Silda Chandrasekhar College

Teaching Plan for the Academic Session 2023-24

Department: **Mathematics**

Name of the teacher: Dr. Nirmal Kumar Mandal.

Stream: BSc (Hons)

Teaching plan for 1st semester students				
Commencement of class: 1st September '24 **Closing of class: 4th February '24**				
Syllabus allotted			**Paper – MJ1T: Unit – 1, 2, 3**	
Month	**Expected number of classes**	**Paper /Unit**	**Number of Lectures**	**Topics to be covered**
September	18	MJ1T Unit – 1	2	Hyperbolic Function
			2	Higher order derivatives
			3	Leibnitz rule and its applications
			3	Concavity and Convexity & Point of inflexion.
			2	Curvature
			3	Envelopes
			3	Asymptotes
October	14	Unit 1	3	Curve Tracing
		Unit 2	3	Reduction Formula
			2	Length of a curve
			2	Area under a curve
			2	Area of surface of revolution
			2	Volume of surface of revolution
November	9	Unit 3	2	Reflection properties of conic
			3	Rotation of axes and second degree equations
			4	Classification of conics
December	20	Unit 3	6	Polar equation of conics
			3	Spheres
			4	Cylindrical surfaces
			4	Central conicoids
			3	Paraboloids
January	21	Unit 3	6	Plane sections of conicoids
			6	Generating lines
			6	Classification of quadrics
			3	Ellipsoid
February	2		2	Revision

Teaching plan for 3rd semester students				
Commencement of class: 13th October '23 Closing of class: 28th January '24				
Syllabus allotted			**Paper –** C6T: Group Theory – I **Paper –** C7T: Numerical Methods CP7: -Lab	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
October 23	3	C6T Unit 1	3	Symmetries of a square, dihedral groups, permutation groups and quaternion groups
November 23	9	Unit 2	4	Subgroups, centralizer, normalizer, center of a group, product of two subgroups.
			5	Cyclic groups
December 23	18	Unit 3	4	Cosets, Lagrange's theorem, Fermat's Little theorem.
		Unit 4	5	Direct product of a finite number of groups, normal subgroups, factor groups, Cauchy's theorem for finite abelian groups.
		Unit 5	9	Group homomorphisms and isomorphisms
January 24	20	C7T Unit 1	1	Algorithms. Convergence. Errors: relative, absolute. Round off. Truncation
		Unit 2	4	Transcendental and polynomial equations: Bisection method, Newton's method, secant method, Regula-falsi method, fixed point iteration, Newton-Raphson method. Rate of convergence of these methods.
		Unit 3	3	System of linear algebraic equations: Gaussian elimination and Gauss Jordan methods. Gauss Jacobi method, Gauss Seidel method and their convergence analysis. LU decomposition
		Unit 4	3	Interpolation: Lagrange and Newton's methods. Error bounds. Numerical differentiation: Methods based on interpolations, methods based on finitedifferences.
		Unit 5	3	Numerical Integration: The algebraic eigen value problem: Power method. Approximation: Least square polynomial approximation.
		Unit 6	2	Ordinary differential equations:
			4	Numerical Practical class

Teaching plan for 5th semester students				
Commencement of class: 18th September '23 Closing of class: 7th January '24				
Syllabus allotted			**Paper-**C12T: Group Theory II **DSE-2:** Probability & Statistics	
Month	**Expected number of**	**Paper**	**Number of**	**Topics to be covered**

