“ Education for Knowledge, Science and Culture ”

… Shikshanmaharshi Dr. Bapuji Salunkhe

VIVEKANAND COLLEGE (AUTONOMOUS), KOLHAPUR

Department of Mathematics

M.Sc.-I

Semester-I & II

CBCS Revised Syllabus to be implemented from June 2021 Onwards.

M.Sc. Part-I Mathematics

Semester wise Syllabus

M.Sc.-I Semester- I

CP-1170A	:	Algebra
CP-1171A	:	Advanced Calculus
CP-1172A	:	Complex Analysis
CP-1173A	:	Ordinary Differential Equations
CP-1174A	:	Classical Mechanics

M.Sc.-I Semester- II

CP-1175B	:	Linear Algebra
CP-1176B (New)	:	Integral Equations
CP-1177B	:	General Topology
CP-1178B	:	Partial Differential Equations
CP-1179B	:	Numerical Analysis

Semester- I

Course Code: - CP-1170A Credit – 05

I) Title of course : - Algebra

II) A brief note: Theorems and proofs are expected to be prepared from recommended books

III) Specific Objectives: To study solvability of groups, Ideals and Modules in detail.

The Course Outcomes: Upon successful completion of this course student will able to

- check solvability of groups via Sylows theorems.
- check irreducibility of polynomial over any field.
- be familiar with theory of modules.

IV) Syllabus:

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

Unit II: Group action on a set, isometry subgroups, Burnside theorem, Direct product and semidirect product of groups , Syllow's theorems, p-subgroups, Group of order 2p and pq, 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, completely reducible modules, free modules. **15 Lectures**

UNIT - V : Examples, Problems, assignments, seminars etc. based on units I to IV. **15 Lectures**

V) Recommended Reading :

1. Fraleigh, J.B., A First course in Abstract Algebra, (3rd edition) Narosa publishing house, New Delhi.
2. Gallian J.A., Abstract Algebra, Narosa Publications, 4th Edition, 1999.
3. Herstein I.N., Topics in Algebra, Vikas Publishing house.

Course Code: - CP-1171A Credit – 05

I) Title of course: - Advanced Calculus

II) A brief note: Theorems and proofs are expected to be prepared from recommended books.

III) Specific Objectives: To introduce and provide detail theory related to function of bounded variation, sequences and series of functions, Multivariable differentiable calculus, Implicit functions.

The Course Outcomes: Upon successful completion of this course student will able to

- Make use of Greens Theorem, Stokes Theorems for an arc rectification of curve.
- Analyze convergence of sequences and series of functions.
- find the directional derivative of function of several variables.
- optimize function of several variables

IV) Syllabus

UNIT-I: Functions of Bounded Variation& Rectifiable Curves – Introduction, Properties of monotonic functions, functions of Bounded Variation(B.V.), Total Variation(T.V.), additive property of T.V., T.V. on [a, x] as function of x, function of B.V. expressed as the difference of increasing functions, continuous functions of B.V., curves & paths, Multiple integral Double integral (Theorem without proof) Application to Area and Volume, (Theorem without proof) ,Greens theorem in the Plane. Applications of Green's theorem's. Change of variables Special case for transformation formula, Surface Integral, Change of parametric representation. Other notations for Surface Integral, stokes theorem, Curl and divergence of the vector field, Gauss divergence theorem. **15 Lectures**

UNIT-II: Sequences and series of functions - Pointwise convergence of sequences of functions, uniform convergence, 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. Multiplication of series, Power series, multiplication of power series, substitution theorem, reciprocal of power series, The Taylor series generated by function, Binomial series.

