unitary and normal liner transformations.

(iv) A brief note: Theorems and proofs are expected to be prepared from Topics in Algebra by Herstein I.N. and Linear Algebra by Hoffman, Kenneth and Kunze R.

(v) UNITS No. of Lectures

Unit I. Direct sum of a vector space, Dual Spaces. Annihilator of a subspace, Quotient Spaces. Algebra of Linear transformations. **15 Lectures**

Unit II Adjoint of a linear transformation, Inner product spaces, Eigen values and eigenvectors of a linear transformation. Diagonalization. Invariant subspaces.**15 Lectures**

Unit III Canonical forms, Similarity of linear transformations, Reduction to triangular forms, Nilpotent transformations, Primary decomposition theorem, Jordan blocks and Jordan forms, Invariants of linear transformations. **15 Lectures**

Unit IV Hermitian, Self adjoint, Unitary and normal linear transformation, Symmetric bilinear forms, skew symmetric bilinear forms, Group preserving bilinear forms. **15 Lectures**

(vi) Recommended Reading:

(In MLA/APA Style Sheet Format)

a) Basic Reading:- 1) Herstein I. N. : Topics in Algebra, 2nd Edition, Willey eastern Limited

2) Hoffman, Kenneth and Kunze R: Linear Algebra, Prentice Hill of India Private Limited., 1984.

b) Additional Reading: Sahi and Bist, Linear Algebra, Narosa Publishing House.

c) Reference Books: 1. A. R. Rao and P. Bhimashankaran, Linear Algebra, Hidustan Book Agency(200)

2. Surjit Singh, Linear Algebra, Vikas publishing House (1997)

ii) Periodicals/Journals: Nil

(NOTE :

i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary. **1 Hr per week for problem solving/ tutorial/ seminar**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary) **Nil**

NEW/REVISED SYLLABUS FOR

M.A. / M. Sc. Mathematics (Part I) (Semester II)

(Introduced from June 2013 onwards)

(i)Paper : MT 202

(ii)Title of Paper : Topology

(iii) Course Outcomes:

To enable the student to;

1.explain basic notations in linear algebra.

2.analyze results in developing advanced mathematics.

3.calculate Eigen values and Eigen vectors.

4.describe similarity of linear transformations and compare unitary and normal liner transformations.

(iv)A brief note:-Theorems and proofs are expected to be prepared from Foundations of General Topology by W. J. Pervin

Unit I: Topological spaces, Examples, Limit points, Closed sets and closure, Interior, exterior, Neighborhoods, Different ways of defining topologies , Bases, Subbases, Subspaces of topological space. Hereditary properties **15 Lectures**

Unit II: Connected Spaces, Components, Connected subspaces of real lines, Compact Spaces, Continuous Functions, Homeomorphisms, Topological properties. **15 Lectures**

Unit III: Separation axioms: T_o, T_1, T_2-spaces, First and second axioms spaces, Separable Spaces, Lindelof spaces, Regular and T_3 -Spaces, Normal and T_4-Spaces. **15 Lectures**

Unit IV: Completely Regular and $T_{3\,1/2}$-Spaces , Completely Normal and T_5 -Spaces , Product Spaces (For To, T_1, T_2, -compact, and connected spaces), Urysohn lemma and Urysohn metrization theorem. **15 Lectures**

(vi) Recommended Reading :

a) Basic Reading :- W. J. Pervin, Foundations of General Topology, Academic Press, New York, 3rd edition, 1970.

b) Additional Reading :-

1) G. F. Simmons, Introduction to Topology and Modern Analysis, Mc Graw Hill Book Company, New Delhi, 1963.

2) J. R. Munkers, Topology: A First Course, Prentice Hall of India Pvt. Ltd.

3) K. D. Joshi, General Topology.

4)Willard, Topology, Academic press.

NOTE : The details of fieldwork, seminar, Group Discussion and Oral examination be given wherever necessary. **1 hr per week for problem solving/tutorials/seminars**

NEW/REVISED SYLLABUS FOR

M.A. / M. Sc. Mathematics (Part I) (Semester II)

(Introduced from June 2013 onwards)

(i) Paper: MT 203

(ii) Title of Paper: Complex Analysis

(iii) Course Outcomes:

To enable the student to;

1. define basic notations in complex analysis
2. assess range of use of notations in complex analysis.
3. formulate various theorems related to complex analysis.
4. classify singularities.compare casorati-weierstrass theorem with others.

(iv) A brief note :- Theorems and proofs are expected to be prepared from Functions of One Complex Variable by J. B. Conway; this should be taken in to account for examination point of view.

Unit 1: Power series, Radius of convergence, analytic functions, Cauchy-Riemann equations, Harmonic functions, Mobius Transformations, line integral. **15 Lectures**

Unit 2: Power series representation of analytic functions, zeros of an analytic function, Liouville's Theorem, Fundamental theorem of algebra, maximum modulus theorem. The index of a closed curve, Cauchy's theorem and integral formula, Morera's Theorem. **15 Lectures**

Unit 3: Counting zeros, open Mapping theorem, Goursat's Theorem, classification of singularities, Laurent series development, Casorati–Weierstrass theorem, residues, residue theorem, evaluation of real integrals. **15 Lectures**

Unit 4: The argument principle, Rouche's theorem, the maximum principle, Schwarz's lemma and its application to characterize conformal maps, Normal families, Hurwitz theorem, Riemann mapping theorem. **15 Lectures**

(vi) Recommended Reading :

a) Basic Reading :- J. B. Conway: Functions of One Complex Variable (3rd Edition) Narosa Publishing House.

b) Additional Reading :- Alfors L. V.: Complex Analysis, McGraw 1979.

c) References :-

i) Herb Silverman, Complex Analysis

ii) S. Ponnusamy, Herb Silverman, Complex Variables with Applications Analysis, Birkhauser, 2006

iii) S.Ponnusamy, Foundations of Complex Analysis, Narosa Publishing House.