	classes		**Lectures**	
September	10	C12T **Unit 1**	2	Automorphism, automorphism groups, Characteristic subgroups, Commutator subgroup.
		Unit 2	3	External direct products, internal direct products, Fundamental theorem of finite abelian groups.
		Unit 3	3	Group actions, stabilizers and kernels, Generalized Cayley's theorem. Index theorem.
		Unit 4	2	Groups acting on themselves by conjugation, class equation and consequences, conjugacy in S_n, p-groups,
October	4	**Unit 4**	4	Sylow's theorems and consequences, Cauchy's theorem, Simplicity of A_n for $n \geq 5$, non-simplicity tests.
November 23	10	**DSE2T Unit 1** Probability and Statistics	4	Sample space, probability axioms, real random variables, probability mass/density functions, mathematical expectation, moments, moment generating function, characteristic function, distribution function.
		Unit 2	6	Joint probability density functions, marginal and conditional distributions, expectation of function of two random variables, conditional expectations, independent random variables, bivariate normal distribution, correlation coefficient, joint moment generating function and calculation of covariance, linear regression for two variables.
December 23	22	**Unit 3**	10	Chebyshev's inequality, statement and interpretation of (weak) law of large numbers and strong law of large numbers. Central limit theorem for independent and identically distributed random variables with finite variance, Markov chains, Chapman-Kolmogorov equations, classification of states.
		Unit 4	12	Random Samples, Sampling Distributions, Estimation of parameters, Testing of hypothesis.
January 24	5			Revision

Teaching plan for 2nd semester students				
Commence of class: 11th March '24				
Syllabus allotted			**Paper – MJ 2T: Unit 1, 2**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
March	14	MJ2 T	8	Complex numbers
			6	Theory of equations
April	18		5	Theory of equations
			5	Inequalities
			5	Relation
			3	Mappings
April	18			
May	25			Integers
June	22			Division algorithm
				Congruence relation

Teaching plan for 4th semester students				
Commence of class: 1st March '24				
Syllabus allotted			**Paper -** C9T: Multivariate Calculus C10T: Ring Theory & Linear Algebra	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
March	**25**	**C9T Unit 1**	**7**	Functions of several variables, limit and continuity of functions of two or more variables Partial differentiation, total differentiability and differentiability, sufficient condition for differentiability. Chain rule for one and two independent parameters, directional derivatives, the gradient, maximal and normal property of the gradient, tangent planes, Extrema of functions of two variables, method of Lagrange multipliers, constrained optimization problems
		Unit 2	**7**	Double integration over rectangular region, double integration over non-rectangular region, Double integrals in polar co-ordinates, Triple integrals, triple integral over aparallelepiped and solid regions. Volume by triple integrals, cylindrical and spherical co- ordinates.Change of variables in double integrals and triple integrals.
		Unit 3	**7**	Definition of vector field, divergence and curl. Line integrals, applications of line integrals: mass and work. Fundamental theorem for lineintegrals, conservative vector fields, independence of path.
		Unit 4	**4**	Green's theorem, surface integrals, integrals over parametrically defined surfaces.
April	**18**	**Unit 4**	**4**	Stoke's theorem, The Divergence theorem.

		C10T: Unit 1	**6**	Definition and examples of rings, properties of rings, subrings, integral domains and fields, characteristic of a ring. Ideal, ideal generated by a subset of a ring, factor rings, operations on ideals, prime and maximal ideals.
		Unit 2	**6**	Ring homomorphisms, properties of ring homomorphisms. Isomorphism theorems I, II and III, field of quotients.
		Unit 3	**6**	Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.
May	**25**	**Unit 4**	**25**	Linear transformations, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations. Isomorphisms. Isomorphism theorems, invertibility and isomorphisms, change of coordinate matrix.
June	**22**	**C9T**	**11**	**Revision**
		C10T	**11**	**Revision**

Teaching plan for 6th semester students				
Commencement of class: 1st February '24 **Closing day of class: 18th June '24**				
Syllabus allotted			**Paper -** C14T: Ring Theory & Linear Algebra II **DSE-3:** Number Theory **DSE-4:** Mathematics Modeling	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
February 24	**23**	**C14T Unit 1**	**7**	Polynomial rings over commutative rings, division algorithm and consequences, principal ideal domains, factorization of polynomials, reducibility tests, irreducibility tests, Eisenstein criterion, and unique factorization in Z [x]. Divisibility in integral domains, irreducible, primes, unique factorization domains, Euclidean domains.
		Unit 2	**6**	Dual spaces, dual basis, double dual, transpose of a linear transformation and its matrix in the dual basis, annihilators. Eigen spaces of a linear operator, diagonalizability, invariant subspaces and Cayley-Hamilton theorem, the minimal polynomial for a linear operator, canonical forms.