15 Lectures

UNIT-III: 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) **15 Lectures**

UNIT – IV: Implicit Functions - 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 - V : Examples, Problems, assignments, seminars etc. based on units I to IV. **15 lectures**

V) Recommended Reading :

Recommended books :

1. Apostal T.M., Mathematical Analysis, Second Edition, Narosa Publishing House.
2. Apostol T. M., Advanced Calculus Vol II .
3. Mapa S.K., Introduction to Real Analysis, 6^{th} edition.
4. Rudin W., Principles of mathematical Analysis, 3^{rd} Edition, McGraw Hill book company

Reference Books:

1. Malik S.C., Arora S., Mathematical Analysis, New Age International Publishers.
2. Goldberg R., Methods of Real Analysis, Blaisdell

Course Code: - CP-1172A Credit – 05

I) Title of course: - Complex Analysis

II) A brief note: -Theorems and proofs are expected to be prepared from recommended books

III) Specific Objectives: To introduce in detail theory of Complex valued functions along with their derivatives ,integrals .

The Course Outcomes: Upon successful completion of this course student will able to

- know how to check given complex valued function is analytic or not.
- find power series expansion of an analytic function with radius of convergence.
- find zeros and singularities of complex valued functions.
- evaluate integral of complex valued functions along given curve.

IV) Syllabus

UNIT-I: Power series, radius of convergence, analytic functions, zeros of an analytic function, Cauchy-Riemann equations, Harmonic functions, Mobius transformations, line integral.

15 Lectures

UNIT - II : Power series representation of analytical function, zeros of an analytic function, Liouville's theorem, Fundamental theorem of algebra, Maximum modulus theorem, the index of closed curve, Cauchy's theorem and integral formula, Morera's theorem. **15 Lectures**

UNIT - III : Counting zero's, The open mapping theorem, Goursat's Theorem, Classification of singularities, Laurent series development, Casorati-weierstrass theorem, residues, residues theorem ,evaluation of real integrals. **15 Lectures**

UNIT - IV : The argument principle , Rouche's theorem, the maximum principle, Schwarz's lemma and its applications to characterize conformal maps. **15 Lectures**

UNIT-V: Examples, Problems, assignments, seminars etc. based on units I to IV **15 lectures**

V) Recommended Reading :

Recommended Book :

1. Conway J.B., Functions of one complex variable. (Narosa Publishing house)

Reference Books :-

1. Ahlfors L.V. : Complex Analysis (Mc Graw Hill).
2. Churchill R.V., Brown J.W.: Complex Variables and Applications (McGraw Hill).
3. Ponnusamy S., Herb Silverman, Complex variables with applications analysis,Birkhauser,2006
4. Ponnusamy S., Foundations of complex analysis, Narosa publishing House.

Course Code: - CP-1173A Credit - 05

I) Title of course: - Ordinary Differential Equations

II) A brief note: - Theorems and proofs are expected to be prepared from recommended books.

III) Specific Objectives: To introduce in detail theory of ordinary differential equations.

The Course Outcomes: Upon successful completion of this course student will able to

- find the linearly independent and hence general solutions of given differential equations
- find series solution of Bessel's and Legendre's differential equations.
- apply Picard's successive approximation method to find approximate solution of initial value problem

IV) Syllabus

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 nth order equations, The non-homogeneous equation of nth 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:- 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. Existence and Uniqueness of solutions to systems, Existence and Uniqueness for linear systems, Equ. of order n. **15 Lectures**

UNIT V: Examples, Seminars, Group Discussion on above units,Oral examinations. **15 Lectures**

V) Recommended Reading :

a) Basic Reading:-

1) Coddington E. A.: An introduction to ordinary differential equations. (1974) Prentice Hall of India Pvt.Ltd. New Delhi.
2) Birkoff G. and Rota G.G.: Ordinary Differential equations, John Willey and Sons

b) Additional Reading:-

1. Simmons G.F. , Differential Equations with Applications and Historical note, McGraw Hill, Inc. New York. (1972)

c) References Books:-

1. Coddington E.A. and Levinson: Theory of ordinary differential equations McGraw Hill, New York(1955)
2. Rainvills E.D.,Elementary differential equations,The Macmillan comp., New York. (1964)

Course Code: - CP-1174A Credit – 05

I) Title of course: - Classical Mechanics

II) A brief note: - Theorems and proofs are expected to be prepared from recommended books.

