TEACHING PLAN
FOR EVEN SEMETER
Jan-2022-July 2022

Name of the Faculty: Mr. Dulal Baruah, M.Sc. MPhil.
Department: Mathematics

Semester: B.A. 2nd Semester (Honours) (CBCS)
Paper Name: Differential Equation **Paper Code: C2.2**
Contact Hour(s): 35 Hrs.

Objectives: After going through this course the students will be able to
• Use the techniques to solve differential equations.
• Apply these techniques in various mathematical models used in real life problems.

Sl. No.	Topics (As per University Syllabus)	Hours	Remarks/Books
1	General solution of homogeneous equation of second order	**3**	Books: S.L. Ross, *Differential Equations,* 3rd Ed.,
2	principle of super position for homogeneous equation	**3**	
3	Wronskian: its properties and applications	**3**	
4	Linear homogeneous and non-homogeneous equations of higher	**5**	
	Euler's equation, method of undetermined coefficients, method of	**4**	
	Evaluation of the Unit (problem practice)	**5**	
5	Tutorial	**2**	
Total		**25 Hrs**	
Unit-4		**Marks: 10**	**Contact hrs: 10**
6	Equilibrium points	**1**	Book: E. A. Codding ton, An Introduction to Ordinary Differential Equation,
7	Interpretation of the phase plane	**2**	
8	predatory-prey model and its analysis	**2**	
9	Epidemic model of influenza and its analysis,	**1**	
10	Battle model and its analysis	**1**	
11	Evaluation of the Unit (problem practice)	**2**	
12	Tutorial	**1**	
	Total	**10 Hrs**	

Teaching Plan

Department of Mathematics

Session: 2021-22(Jan-Jun)

Name of the Teacher: Dr. Abhijit Mukherjee

BA. 2nd Semester(Hons: Mathematics)

Allotted Paper: C 2.1 (Real Analysis)

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

1) Identify the properties of the number system.
2) Describe various analytical properties of the real number system.

Paper/Unit	Detailed Teaching Plan	Teaching Hours Required
Unit-II	1. Definition of Sequence, Bounded Sequence, Convergent Sequence with examples	4
	2. Limit of a sequence,	3
	3. Limit Theorems	4
	4. Monotone Sequence and Monotone Convergence Theorem	4
	5. Subsequences, Divergence criteria	4
	6. Monotone Subsequence theorem,	3
	7. Bolzano-Weirstrass theorem	4
	8. Cauchy Sequence	4
	9. Cauchy Convergence criterion	3
	10. Tutorial	2

Teaching Plan

Department of Mathematics

Session: 2021-22(Jan-Jun)

Name of the Teacher: Dr. Abhijit Mukherjee

BA. 2nd Semester(Hons: Mathematics)

Allotted Paper: C 2.2 (Differential Equations)

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

1) Use the techniques to solve differential equations.
2) Apply these techniques in various mathematical models used in real life problems.

Paper/Unit	Detailed Teaching Plan	Teaching Hours Required
Unit-I	1. Differential equations and mathematical models	1
	2. General, particular, explicit, implicit and singular solutions of a differential equation	1
	3. Exact differential equations and integrating factors	4
	4. Separable equations and equations reducible to this form	3
	5. Linear equation and Bernoulli equations	2
	6. Special integrating factors and transformations	2
	7. Tutorial	2
Unit-III	1. General solution of homogeneous equation of second order	3
	2. Principle of super position for homogeneous equation	3
	3. Wronskian, its properties and applications.	4
	4. Linear homogeneous and non-homogeneous equations of higher order with constant coefficients	4
	5. Euler's equation	3
	6. Method of undetermined coefficients	3
	7. Method of variation of parameters.	3
	8. Tutorial	2

Teaching Plan

Department of Mathematics

Session: 2021-22(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:

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

Teaching Plan

Department of Mathematics

Session: 2021-22(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

WOMEN'S COLLEGE, TINISUKIA
TEACHING PLAN
COURSE: B.A.
SESSION: 2022

Subject: MATHEMATICS
Name of the teacher: Dr. Bandita Phukan
Method to be applied: Lecture, analytical and activity method, interaction and discussion
Teaching materials: White board, chalk pencil, duster, book, Laptop, projector

