# LORETO COLLEGE
# Department of Mathematics

## TIME PLAN

## March – June 2025

**Name of the teacher: Dr Satyabrota Kundu**
**Initials            : SK**

**Teaching Objectives:**
- To impart comprehensive knowledge in theoretical and empirical perspectives on the core mathematical issues.
- To indoctrinate the fundamental mathematical tools required for empirical appraisal of various mathematical problems.
- To give exposure to analytical and logical matters subsumed in mathematical theories.

## 2nd  Semester Topic-wise Time Plan

| Topics | Hours allotted | Topics (as per curriculum) | Teaching method | Learning outcome (output) | Assessment |
|---|---|---|---|---|---|
| Basic Algebra: Group A | 25 | 1. Complex Numbers 2. Theory of equations: Relation between roots and coefficients, transformation of equation, Descartes rule of signs, Application of Sturm's theorem, cubic equation (solution by Cardan's method) and biquadratic equation (solution by Ferrari's method). •Inequalities: The inequality involving $AM \geq GM \geq HM$, Cauchy-Schwartz inequality. | Class lecture and problem-solving sessions. Revisions and doubt clearing slots | Achieve a fervent understanding of basic algebra. | Class test and home assignments |

| Group B | 25 | 1. Relation: equivalence relation, equivalence classes & partition, partial order relation,<br>2. poset, linear order relation.<br>3. •Mapping: composition of mappings, relation between composition of mappings and<br>4. various set theoretic operations. Meaning and properties of $f-1$ $(B)$, for any mapping<br>5. $f : X \to Y$ and $B \subseteq Y$ .<br>6. •Well-ordering property of positive integers, Principles of Mathematical induction,<br>7. equivalence of Wellordering property and Principles of Mathematical induction<br>8. (statement only), division algorithm, divisibility and Euclidean algorithm. Prime<br>9. numbers and their properties, Euclid's theorem. Congruence relation between integers.<br>10. Fundamental Theorem of Arithmetic. Chinese remainder theorem. Arithmetic<br>11. functions, some arithmetic | Class lecture and problem-solving sessions. Revisions and doubt clearing slots | Gather theoretical insights of the fundamental calculus. | Class test and home assignments |
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| | | functions such as $\phi$, $\tau$, $\sigma$ and their properties. | | | |
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| Group C | **25** | 1. Systems of linear equations, homogeneous and non-homogeneous systems. Existence and Uniqueness of solution. The matrix equation $Ax = b$, row reduction and echelon forms, uniqueness of reduced echelon form. Rank of a matrix and characterization of invertible matrices, Pivot positions, basic | Class lecture and problem-solving sessions. Revisions and doubt clearing slots | Getting skilled in problem solving techniques | Class test and home assignments |

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| | | and free variables, parametric description of | | | |
| | | the solution set. Existence and uniqueness theorem. | | | |
| | | •Vectors in $R^{n}$, algebraic and geometric properties of the vectors. Vector form of a | | | |
| | | linear system and the column picture. Existence of solutions and linear combination of | | | |
| | | vectors. Geometry of linear combination and subsets spanned by some vectors. | | | |
| | | Uniqueness of solution and linear independence of vectors. Algebraic and geometric characterizations of linearly independent subsets | | | |

| | | | | Developing a strong aptitude in making basic aspects of Geometry. | Class test and home assignments |
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## TIME PLAN 2023-2024

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**Initials** : SK

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- To impart comprehensive knowledge in theoretical and empirical perspectives on the core mathematical issues.
- To indoctrinate the fundamental mathematical tools required for empirical appraisal of various mathematical problems.
- To give exposure to analytical and logical matters subsumed in mathematical theories.

## 2<sup>nd</sup> Semester I.D.C. Topic-wise Time Plan

| Topics | Hours allotted | Topics (as per curriculum) | Teaching method | Learning outcome (output) | Assessment |
|---|---|---|---|---|---|
| I.D.C. Theory: 50 and Tutorial : 25 | **75** | 1. Profit, Loss and discount, Dividend, Calculation of income tax, Tabulations, Bar graphs, Pie charts, Line graphs. <br><br> • Introduction to Financial Markets and Instruments: Money Market and Capital Market, Financial Instruments – Stock, | Class lecture and problem-solving sessions. Revisions and doubt clearing slots | Achieve a fervent understanding of basic integral calculus. | Class test and home assignments |

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| | | Bonds, Derivatives; Concept of Value (intrinsic) vs. Price of Financial Instruments, Concept of Arbitrage.<br><br>• Time Value of Money: Interest (simple and compound, discrete and continuous), Annuities, net present value, internal rate of return (calculation by bisection and Newton-Raphson methods), Comparison of NPV and IRR.<br><br>• Bonds: Bond Valuation; Bond Prices and Yields; Duration, Convexity, Interest Rate Risk; Fixed vs. Floating Rate Bonds, Immunization.<br><br>• Portfolio Theory: Brief introduction to expectation, variance, covariance and | | | |

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| | | correlation; Asset Return and Risk; Portfolio Risk (Variance) and Return– Historical and Ex-Ante; Diversificatio n and Risk Reduction; Feasible and Optimal Portfolio – Efficient Frontier; Markowitz model (review of Lagrange multipliers for 1 and 2 constrain | | | |