Department of Mathematics

Teaching Plan

Name of the faculty: Samir Saha

Sem I Core Course II: ALGEBRA(Unit-2 and 3)

Month	Topics to be covered			
	1st week	2nd week	3rd week	4th week
July				
August	Relation,Equivalence relation	Equivalence classes and partition.Practice Problems	Partial order relation,poset.	Linear order relation.Mapping:injective and surjective.Practice Problems
September	One to one correspondence,invertible mapping.composition of mappings, relation between composition of mappings and various set theoretic operations.	Meaning and properties of $f^{-1}(B)$, for any mapping $f : X \to Y$ and $B \subseteq Y$. Practice Problems•	Well-ordering property of positive integers, Principles of Mathematical induction, division algorithm, divisibility and Euclidean algorithm.	Prime numbers and their properties, Euclid's theorem. Congruence relation between integers. Fundamental Theorem of Arithmetic.solving related problems.
October	Puja Vacation	Puja Vacation	Puja Vacation	Chinese remainder theorem. Arithmetic functions, some arithmetic functions such as φ, τ, σ and their properties.
November	Rank of a matrix, inverse of a matrix.Practice Related Problems	Characterizations of invertible matrices. Systems of linear equations,	Row reduction and echelon forms, vector equations, of Arithmetic. Chinese remainder theorem	The matrix equation $AX = B$, solution sets of linear systems, applications of linear systems.Practice Problems
December	Internal and Tutorial	University Exam	University Exam	University Exam

Sem II Core Course III: REAL ANALYSIS(Unit-2 and 3)

Month	Topics to be covered			
	1st week	2nd week	3rd week	4th week
January	CU Exam	Real sequence. Bounded sequence	Convergence and non-convergence. Examples	Practice Problems
February	Boundedness of convergent sequence. Uniqueness of limit..	Algebra of limits.Relation between the limit point of a set and the limit of a convergent sequence of distinct elements.	Monotone sequences and their convergence.Sandwich rule. Nested interval theorem.	Limit of some important sequences : n n 1 n o n , {x n}n , n x 1 n o n , {xn}n with xn+1 xn → l and |l| < 1, n1 + 1 n no n , n 1 + 1 1! + 1 2! + · · · + 1 n! o n , {a xn }n (a > 0). Cauchy's first and second limit theorems.
March	Cauchy's first and second limit theorems. Practice Related Problems	Subsequence. Subsequential limits, lim sup as the L.U.B. and lim inf as the G.L.B of a set containing all the subsequential limits	lim sup as the L.U.B. and lim inf as the G.L.B of a set containing all the subsequential limits and related problems.	Alternative definition of limsup and liminf of a sequence using inequality or as lim sup xn = inf n sup{xn, xn+1, . . . , } and lim inf xn = sup n inf{xn, xn+1, . . . , } h Equivalence between these definitions is assumed..
April	A bounded sequence {xn} is convergent if and only if lim sup xn = lim inf xn.	Every sequence has a monotone subsequence Bolzano-Weirstrass theorem for sequence. Cauchy's convergence criterion. Cauchy sequence. Unit-3	Infinite series, convergence and non-convergence of infinite series, Cauchy criterion	Tests for convergence : comparison test, limit comparison test,
May	Ratio test, Cauchy's n-th root test. Alternating series, Leibniz test.and solving related problems	Absolute and conditional convergence.and Doubt Clearing	Internal Test	Tutorial tests
June	University Exam	University Exam	University Exam	University Exam

Sem III : Core Course VII: MULTIVARIATE CALCULUS-I(Unit-2)

Month	Topics to be covered			
	1st week	2nd week	3rd week	4th week
July	Functions of several variables, limit	Continuity of functions of two or more variables, Partial derivatives,	Total derivative and differentiability .	Sufficient condition for differentiability.Practice Related Problems
August	Chain rule for one and two independent parameters,	Chain rule for one and two independent parameters,	Directional derivatives, the gradient	Practice Problems
September	Maximal and normal property of the gradient	Practice Problems	Tangent planes. Extrema of functions of two variables,	Practice Problems
October	Puja Vacation	Puja Vacation	Puja Vacation	Method of Lagrange multipliers,
November	Constrained optimization problems.	Practice Problems	Doubt Clearing	Internal Test
December	Tutorial	University Exam	University Exam	University Exam