III) Specific Objectives: To study the mathematical artifact and learn sometime about the art of applying mathematical knowledge to solve the problems arises in the real world.

The Course Outcomes: Upon successful completion of this course student will able to

- analyze motion of system of particles through Lagrangian & Hamiltonian principles
- apply principle of variation of calculus for extrimization of problem.
- study motion of rigid body

IV) Syllabus

UNIT – I: Mechanics of a particle, Mechanics of a system of particles, conservation theorems, constraints, Generalised coordinates, D' Alembert's Principle, Lagrange's equations of motion, simple applications of Lagrangian formulation, 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. **15 Lectures**

UNIT – II: Functional, 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. Hamilton's Principle, Derivation of Hamilton's principle from D'Alembert's principle, Lagrange's equations of motion from Hamilton's principle. Lagrange's equations of motion for non conservative 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, cyclic co-ordinates and Routh's procedure. Orthogonal transformations, Properties of transformation matrix, infinitesimal 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**

UNIT V: Examples, Seminars, Group Discussion on above units, Oral examinations**15 Lectures**

V) Recommended Books :

1) Goldstein, H. Classical Mechanics. (1980), Narosa Publishing House, 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.

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.
3) Bhatia, V. B. Classical Mechanics with Introduction to Non-linear Oscillation and Chaos.(1997), Narosa publishing House.
4) Gupta, A. S. Calculus of Variations with Applications (1997), Prentice Hall of India.
5) Katkar L.N.,Problems in Classical Mechanics

Semester- II

Course Code: - CP-1175B Credit – 05

I) Title of course: - Linear Algebra

II) A brief note: - Theorems and proofs are expected to be prepared from recommended books.

III) Specific Objectives: To introduce different concepts related to field of Linear algebra**.**

The Course Outcomes: After studying this course, students will have a demonstrable knowledge of Vector space, Linear Transformations, Canonical Forms and Bilinear Transformations.

IV) Syllabus:

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**

UNIT V: Examples, Seminars, Group Discussion on above units,Oral examinations. **15 Lectures**

V) Recommended Reading:

a) Basic Reading:-

1) Hoffman, Kenneth and Kunze R: Linear Algebra, Prentice Hill of India Private Limited, 1984.
2) Herstein I. N. : Topics in Algebra, 2nd Edition, Willey eastern Limited

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

c) Reference Books:

1. Rao A. R. and Bhimashankaran P., Linear Algebra, Hidustan Book Agency (200)
2. Singh Surjit, Linear Algebra, Vikas publishing House (1997)

Course Code: - CP-1176B (New) Credit – 05

I) Title of course: - Integral Equations

II) A brief note: - Theorems and proofs are expected to be prepared from recommended books.

III) Specific Objectives: To study theory of integral equations.

The Course Outcomes: Upon successful completion of this course student will able to

- solve linear Fredholm and Volterra Integral equations.
- compare properties of Differential and Integral equations.
- To solve Initial and Boundary value problems by converting to equivalent integral equations

IV) Syllabus

UNIT-I: Classification of linear integral equations, Conversion of initial value problem to Volterra integral equation, Conversion of boundary value problem to Fredholm integral equation, Separable kernel, Fredholm integral equation with separable kernel, Fredholm alternative. Homogeneous Fredholm equations and eigen functions. **15 Lectures**

UNIT- II: Solutions of Fredholm integral equations by: Successive approximations Method, Successive substitution Method, Adomian decomposition method, Modified decomposition method, Resolvent kernel of Fredholm equations and its properties, Solutions of Volterra integral equations: Successive approximations method, Neumann series, Successive substitution Method **15 Lectures**