		Unit 3	**6**	Inner product spaces and norms, Gram-Schmidt orthogonalisation process, orthogonal complements, Bessel's inequality, the adjoint of a linear operator. Least squares approximation, minimal solutions to systems of linear equations. Normal and self-adjoint operators. Orthogonal projections and Spectral theorem.
March	**19**	**DSE3T Unit 1**	**19**	Linear diophantine equation, prime counting function, statement of prime number theorem, Goldbach conjecture, linearcongruences, complete set of residues. Chinese remainder theorem, Fermat's little theorem, Wilson's theorem.
April	**18**	**Unit 2**	**18**	Number theoretic functions, sum and number of divisors, totally multiplicative functions, definition and properties of the Dirichlet product, the Mobius Inversion formula, the greatest integer function, Euler's phi-function, Euler's theorem, reduced set of residues, some properties of Euler's phi-function.
May	**24**	**Unit 3**	**24**	Order of an integer modulo n, primitive roots for primes, composite numbers having primitive roots, Euler's criterion, the Legendre symbol and its properties, quadratic reciprocity, quadratic congruences with composite moduli. Public key encryption, RSAencryption and decryption, the equation x2 + y2= z2, Fermat's Last theorem.
June	**13**	**DSE4T Unit 1**	**6**	Power series solution of Bessel's equation and Legendre's equation, Laplace transform and inverse transform, application to initial value problem up to second order.
		Unit 2	**7**	Monte Carlo simulation modelling: simulating deterministic behavior (area under a curve, volume under a surface), generating random numbers: middle square method, linear congruence, queuing models: harbor system, morning rush hour, Overview of optimization modelling. Linear programming model: geometric

				solution algebraic solution, simplex method, sensitivity analysis

Name of the teacher: Dr. Sumanta Banerjee

Stream: B.Sc. (Hons)

Paper code: **– SEC 1: MATLAB-1, CC5, SEC1: Logic and Sets, CC 11.**

Teaching plan for 1st semester students				
Syllabus allotted: SEC 1: MATLAB-1 (Entire Paper)			**Paper –SEC 1: MATLAB-1**	
Month	**Expected number of classes**	**Paper**	**Number of Classes**	**Topics to be covered**
September	14	SEC 1	14	1. MATLAB interface, data types. 2. Variables, Flow control statements. 3. Arrays: creating, indexing, operations. 4. Finding the sum, product, max, min of a list of number in an array, in a sub-array without library function. 5. Matrix creating, indexing, operations. 6. Finding a sub-matrix of the given matrix.
October	10	SEC 1	10	1. Find the column sum, product, max, min of the given matrix without library function. 2. Find the row sum, product, max, min of the given matrix without library function. 3. Mathematical library functions, user-defined function: anonymous function.
November	08	SEC 1	08	1. Define any transcendental function and then find and show the table of its functional values. 2. Plotting of two-dimensional functions: Graph plotting, Graph

				formatting (title, axis, line styles, colors, etc.).
December	14	SEC 1	14	1. Plotting of graphs of various functions such as Exponential function, Trigonometric function, Logarithmic function, Algebraic function. 2. Plotting the graphs of polynomial of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.
January	16	SEC 1	16	1. Graph plotting: multiple plots, polar plots. 2. Sketching parametric curves (such as trochoid, cycloid, epicycloids, hypocycloid). 3. Tracing of conics in cartesian coordinates/ polar coordinates. 4. 3D plotting (line, surface, mesh, and contour) of three-dimensional functions.
February	06	SEC 1	06	1. Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone, elliptic, paraboloid, and hyperbolic paraboloid using cartesian coordinates.

Teaching plan for 3rd semester students				
Syllabus allotted: CC5 (Units 1,2, and 4) **SEC1 (Entire Paper)**			**Papers–CC5, SEC1: Logic and Sets**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
October	04	CC 5	02	1. Limits of functions, sequential criterion for limits, divergence criteria.
		SEC 1	02	1. propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions.