Note: The details of fieldwork, seminar, Group Discussion and Oral examination be given wherever necessary. 1 **hr per week for problem Solving /tutorial / seminar**

NEW/REVISED SYLLABUS FOR

M.A. / M. Sc. Mathematics (Part I) (Semester II)

(Introduced from June 2013 onwards)

(i) Paper: MT 204

(ii) Title of Paper: Numerical Analysis

(iii) Course Outcomes:

To enable the student to;

1. analyze various methods in numerical analysis.
2. define scientific and engineering computation.
3. assess different iteration methods.
4. calculate Lagrange and Newton interpolation.solve different mathematical problems using numerical analysis.

(iv) A brief note: Theorems and proofs are expected to be prepared from Numerical methods for scientific and Engineering Computation' M. K. Jain, S. R. K. Iyengar, R. K. Jain.

(v) UNITS No. of Lectures

Unit 1 Transcendental & polynomial equations: Bisection method, Iteration methods based on First degree equation (Secant method, Regula Falsi method, Newton Raphson method), Rate of Convergence, Iteration methods, Birge – Vieta method, Bairstow method, **15 Lectures**

Unit 2 System of linear algebraic equations and eigen value problems: Iteration methods (Jacobi iteration method, Gauss seidel iteration method) convergence analysis, Matrix factorization methods (Doo little reduction, Crout reduction), Eigen values and eigenvectors, Gerschgorin theorem, Brauer theorem, Jacobi method for symmetric matrices, Householder's method for symmetric matrices, power method. **15 Lectures**

Unit 3 Interpolation differentiation and integration: Lagrange and Newton interpolation, Truncation error bounds, Newtons divided difference interpolation, finite difference operators, numerical differentiation, methods based on inter polation, numerical integration, Error analysis, methods based on interpolation Newton cotes methods, Error estimates for trapezoidal and Sampson's rule. **15 Lectures**

Unit 4 Numerical solution of differential equations: Euler's method, analysis of Euler's method, Backward Euler's method, order of Euler's method, Explicit Runge – Kutta method of order two and four, mid point method, Taylor series method, convergence and stability of numerical methods, Truncation error, error analysis. **15 Lectures**

(vi) Recommended Reading:

a) Basic Reading: 'Numerical methods for scientific and Engineering Computation' M. K. Jain, S. R. K. Iyengar, R. K. Jain, New Age International Limited Publishers 1993.

b) Additional Reading : 1. Numerical Mathematics, Numerical solutions of Differential

Equations by M. K. Jain

2. Introductory methods of Numerical Analysis' S. S. Sastry, Prentice Hall of India New Delhi.

c) References :

i) Books

ii) Periodicals/Journals:

NOTE: The details of fieldwork, seminar, Group Discussion and Oral examination be given wherever necessary. **1 Hr per week for problem solving/tutorial/seminar**

ii) General/Specific instructions for Laboratory safety should be given wherever necessary) **Nil**

NEW/REVISED SYLLABUS FOR

M.A. / M. Sc. Mathematics (Part I) (Semester II)

(Introduced from June 2013 onwards)

(i) Paper: MT - 205

(ii) Title of Paper: Differential Geometry

(iii) Course Outcomes:

To enable the student to;

1. describe concept of differential geometry.
2. study the geometry of curves.
3. understand basic notations of surfaces.
4. calculate, coordinate patches and surfaces and apply orthogonal transformations in differential geometry.

(iv) A brief note: Theorems and proofs are expected to be prepared from O'Neill, B. Elementary Differential geometry, Academic Press, Revised Edition 2006.

(v) UNIT No. of Lectures

Unit – I Vector space, Euclidean space R_3. Tangent vectors and vectors fields, Frame fields, Natural frame fields, Directional derivative , Curves in R_3 and reparametrization of curves, standard curves, Speed of curve, length of curve. 1- forms, differential forms.**No. of Lectures 15**

Unit – II The Frenet Formulae for unit speed curve. Frenet approximation of curves, Arbitrary speed curves, Frenet formulas for arbitrary speed curve, Covariant Derivative. Isometries of R_3, Orthogonal transformations. **No. of Lectures 15**

Unit – III Coordinate patches, surface in R_3, simple surface, cylinder surface, surface of revolution, parametrization of a region, parametrization of cylinder and surface of revolution, smooth overlapping patches, tangent and normal vector fields on a surface. **No. of Lectures 15**

Unit – IV The shape operator of surface M in R_3, normal curvature, principal curvatures, Gaussian and mean curvatures, Umbilic points, fundamental forms of a surface, computational techniques, special curves on surface, asymptotic and geodesic curves. **No. of Lectures 15**

(vi) Recommended Reading : (In MLA/APA Style Sheet Format)

1. Basic Reading: O'Neill, B.: Elementary Differential geometry, Academic Press, Revised Edition 2006.

References Books:

1. D. Somasundaram: Differential Geometry- First Course, Narosa Publishing House, New Dehli, 2010.

2. Nirmala Prakash: Differential Geometry, Tata Mcgraw Hill, 1981.

3. K. S. Amur and etl.: Differential Geometry,Narosa Publishing House, 2010.

4. Millman, R. and Parker, G. D. Elements of Differential Geometry, Prentice-Hall

of India Pvt. Ltd. 1977.

5. Hicks, N. : Notes of differential geometry, Princeton University Press (1968)

NOTE:

i) The details of field work, seminar, Group Discussion and Oral examination be given wherever necessary.

ii) General/Specific instructions for Laboratory safety should be given wherever necessary)