**B. Sc (Prog) PHYSICAL SCIENCES, MATHEMATICS**

**COURSE OUTCOMES**

**CORE COURSES**

**Math. C-1:- Calculus**

**By the end of the course, the students will be able to**

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| C01 | Students are expected to be able to use Leibnitz’s rule to evaluate derivation of higher order |
| C02 | Concepts of calculus including limits, continuity and differentiability |
| C03 | Acquired knowledge on some the basic properties of vector function |
| C04 | Operations with vector-valued function sketching parametric curves (i.e., Trochoid, Cycloid) |

**Math. C-2:- Discrete Mathematics**

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| C01 | The acquired knowledge will help students in simple Mathematical modeling |
| C02 | Brief idea of Chinese remainder theorem & Fermat’s little theorem. |
| C03 | Understand the Principle of mathematical induction fundamental theorem of arithmetic. |
| C04 | Fundamental properties of matrix & find the eigen values, eigen vectors of a square matrix. |

**Math. C-3:- Real Analysis**

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| C01 | Define fundamental properties of real numbers that lead to the formal development of real analysis. |
| C02 | Understand limits and their use in sequences, Series, differentiation & integration. |
| C03 | Abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems |
| C04 | Perform the test the divergence and convergence of series using comparison test and Cauchy’s nth root test. |

**Math. C-4:- Differential Equation**

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| C01 | To solve differential equation by separable and exact from, integrating factor and Bernoull’s equation. |
| C02 | Understand the case study of detecting art forgeries ( Exponential decay radioactivity. |
| C03 | Perform the general equation of homogenous equation & second order. |
| C04 | Use concepts of method of variation parameter, interpretation of the phase plane predatory-pray model and its analysis |

**Math. C-5:- Theory of Real Functions**

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| C01 | Students will have working knowledge on the concepts and theorem of elementary calculus functions of one real variable |
| C02 | Understand Indeterminate form by L-Hospital’s Rule |
| C03 | Application of Taylor’s theorem to convex function |
| C04 | Define fundamental theorem of calculus. Understand and apply the Gosics of Riemann integration. |

**Math. C-6:- Groups Theory-I**

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| C01 | Student learning this course gets idea on concept and examples of groups and their properties. |
| C02 | Understand cyclic groups, permutation groups & normal subgroups |
| C03 | Apply this knowledge to problems in Physics, Computer Science, Economics & Engineering |
| C04 | Perform the properties of isomorphisms, 1st , 2nd & 3rd isomorphism theorum |

**Math. C-7:- Partial Differential Equations & System of ODE.**

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| C01 | Basic concepts of mathematical problems of First order equations |
| C02 | Method of characteristics for obtaining general solutions of Quasi-Linear equation |
| C03 | Understand the derivation of Heat equation, Wave equation & Laplace equation. |
| C04 | Reduction of second order Linear equations of canonical forms. |

**Math. C-8:- Numerical Methods & Scientific Computing**

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| C01 | Define an approximate solutions of non-linear equations by Bisection method, Regula-Falsi methoed, Newton Raphson method. |
| C02 | Understand the system of linear algebraic equations by Gaussian elimination and Gauss Jordan methods |
| C03 | Perform existence uniqueness of interpolators polynomials |
| C04 | Explain simple quadrature rules by Newtomn-Cotes rules, Trapezoidal rule and Simpsons rule |

**Math. C-9:- Topology of Metric Space**

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| C01 | Learn to work with abstract topological spaces |
| C02 | Define metric space , Cauchy sequence, open and closed balls, neighborhood and limit point of a set |
| C03 | Explain countability axioms and separability |
| C04 | Understand Baire’s category theorem, Extension theorem |

**Math. C-10:- Ring Theory**

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| C01 | Define rings, properties of rings, sub rings, integral domain and fields |
| C02 | Understand Characteristic of a ring |
| C03 | Generated by a subset of a ring, properties of ring homomorphism |
| C04 | Explain principal ideal domains, Eisenstein criterion, Euclidean domin |

**Math. C-11:- Multivariate Calculus**

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| C01 | Students will be able to calculate partial derivatives, directional derivatives, extreme values and can calculate double, triple and line integrals. |
| C02 | Explain the basic idea of vector calculus including green’s theorem, divergence theorem and stokes theorem |
| C03 | Understand the students can help in numerical computations involving several variables |
| C04 | Applications of line integral i.e., mass and work, fundamental theorem for the integral |

**Math. C-12:- Linear Algebra**

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| C01 | Define Linear Algebra is a basic course in almost all branches of Science |
| C02 | The students will use this knowledge wherever, he/she goes after undergraduate programme |
| C03 | Applications in Computer Science, finance mathematics, Industrial Mathematics and Bio-mathematics |
| C04 | Least squares Approximation, Orthogonal projection and spectral theorem |

**Math. C-13:- Complex Analysis**

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| C01 | Students will be able to handle certain integrals not evaluated earlier and will know a technique for counting the zeros of polynomials |
| C02 | Explain operations with various forms of complex numbers to solve equations |
| C03 | Brief idea of basic properties of complex numbers and complex plane |
| C04 | Applications of Cauchy”s theorem and evolution of some integrals, Cauchy’s integral formulas |

**Math. C-14:- Group Theory-II**

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| C01 | Define knowledge of automorphism helps to study more on field theory |
| C02 | Students learn on direct products, group actions, class equation and their application with proof of all results |
| C03 | Explain the significance of the notion of cosets, normal subgroups and of factor groups |
| C04 | Understand the fundamental concepts of Group actions and application of group actions, Generalized cayley’s theorem, Index theorem |

**Discipline Specific Elective Paper-I (Liner Programming)**

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| C01 | Knowledge on this topic in higher studies will help students to deal industrial models |
| C02 | Perform Prerequisite for studding advanced courses in nonlinear programming problems |
| C03 | Understand inventory control problem and their comparison |
| C04 | Find assignment problem and its mathematical formulation, algorithm for solving transportation problem |

**Discipline Specific Elective Paper-II (Probability & Statistics )**

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| C01 | The students shall learn probability & statistics for various random variables. |
| C02 | Understand the multivariate distributions, correlations and relations |
| C03 | Formulate the law of large numbers and shall be able to do basic numerical calculations |
| C04 | Brief descriptions of sampling distributions, population distributions and sampling distributions of mean, central limit theorem |

**Discipline Specific Elective Paper-III (Differential Geometry )**

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| C01 | Define serrate-frenetic formula |
| C02 | Understand the relation between tangent, normal and biomials |
| C03 | Brief idea of first and second fundamental forms and ideals on various curvatures |
| C04 | Explain scope to take more advanced courses in surface theory and geometry. |