UNIT–III: Solution of Volterra integral equations by Adomian decomposition method, and the modified decomposition method, Resolvent kernel of Volterra equations and its properties, Convolution type kernels, Applications of Laplace and Fourier transforms to solutions of Volterra integral equations, Symmetric Kernels: Fundamental properties of eigenvalues and eigenfunctions for symmetric kernels, expansion in eigenfunctions & bilinear form. **15 Lectures**

UNIT – IV: Hilbert Schmidt Theorem and its consequences, Solution of symmetric integral equations, Operator method in the theory of integral equations, Solution of Volterra and Fredholm integrodifferential equations by Adomian decomposition method, Green's function: Definition, Construction of Green's function & its use in solving boundary value problem**15 Lec**

UNIT V: Examples,Seminars, Group Discussion on above units, Oral examinations.**15 Lectures**

V) Recommended Reading:

Recommended Book(s):

1. Kanwal R.P., Linear Integral Equation- Theory and Technique, Academic Press, 1971.
2. Wazwaz A.M., Linear and Nonlinear Integral Equations-Methods and Applications, Springer, 2011.

Reference Books:

1. Chambers L.G., Integral Equations-A Short Course, International Text Book Comp., 1976.
2. Krasnov M.A., et.al. Problems and exercises in Integral equations, Mir Publishers, 1971.
3. Cochran J.A., The Analysis of Linear Integral Equations, Mc Graw Hill Publications,1972.
4. Green C.D., Integral Equation Methods, Thomas Nelson and sons, 1969.

Course Code: - CP-1177B Credit – 05

I) Title of course: - General Topology

II) A brief note: -Theorems and proofs are expected to be prepared from recommended books

III) Specific Objectives: Introduce different types and concepts related of different topologies on a set and study their properties**.**

The Course Outcomes: Upon successful completion of this course student will able to

- find different topologies on a given set and study their properties.
- check continuity of functions through different topological approaches.

IV) Syllabus:

UNIT- I: 15 Lectures

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

UNIT- II: 15 Lectures

Connected Spaces, Components, Connected subspaces of real lines, Compact Spaces,One point compactification, Continuous Functions, Homeomorphisms, Topological properties.

UNIT- III: 15 Lectures

Separation axioms: T_0, T_1, T_2-spaces, First and second axioms spaces, Separable Spaces, Lindelof spaces, Regular and T_3 -Spaces, Normal and T_4-Spaces.

UNIT- IV: 15 Lectures

Completely Regular and $T_{3\,1/2}$-Spaces , Completely Normal and T_5 -Spaces , Product Spaces (For T_0, T_1, T_2, -compact, and connected spaces), Urysohn lemma and Urysohn metrization theorem.

Unit – V: 15 Lectures

Examples, Problems, assignments, seminars etc. based on units I to IV above.

V) Recommended Reading:

Recommended Book(s):

1. Pervin W. J., Foundations of General Topology, Academic Press, New York, 3rd edition, 1970.

Reference Books:

1) Munkers J. R., Topology: A First Course, Prentice Hall of India Pvt. Ltd.
2) Simmons G. F., Introduction to Topology and Modern Analysis, Mc Graw Hill Book Company, New Delhi, 1963.
3) Joshi K. D., General Topology.
4) Willard, Topology, Academic press.

Course Code: - CP-1178B Credit - 05

I) Title of course: - Partial Differential Equations

II) A brief note: - Theorems and proofs are expected to be prepared from recommended books.

III) Specific Objectives: To introduce in detail first and second order partial differential equations along with their classification and various method of solutions.

The Course Outcomes: Upon successful completion of this course student will able to

- classify given second order partial differential equations .
- use different method to solve boundary value problem specially use wave equations, Heat equations

IV) Syllabus

Unit I: Curves and surfaces, First order Partial Differential Equations, , classification of first order partial differential equations, classifications of Integrals, Linear equations of first order. Pfaffian differential equations, Criteria of Integrability of a Pfaffian differential equation. Compatible systems of first order partial differential equations. **15 Lectures**

