# LORETO COLLEGE
## Department of Mathematics

## TIME PLAN 2023-2024

**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<br>**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).<br>•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 |

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| 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. | | | |
| 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 | | | |

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| | | | | Developing a strong aptitude in making basic aspects of Geometry. | Class test and home assignments |

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## 2nd 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>• 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>• 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>• Bonds: Bond Valuation; Bond Prices and Yields; Duration, Convexity, Interest Rate Risk; Fixed vs. Floating Rate Bonds, Immunization.<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 | | | |