Sem IV: Core Course VIII: SERIES OF FUNCTIONS (Unit-3)

Month	Topics to be covered			
	1st week	2nd week	3rd week	4th week

January	CU Exam	Sequence of functions defined on a set, Pointwise and uniform convergence	Practice Problems	Cauchy criterion of uniform convergence. Weirstrass' M-test. Boundedness,
February	Continuity, Practice Problems	Continuity and related Problems	Differentiability of the limit function of a sequence of functions in case of uniform convergence.	Related problem solving
March	Series of functions defined on a set, Pointwise and uniform convergence. Cauchy criterion of uniform convergence. and practice related problems solving.	Weierstrass' M-test. Passage to the limit term by term. Boundedness	Continuity, integrability,	Differentiability of a series of functions in case of uniform convergence. Practice Problems
April	Power series : Fundamental theorem of power series. Cauchy-Hadamard theorem and its application in problem solving.	Determination of radius of convergence. Uniform and absolute convergence of power series.	Properties of sum function. Differentiation and integration of power series.	Abel's limit theorems. Uniqueness of power series having sum function. Practice Related Problems
May	Fourier series : Trigonometric series. Statement of sufficient condition for a trigonometric series to be a Fourier series. Fourier coefficients for periodic functions defined on $[-\pi, \pi]$.	Statement of Dirichlet's condition of convergence. Statement of theorem of sum of Fourier series. Doubt Clearing and Practice Related Problems	Internal Test	Tutorial tests
June	Exam			

Sem V: Core Course X11: LINEAR ALGEBRA II

Month	Topics to be covered			
	1st week	2nd week	3rd week	4th week
July	Inner product spaces and norms, Gram-Schmidt orthonormalisation process,	Orthogonal complements, Bessel's inequality. Practice related problems	The adjoint of a linear operator and its basic properties.	Bilinear and quadratic forms, solving related

				problems.
August	Bilinear and quadratic forms, Diagonalisation of symmetric matrices	Second derivative test for critical point of a function of several variables,	Practice Problems	Hessian matrix, Sylvester's law of inertia
September	Dual spaces, dual basis, double dual,	Transpose of a linear transformation and its matrix in the dual basis, annihilators	Eigenspaces of a linear operator, diagonalizability,Practice Problems	Practice Problems
October	Puja Vacation	Puja Vacation	Puja Vacation	Invariant subspaces and Cayley-Hamilton theorem,
November	The minimal polynomial for a linear operator,solving related problems.	Canonical forms (Jordan & rational).Practice related problems	Practice Problems	Doubt Clearing .Internal Test
December	Tutorial	University Exam	University Exam	University Exam

Sem VI: Core Course XIII:COMPLEX ANALYSIS (Unit-2)

Month	Topics to be covered			
	1st week	2nd week	3rd week	4th week
January	CU Exam	Stereographic projection. Regions in the complex plane.	Limits, limits involving the point at infinity.Practice Problems	Continuity of functions of complex variable.Practice Related Problems
February	Derivatives, differentiation formulas	Cauchy-Riemann equations, sufficient conditions for differentiability.	Practice problems on C-R Equations.	Analytic functions and related problems

March	Exponential function, logarithmic function, trigonometric functions, hyperbolic functions	Practice Problems	M¨obius transformation.	M¨obius transformation. Practice Problems
April	Power series : Cauchy-Hadamard theorem. Determination of radius of convergence and related problems.	Uniform and absolute convergence of power series	Analytic functions represented by power series. Uniqueness of power series.	Contours, complex integration along a contour and its examples,Practice Problems
May	Upper bounds for moduli of contour integrals. Cauchy- Goursat theorem (statement only) and its consequences,	Cauchy integral formula.and Practice Related Problems	Internal Test	Tutorial tests
June	Exam			