UNIT- II: Charpits method, Jacobi method of solving partial differential equations, Cauchy Problem, Integral surfaces through a given curve for a linear partial differential equations, for a non-linear partial differential equations, Method of characteristics to find the integral surface of a quasi linear partial differential equations. **15 Lectures**

UNIT- III: Second order Partial Differential Equations. Origin of Partial differential equation, wave equations, Heat equation. Classification of second order partial differential equation. Vibration of an infinite string (both ends are not fixed) Physical Meaning of the solution of the wave equation. Vibration of an semi infinite string, Vibration of a string of finite length, Method of separation of variables, Uniqueness of solution of wave equation. Heat conduction Problems with finite rod and infinite rod, Cauchy problems. **15 Lectures**

UNIT-IV: Families to equipotential surfaces, Laplace equation, Solution of Laplace equation, Laplace equation in polar form, Laplace equation in spherical polar coordinates. Kelvin's inversion theorem. Boundary Value Problems: Dirichlets problems and Neumann problems. maximum and minimum principles, Stability theorem. **15 lectures**

UNIT -V : Examples, Problems, assignments, seminars etc. based on units I to IV above.

15 lectures

V) Recommended Reading:

Recommended Book(s):

1. Amarnath T.: An elementary course in Partial differential equations, Narosa publication, 1987.

Reference Books:

1. Sneddon I. N.,: Elements of Partial Differential Equations, McGraw Hill Int.
2. Frite John: Partial Differential Equations

Course Code: - CP-1179B Credit - 05

I) Title of course: - Numerical Analysis

II) A brief note: - Theorems and proofs are expected to be prepared from recommended books.

III) Specific Objectives: To analyze methods used to solve the mathematical problem numerically.

The Course Outcomes: Upon successful completion of this course student will able to

- solve linear and nonlinear equations by various numerical methods.
- find numerical integration along with error computation .
- solve initial value problem by different numerical methods.

IV) Syllabus

UNIT I: Rate of convergence of Secant Method, Regula -Falsi Method and Newton-Raphson Method. Bairstow method, Matrix factorization methods (Doo little reduction, Crout reduction) Eigen Values and eigenvectors, Gerschgorin theorem, Breuer theorem, Jacobi Method for symmetric matrices. **15 Lectures**

UNIT- II: Numerical Integration: Error estimates of trapezoidal and Simpson's Numerical Integration rule. Gauss- Legendre integration Methods (n= 1, 2), Lobatto Integration Method (n=2), Radau Integration method (n=2) and their error estimates **15 Lectures**

UNIT- III: Runge – Kutta Method: second order methods, the coefficient tableau, third order methods (without proof), order conditions, Fourth order methods (without proof), Implicit Runge- kutta methods, Stability characteristics, Taylor Series Methods: Introduction to Taylor series methods, Manipulation of Power Series, an example of a Taylor series solution.

15 Lectures

UNIT- IV: Linear multistep methods: Adams Methods, General form of linear multistep methods, Predictor- corrector Adams methods, Starting Methods , Analysis of linear multistep methods: Convergence, consistency, sufficient condition for convergence, Stability characteristics. **15 Lectures**

UNIT- IV: Examples, Seminars**,** Group Discussion, Oral examinations **15 Lectures**

V) Recommended Reading:

Recommended Books:

1. Jain M. K.,. Iyengar S. R. K, Jain R. K., 'Numerical methods for scientific and Engineering Computation', New Age International Limited Publishers 1993.(For Unit 1 and Unit 2).
2. Butcher J.C., Numerical Methods for Ordinary Differential equations, John Wiley and sons Ltd., 2nd Edition. .(For Unit 3 and Unit 4).

Additional Reading :-

1. Henrici P., Discrete Variable Methods in Ordinary Differential Equations, John Wiley and sons Ltd.
2. Sastry S. S., 'Introductory methods of Numerical Analysis', Prentice Hall of India New Delhi.

Nature of Question Paper

***Instructions*:** *1) Questions **No. 1** is **compulsory**.*

*2) Attempt any **four** questions from que. no. 2 to que. no. 7.*

3) All questions carry equal marks.

