Teaching Plan

Department of Mathematics

Session: 2022-23(Jan-Jun)

Name of the Teacher: Dr. Abhijit Mukherjee

BA. 4th Semester(Hons: Mathematics)

Allotted Paper: C 4.2 (Riemann Integration and Series of Functions)

Objective: After going through this course the students will be able to describe:

1) Riemann integration, improper integrals
2) Differentiation and integration of power series

Paper/Unit	Detailed Teaching Plan	Teaching Hours Required
Unit-I	1. Riemann Integration	2
	2. Inequalities of Upper and Lower Sums	4
	3. Riemann Conditions of Integrability	2
	4. Tutorial	2
Unit-II	1. Riemann sum and definition of Riemann integral through Riemann sums	3
	2. Equivalence of two definitions	2
	3. Riemann integrability of monotone and continuous functions	4
	4. Properties of the Riemann integral	4
	5. Definition and Integrabilityof piecewise continuous and monotone functions	3
	6. Intermediate Value theorem for Integrals	3
	7. Fundamental Theorems of Calculus.	3
	8. Tutorial	3
Unit-III	1. Improper integrals	3
	2. Convergence of Beta and Gamma functions	5
	3. Tutorial	2
Unit-IV	1. Pointwise and uniform convergence of sequence of functions	3
	2. Theorems on continuity, derivability and integrability of the limit function of a sequence of functions	5
	3. Series of functions	2
	4. Theorems on the continuity and derivability of the sum function of a series of functions	4
	5. Cauchy criterion for uniform convergence	4
	6. Weierstrass M-Test	4
	7. Tutorial	3
Unit-V	1. Limit superior and Limit inferior	2
	2. Power series, radius of convergence	3
	3. Cauchy Hadamard Theorem	2
	4. Differentiation and integration of power series	5
	5. Abel's Theorem	2
	6. Weierstrass Approximation Theorem	3
	7. Tutorial	2

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Session: 2022-23(Jan-Jun)

Name of the Teacher: Dr. Abhijit Mukherjee

BA. 4th Semester(Generic: Mathematics)

Allotted Paper: DSC-1D (Algebra)

Objective: After going through this course the students will be able to:

1) Describe various algebraic structures on sets;
2) Identify the algebraic structures present in different branches of Sciences

Paper/Unit	Detailed Teaching Plan	Teaching Hours Required
Unit-I	1. Definition and examples of groups	3
	2. examples of abelian and non-abelian groups	2
	3. the group Zn of integers under addition modulo n	2
	4. the group U(n) of units under multiplication modulo n	2
	5. Cyclic groups from number systems	3
	6. complex roots of unity	2
	7. circle group, the general linear group GLn (n,R)	3
	8. groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square	5
	9. the permutation group symmetric groups	4
	10. Group of quaternions	2
	11. Tutorial	2

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Department of Mathematics

Session: 2022-23(Jan-Jun)

Name of the Teacher: Dr. Abhijit Mukherjee

BA. 6th Semester(Hons: Mathematics)

Allotted Paper: C 6.1 (Metric Spaces and Complex Analysis)

Objective: After going through this course the students will be able to describe:

1) Various properties of metric space
2) Complex Number System, its differentiation and integration

Paper/Unit	Detailed Teaching Plan	Teaching Hours Required
Unit-I	1. Definition and Examples of Metric Spaces	3
	2. Sequences in Metric Space, Cauchy Sequence	3
	3. Complete Metric Spaces, Open and Closed Balls	4
	4. Neighbourhood, Open set, Limit Point, Interior of a Set, Closed Set, Diameter of a Set.	2
	5. Cantor's theorem	2
	6. Subspaces, Dense Set, Separable spaces	4
	7. Tutorial	2
Unit-II	1. Continuous mapping, Sequential criterion, Characterization of Continuity.	3
	2. Uniform Continuity, Homeomorphism, Contracting mapping.	3
	3. Compactness, Banach Fixed Point theorem.	3
	4. Connectedness, Connected subset of R.	4
	5. Tutorial	2
Unit-III	1.Limits, Limits involving the point at infinity, Continuity.	5
	2. Propertries of Complex number, Regions in the Complex Plane, Functions of Complex variable, Mapping.	6
	3. Derivatives, Differentiation formulas, C-R Equations, Sufficient conditions of integrability.	7
	4. Tutorial	2
Unit-IV	1. Analytic function, Examples of Analytic Function.	2
	2. Exponential function, Logarithmic function, Trigonometric function.	2
	3. Derivatives of functions, Definite integral of functions.	3
	4. Contour, Contour integrals and its examples.	3
	5. Cauchy-Goursat theorem, Cauchy Integral formula.	3
	6. Tutorial	2
Unit-V	1. Liouville's theorem, Fundamental theorem of Algebra.	2
	2. Convergence of Sequences and Series.	3
	3. Taylor's theorem and examples.	3
	4. Tutorial	2
Unit-VI	1. Laurent's series and examples	4
	2. Absolute & Uniform convergence of Power Series	4
	3. Tutorial	2

Teaching Plan

Department of Mathematics

Session: 2022-23(Jan-Jun)

Name of the Teacher: Dr. Abhijit Mukherjee

BA. 6th Semester(Hons: Mathematics)

Allotted Paper: DSE 4.1 (Mathemetical Methods)

Objective: After going through this course the students will be able to:

1) Construct mathematical models for real world problems
2) Solve real world problems through studied theories

Paper/Unit	Detailed Teaching Plan	Teaching Hours Required
Unit-I	1. Fourier series, Dirichlet's condition	6
	2. Fourie series for Even & Odd functions	6
	3. Half range Fourier series	6
	4. Tutorial	2
Unit-II	1. Definition of L.T., Existence theorem for L.T	2
	2. Liearity property of L.T & L.T of some elementary functions.	2
	3. Shifting theorems & Change of Scale properties.	5
	4. L.T of derivatives & Integrals	4
	5. Tutorial	2
Unit-III	1. Inverse L.T and its properties	5
	2. Shifting theorems, Scale properties.	7
	3. Convolution theorem	6
	4. Tutorial	2
Unit-IV	1. Definition of F.T, Dirichlet's conditions, Inverse F.T.	5
	2. Fourier Sine & Cosine transform & their inversion formula	6
	3. Linearity property, Scale property and Shifting property.	6
	4. Modulation theorem and Convolution theorem.	2
	5. Tutorial	1
Unit-V	1. Solution of Boundary value problems & Initial value problems in 1D and 2D cases.	6
	2. Solution of Laplace & Poission equations in 2D cases.	6
	3. Tutorial	3