November	10	CC 5	07	1. Limit theorems, one sided limits. Infinite limits and limits at infinity. 2. Continuous functions, sequential criterion for continuity and discontinuity. Algebra of continuous functions. 3. Intermediate value theorem, location of roots theorem, preservation of intervals theorem.
		SEC 1	03	1. Converse, contra positive and inverse propositions an 2. Precedence of logical operators.
December	17	CC 5	12	1. Uniform continuity, non-uniform continuity criteria, uniform continuity theorem. 2. Differentiability of a function at a point and in an interval. 3. Algebra of differentiable functions. Relative extrema. 4. Rolle's theorem. Mean value theorem, Darboux's theorem. Applications of mean value theorem.
		SEC 1	05	1. Propositional equivalence: Logical equivalences. Predicates and quantifiers. 2. Sets, subsets, set operations and the laws of set theory and Venn diagrams. Examples of finite and infinite sets. 3. Finite sets and counting principle. Empty set, properties of empty set. Standard set operations. 4. Classes of sets. Power set of a set.
January	18	CC 5	13	1. Metric spaces: Definition and examples. 2. Open and closed balls, neighbourhood,open set, interior of a set. 3. Limit point of a set, closed set, diameter of a set, subspaces. 4. Dense sets, separable spaces.
		SEC 1	05	1. Difference and Symmetric difference of two sets. 2. Generalized union and intersections. 3. Relation,composition of relations,

				types of relations,partitions, Equivalence Relations, Partial ordering relations.

Teaching plan for 5th semester students				
Syllabus allotted: CC 11 (Entire Paper)			**Paper –CC 11**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
September	07	CC 11	07	1. Partial differential equations – Basic concepts and definitions. 2. First- order equations: classification. 3. Method of characteristics for obtaining general solution of quasi linear equations.
October	09	CC 11	09	1. Canonical forms of first-order linear equations. 2. Method of separation of variables for solving first order partial differential equations. 3. Classification of second order linear equations as hyperbolic, parabolic, or elliptic. 4. Reduction of second order linear equations to canonical forms.
November	09	CC 11	09	1. Heat equation, wave equation and Laplace equation. 2. The Cauchy problem, Cauchy problem of an infinite string. Initial boundary value problems. Semi-infinite string with a fixed end, semi-infinite string with a free end. 3. Method of separation of variables, solving the vibrating string problem.
December	16	CC 11	16	1. Solving the heat conduction problem. 2. Central force. 3. Constrained motion, varying mass, tangent and normal components of acceleration.
January	06	CC 11	06	1. Planetary motion, Kepler's second law.

Paper code: **– SEC 2: MATLAB-2, CC 8, SEC2: Graph Theory, CC 13.**

Teaching plan for 2nd semester students				
Syllabus allotted: SEC 2: MATLAB-2 (Entire Paper)			**Paper –SEC 2: MATLAB-2**	
Month	**Expected number of classes**	**Paper**	**Number of Classes**	**Topics to be covered**
March	10	SEC 2	10	7. Introduction to M-file: scripts and function. 8. Flow control statements. 9. Standard arrays library functions. 10. Standard matrix library functions. 11. Find the sum, product, max, min, sort of a list of number in an array, in a sub-array using library function.
April	17	SEC 2	17	4. Find the column sum, product, max, min of the given matrix using library function. 5. Find the row sum, product, max, min of the given matrix using library function. 6. User-defined function: primary function, sub-function, function of functions, library functions. 7. Importing and Exporting data, read spread sheet data, write spread sheet data, MAT-file. 8. Fitting a curve for given data. 9. Plotting of given data: Graph plotting, multiple plots, matrix plots, polar plots, 3D plotting (line, surface, mesh, and contour) of three-dimensional data.
May	20	SEC 2	20	3. Obtaining surface of revolution of curves. 4. Conversion of one number system to another number system among decimal, binary, octal, hexadecimal. 5. Solution of a square, under

				determined and over determined system of linear equation. 6. Different problems for root, eigenvalues and eigenvectors of the matrix. 7. Plotting of recursive sequences.
June	19	SEC 2	19	3. Study the convergence of sequences through plotting. 4. Verify Bolzano-Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot. 5. Studytheconvergence/divergence of infinite series by plotting their sequences of partial sum. 6. Cauchy's root test by plotting nth roots. 7. Ratio test by plotting the ratio of nth and (n+1)-th term.