4) Figures to right indicates full marks.

5) Use of log table/calculator is allowed.

Time: 3 hours **Total Marks: 90**

Q. 1. A) Choose correct alternative. (2 Marks each) **08**

i)

A) B) C) D)

ii)

A) B) C) D)

iii)

A) B) C) D)

iv)

A) B) C) D)

B) Fill in the blanks. (2 Marks each) **10**

Q.2. A) **18**

B)

C)

OR

A) **18**

B)

Q.3. A) **18**

B)

C)

OR

A) **18**

B)

Q.4 A) **18**

B)

C)

OR

A) **18**

B)

Q.5. A) **18**

B)

C)

OR

A) **18**

B)

Q.6. A) **18**

B)

C)

OR

A) **18**

B)

Q.7. A) **18**

B)

C)

OR

A) **18**

B)

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REMARK:

Note that the distribution of marks for A, B, C or A, B (Q.N.2 to Q.N.-7) may vary according to the nature of question.

SCHEME OF MARKING (THEROY)

Sem.	CP	Marks	Evaluation	Answer Books	Standard of passing
I	CP1170A TO CP1174A	90	Semester wise	As per Instruction	35% (36 marks)
II	CP1175B TO CP1179B	90	Semester wise	As per Instruction	35% (36 marks)

SCHEME OF MARKING (CIE) Continuous Internal Evaluation

Sem.	CP	Marks	Evaluation	Sections	Answer Books	Standard of passing
I	CP 1170 A TO CP 1174 A	30	Concurrent	-	As per Instruction	35% (12 marks)
II	CP1175 A TO CP1179 A	30	Concurrent	-	As per Instruction	35% (12 marks)

*A separate passing is mandatory

M.Sc – I Mathematics C B C S PATTERN (2018-19)

S E M E S T E R – I (Duration – 6 Months)																		
Sr. No	Course Title	**Teaching Scheme**						**Examination scheme**										
								Theory								Practical		
		Theory			Practical			Theory			Internal			Total		Total		
		No.of lectures	Hours	Credits	No. of Lectures	Hours	Credits	Max.	Min.	Hours	Max.	Min.	Hours	Max.	Min.	Max.	Min.	Hours.
1	CP-1170A	5	5	5	-	-	-	90	36	3	30	12	1	120	48	**N0 PRACTICAL EXAMINATION**		
2	CP-1171A	5	5	5	-	-	-	90	36	3	30	12	1	120	48			
3	CP-1172A	5	5	5	-	-	-	90	36	3	30	12	1	120	48			
4	CP-1173A	5	5	5	-	-	-	90	36	3	30	12	1	120	48			
5	CP-1174A	5	5	5	-	-	-	90	36	3	30	12	1	120	48			
	Total	25	25	**25**	-	-	-	450	-	-	150	-		600	-			
	Semester-II(duration 6 months)																	
6	CP-1175B	5	5	5	-	-	-	90	36	3	30	12	1	120	48	**N0 PRACTICAL EXAMINATION**		
7	CP-1176B	5	5	5	-	-	-	90	36	3	30	12	1	120	48			
8	CP-1177B	5	5	5	-	-	-	90	36	3	30	12	1	120	48			
9	CP-1178B	5	5	5	-	-	-	90	36	3	30	12	1	120	48			
10	CP-1179B	5	5	5	-	-	-	90	36	3	30	12	1	120	48			
				25	-	-	-	450	-	-	150	-		600	-			
	Total	5	5	**50**	-	-	-	900			300			1200	48			

- Student contact hours per week : 25 Hours (Min.)
- Total Marks for M.Sc.-I : **1200**
- Theory Lectures : 60 Minutes Each
- Total Credits for M.Sc.-I (Semester I & II) : **50**
- CP-Core Paper
- Course list as per enclosed Annexure. ***Separate passing is mandatory for Theory, Internal.***
- No Practical Examination