Allotted Paper/code /Title	Unit	Topic	Period required	Detailed Teaching Plan
C2.1 Real Analysis	I		35	**Unit I**: Algebraic property of R (2), order property of R (2), Neighbourhood of a point in R (2), Countable and uncountable sets and related theorems (5), bounded above and bounded below sets (2) bounded and unbounded sets (2), Suprema and infima (2), The Completeness property of R (3), Archimedean Property (3), Density of rational and irrational numbers in R (2), Density theorem or Betweeness property(3) Intervals (1), Characterization theorem of intervals (1), Limit point of a set (2), Isolated point (1), Bolzano-Weierstrass theorem for sets (2)
C2.2 Differential Equations	II		10	**Unit II:** Concept of Mathematical models, Introduction to compartmental model, Balance law, (1) exponential decay model (2), lake pollution model - case study of Lake Burley Griffin, (2) Model of drug assimilation into the blood 1. case of a single cold pill, 2. case of a course of cold pills, (2) Model of exponential growth of population, (1) limited growth of population (1) and limited growth with harvesting. (1)

Allotted Paper/code /Title	Unit	Topic	Period required	Detailed Teaching Plan
C2.2 Differential Equations (Practical)		**Practical**	30	1. Plotting of second order solution family of differential equation. (1) 2. Plotting of third order solution family of differential equation. (1) 3. Growth model (2) 4. Decay model (2) 5. Lake pollution model (with constant/seasonal flow and pollution concentration). (2) 6. Case of single cold pill and a course of cold pills. (2) 7. Limited growth of population (with and without harvesting) (2) 8. Predatory-prey model (2) 9. Epidemic model of influenza (2) 10. Battle model (2) 11. Plotting of recursive sequences. (2) 12. Study the convergence of sequences through plotting. (2) 13. Verify Bolzano-Weierstrass theorem through plotting of sequences and hence identify convergent subsequences from the plot. (2) 14. Study the convergence/divergence of infinite series by plotting their sequences of partial sum. (2) 15. Cauchy's root test by plotting n th roots. (2) 16. Ratio test by plotting the ratio of n th and (n+1) th term. (2)
C4.1 Numerical Methods	I, II, III, IV, V, VI		60	**Unit-1** Algorithms, Convergence, Relative Error, Absolute Error Round off error, Truncation error **Unit-2** Transcendental and Polynomial equations: Bisection method, Newton's method, Secant method. Rate of convergence. **Unit-3** System of linear algebraic equations: Gaussian Elimination and Gauss Jordan methods. Gauss Jacobi method, Gauss Seidel method and their convergence analysis.

				Unit-4 Interpolation: Lagrange and Newton's methods. Error bounds. Finite difference operators. Gregory forward and backward difference interpolation. **Unit-5** Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule, Simpsons 3/8th rule, Boole's Rule. Midpoint rule, Composite Trapezoidal rule, Composite Simpson's rule. **Unit-6** Ordinary Differential Equations: Euler's method. Runge-Kutta methods of orders two and four.
C4.1 Numerical Methods		**Practical**	30	1. Calculate the sum 1/1 + 1/2 + 1/3 + 1/4 + ----------+ 1/N. (2) 2. To find the absolute value of an integer. (2) 3. Enter 100 integers into an array and sort them in an ascending order. (2) 4. Bisection Method. (2) 5. Newton Raphson Method. (2) 6. Secant Method. (2) 7. Regulai-Falsi Method. (2) 8. LU decomposition Method. (4) 9. Gauss-Jacobi Method. (2) 10. SOR Method or Gauss-Siedel Method. (3) 11. Lagrange Interpolation or Newton Interpolation. (3) 12. Simpson's rule. (4)
GE-4.1 Algebra		**Subgroups**	30	**Unit-2** Subgroups (2), cyclic subgroups (3), the concept of a subgroup generated by a subset and the commutator subgroup of group (5), examples of subgroups (4), centre of a group (3), Cosets (2), Index of subgroup (1), Lagrange's theorem (2), order of an element (2), Definition of Normal subgroups and examples (2), and characterizations (2), Quotient groups (2),