Teaching plan for 4th semester students				
Syllabus allotted: CC 8 (Units 1,2, 3, and 5) **SEC2 (Entire Paper)**			**Papers–CC 8, SEC 2: Graph Theory**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
March	16	CC 8	11	2. Riemann integration: inequalities of upper and lower sums, Darbaux integration, Darbaux theorem. 3. Riemann conditions of integrability, Riemann sum and definition of Riemann integral through Riemann sums, equivalence of two definitions. 4. Riemann integrability of monotone and continuous functions. 5. Properties of the Riemann integral; definition and integrability of

				piecewise continuous and monotone functions.
		SEC 2	05	2. Definition, examples and basic properties of graphs. 3. Pseudo graphs, complete graphs, bipartite graphs.
April	18	CC 8	12	4. Intermediate Value theorem for Integrals; Fundamental theorem of Integral Calculus. 5. Improper integrals. Convergence of Beta and Gamma functions. 6. Pointwise and uniform convergence of sequence of functions.
		SEC 2	06	3. Isomorphism of graphs. 4. Eulerian circuits, Eulerian graph, semi-Eulerian graph, theorems. 5. Hamiltonian cycles,theorems.
May	21	CC 8	14	5. Theorems on continuity, derivability and integrability of the limit function of a sequence of functions. 6. Series of functions. 7. Theorems on the continuity and derivability of the sum function of a series of functions. 8. Cauchy criterion for uniform convergence.
		SEC 2	07	5. Representation of a graph by matrix, the adjacency matrix, incidence matrix. 6. Weighted graph. 7. Tree and their properties, spanning tree.
June	20	CC 8	14	5. Weierstrass M-Test. 6. Power series, radius of convergence. 7. Cauchy Hadamard theorem. 8. Differentiation and integration of power series; Abel's theorem. 9. Weierstrass approximation theorem.
		SEC 2	06	4. Travelling salesman's problem, shortest path. 5. Dijkstra's algorithm. 6. Warshall algorithm.

Teaching plan for 6th semester students				
Syllabus allotted: CC 13 (Entire Paper)			**Paper –CC 13**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
February	12	CC 13	12	4. Metric spaces: sequences in metric spaces, Cauchy sequences. Complete metric spaces. 5. Cantor's theorem. 6. Continuous mappings, sequential criterion and other characterizations of continuity. 7. Uniform continuity.
March	18	CC 13	18	5. Connectedness, connected subsets of R. 6. Compactness: Sequential compactness, Heine-Borel property. 7. Totally bounded spaces, finite intersection property, and continuous functions on compact sets. 8. Homeomorphism,contraction mappings. 9. Banach fixed point theorem and its application to ordinary differential equation.
April	19	CC 13	19	4. Complex numbers, Limits, limits involving the point at infinity, continuity. 5. Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings. 6. Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability. 7. Analytic functions, examples of analytic functions
May	20	CC 13	20	4. Exponential function, logarithmic function, trigonometric function, 5. Derivatives of functions, and definite integrals of functions. 6. Contours, Contour integrals and its examples, upper bounds for moduli

				of contour integrals. 7. Cauchy- Goursat theorem, Cauchy integral formula. 8. Liouville's theorem and the fundamental theorem of algebra.
June	12	CC 13	12	2. Convergence of sequences and series, Taylor series and its examples. 3. Laurent series and its examples, 4. Absolute and uniform convergence of power series.

Name of the teacher:Atindra Narayan Sahu

Stream: B.Sc. (Hons)

Paper code: **– MJ-1, CC 5, DSE-1:Linear Programming.**

Teaching plan for 1st semester students				
Syllabus allotted: MJ-1 (UNIT-4)			**Paper –MJ-1**	
Month	**Expected number of classes**	**Paper**	**Number of Classes**	**Topics to be covered**
September	14	MJ-1	14	General, particular, explicit, implicit and singular solutions of a differential equation
October	10	MJ-1	10	First order but not first degree differential equation.
November	08	MJ-1	07	Exact differential equations and integrating factors.
December	14	MJ-1	16	Equations reducible to the form of exact differential equations.
January	16	MJ-1	18	Linear equation, Bernoulli equation.
February	06	MJ 1	03	Special integrating factors and transformations

Teaching plan for 3rd semester students				
Syllabus allotted: CC5 (Unit 3)			**Papers–CC5**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
October	04	CC 5	04	6. Cauchy's mean value theorem. 7. Taylor's theorem with Lagrange's form of remainder.
November	07	CC 5	07	7. Taylor's theorem with Cauchy's form of remainder. 8. Application of Taylor's theorem to convex functions.
December	16	CC 5	16	9. Relative extrema. 10. Taylor's series and Maclaurin's series expansions of exponential and trigonometric functions.
January	15	CC 5	15	10. Maclaurin's series expansions of different functions. 11. Application of Taylor's theorem to inequalities.

Teaching plan for 5th semester students				
Syllabus allotted: DSE-1 (Entire Paper)			**Paper –DSE-1Linear Programming**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
September	08	DSE-1	08	8. Introduction to linear programming problem. 9. Theory of simplex method, graphical solution, convex sets,optimality and unboundedness.
October	10	DSE-1	10	10. The simplex algorithm, simplex method in tableau format. 11. Introduction to artificial variables, two-phase method. Big-M method and their comparison.
November	12	DSE-1	12	8. Duality, formulation of the dual problem, primal-dual relationships, 9. Transportation problem and its

				mathematical formulation, northwest-corner method, least cost method and Vogel approximation method for determination of starting basic solution.
December	20	DSE-1	20	9. Algorithm for solving transportation problem, assignment problem and its mathematical formulation, Hungarian method for solving assignment problem. 10. Game theory: formulation of two person zero sum games, solving two person zero sum games, games with mixed strategies.
January	07	DSE-1	07	5. graphical solution procedure,linearprogramming solutionof games.

Paper code: **– MJ-2, CC 10, CC 14.**

Teaching plan for 2nd semester students				
Syllabus allotted: MJ-2 (UNITS 3 and 4)			**Paper –MJ-2**	
Month	**Expected number of classes**	**Paper**	**Number of Classes**	**Topics to be covered**
March	09	MJ-2	09	12. Systems of linear equations. 13. Row reduction and echelon forms, vector equations. 14. The matrix equation Ax=b.
April	14	MJ-2	14	10. Solution sets of linear systems, applications of linear systems, linear independence. 11. Definition of vector space, introduction to linear transformations, matrix of a linear transformation.
May	14	MJ-2	14	8. Inverse of a matrix, characterizations of invertible matrices. Subspaces of a vector space, dimension of subspaces. 9. Rank of a matrix.

June	15	MJ-2	15	8. Eigen values, eigen vectors and characteristic equation of a matrix. Cayley-Hamilton theorem and its use in finding the inverse of a matrix.

Teaching plan for 4th semester students				
Syllabus allotted: CC10 (Unit3)			**Papers–CC10**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
March	15	CC 10	15	8. Vector spaces, subspaces. 9. Algebra of subspaces.
April	14	CC 10	14	1. Quotient spaces. 2. Linear combination of vectors, linear span.
May	15	CC 10	15	11. Linear independence, basis and dimension.
June	16	CC 10	16	12. Dimension of subspaces.

Teaching plan for 6th semester students				
Syllabus allotted: CC 14 (Unit 2)			**Paper –CC 14**	
Month	**Expected number of classes**	**Paper**	**Number of Lectures**	**Topics to be covered**
February	10	CC 14	10	10. Dual spaces, dual basis, double dual.
March	15	CC 14	15	12. Transpose of a linear transformation and its matrix in the dual basis. 13. Annihilators.

April	14	CC 14	14	10. Eigen spaces of a linear operator, diagonalizability. 11. Invariant subspaces.
May	14	CC 14	14	11. Cayley-Hamilton theorem. 12. The minimal polynomial for a linear operator.
June	10	CC 14	10	6. Canonical forms.