Mahatma Gandhi Vidyamandir's
Loknete Vyankatrao Hiray Arts, Science and Commerce College,
Panchavati, Nashik-422003
(Affiliated to SPPU, Pune, Reaccredited with 'A' grade, Recipient of Best College Award by SPPU)

# Programme Specific Outcomes,

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# Course Outcomes of M.Sc

## Department of Mathematics

**Academic Year**

**2021-22**

## Programme Specific Outcomes: M.Sc. Subject (Programme code)

| Name of the Programme: M.Sc. Subject | |
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| **Program Specific Outcomes** | |
| **At the end of the programme, student will be able to** | |
| 1 | Student can develop basic programmes in Python and Data Science |
| 2 | Student can teach mathematics at school, UG and PG level |
| 3 | Student were able to study mathematical research topics |
| 4 | Students were able to apply mathematics in industry |
| 5 | Students were able to study basics of coding |
| 6 | Student can learn mathematical methods to solve basic problems occurring in nature |

# Course Outcomes: M.Sc. Subject (Programme code)

| Class : M. Sc. Subject | | |
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| **Semester – I** | | |
| **Paper** | **Course code & course title** | **At the end of the course, student will be able to** |
| MTUT 111 | Linear Algebra | **CO1:** Define vectors, concept of basis and dimension. |
| | | **C02:** Discuss Concept of Linear maps and matrices. |
| | | **CO3:** Analyze Basic concepts of Invariant subspaces. |
| | | **C04:** Estimate the structure of orthogonal transformation. |
| | | **C05:** Describing principle axes theorem. |
| | | **C06:** Create orthogonal and Orthonormal transformation and transformations into matrices |
| MTUT 112 | Real Analysis | **CO1**: Define properties of sets |
| | | **CO2**: Describe Concept of various functions and simple functions |
| | | **CO3**: Solve the problems of Continuous and measurable functions |
| | | **CO4**: Discuss about the Fundamental Theorem of Calculus and its applications |
| | | **CO5**: Describe functions of Bounded variations & its applications |
| | | **CO6**: Analyze the problems of differentiability & integrability |
| MTUT 113 | Group Theory | **CO1:** Define basic definitions and properties of Groups |
| | | **CO2:** Distinguish Between Center and Centralizer of Groups |
| | | **CO3:** Apply fundamental theorem of homomorphism on groups |
| | | **CO4:** Differentiate between Normal and Factor Group and between Internal Direct Products and External Direct product |
| | | **CO5**: State Sylow theorems, Lagrange's Theorems, Cayley's Theorems with its applications |
| | | **CO6:** Compose different groups using Group actions |
| MTUT 114 | Advanced Calculus | **CO1** : Define the concepts of differentiation for multivariable |
| | | **CO2** : Discuss Extreme value problems and its applications |
| | | **C03** : Solve Problems based on multiple integrals |
| | | **C04 :** Apply Green's theorems and its applications |
| | | **C05:** Effective implementation of Divergence Theorem and Stoke's Theorem |
| | | **C06:** Use the concept of calculus and find Area and Volume. |

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| MTUT 115 | Ordinary Differential Equations | **C01**: Define linear equations with 1st and 2nd order |
| | | **C02**: Discuss the concept of Wronskian and its applications |
| | | **C03**: Use to appropriate method to solve initial value problem. |
| | | **C04**: Find Regular singular points and point at infinity |
| | | **C05**: Simplify Lipchitz's condition and its applications |
| | | **C06:** Use to calculate the movement or flow of electricity. |
| **Semester – II** | | |
| MTUT 121 | Complex Analysis | **C01**: Discuss Path connectivity and Fundamental Theorem of Algebra. |
| | | **C02**: Define Review of calculus of multi variables. |
| | | **CO3**: Analyze Analyticity of complex Differentiation functions and its applications |
| | | **C04**: Estimate Winding numbers and its applications. |
| | | **C05**: Explain Local mapping, Homotopy and simple connectivity. |
| | | **C06**: Used in analogue electronic design. |
| MTUT 122 | General Topology | **C01 :** Describe meaning of topology |
| | | **C02:** Explain Connectedness and Compactness property of Arbitrary spaces |
| | | **C03:** Analyze the difference between two arbitrary spaces |
| | | **C04:** Study properties of continuity between arbitrary spaces |
| | | **CO5:** Examine the homeomorphic properties of topological spaces |
| | | **CO6:** Apply topological properties to real life and arbitrary objects |
| MTUT 123 | Ring Theory | **CO1:** Define Basic Definitions and properties of Rings |
| | | **CO2**: Describes the properties of ideals and its applications towards rings |
| | | **CO3:** Explain Field of fractions with its applications towards PID and UFD |
| | | **CO4:** Discuss about the Eisenstein's criterion and its applications towards irreducibility of polynomials |
| | | **CO5:** Describing characteristic of ring |
| | | **CO6:** Describe application of Ring theory towards Field Theory |
| MTUT 124 | Advanced Numerical Analysis | **CO1:**Know the importance of Numerical ,Basic concepts in Matrix and Linear Algebra |
| | | **CO2:** Identify and interpret the fundamental the concepts of polynomial and roots of equation. |

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| | | **C03:** Apply to knowledge and skills in numerical methods to solve algebraic and transcendental equations. |
| | | **C04:** Use the concept of eigen value problem techniques for mathematical problem arising in various field. |
| | | **C05:** Applications to Electrical Circuit problems, ODE, PDE . |
| | | **C06:** Explain Error analysis and its applications. |
| MTUT 125 | Partial Differential Equations | **C01:** Define concepts of PDE. |
| | | **C02:** Discuss Various methods for Nonlinear 1st order PDE. |
| | | **C03:** Explain Canonical Forms and classification of 2nd order |
| | | **C04:** Solve Boundary Value Problems |
| | | **C05:** Apply D' Alembert's solution and applications. |
| | | **C06**: Simplify the wave equations, heat equations e |

| Class : M. Sc. Subject -II | | |
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| **Semester – III** | | |
| **Paper** | **Course code & course title** | **At the end of the course, student will be able to** |
| MTUT 131 | Functional Analysis | **CO1:** Define Basic theory of Functionals |
| | | **CO2**: Explain the definition and concepts in Hilbert Space |
| | | **CO3:** Discuss applications of Linear Operators |
| | | **CO4:** Analyze and apply concepts in Banach Space |
| | | **CO5:** Solve example of Inner product spaces |
| | | **C06:** Use to systematically investigating relationships between problem behaviour and environmental events |
| MTUT 132 | Field Theory | **CO1:** Define Basic Definitions of Field Extensions |
| | | **CO2:** Describe Eisenstein Criterion, Adjunction of roots, Compass and Ruler construction |
| | | **CO3:** Discuss the Fundamental Theorems of Algebra |
| | | **CO4:** Solve the problems of Ruler and Compass Construction |
| | | **CO5:** Illustrate the problems of polynomial solvable by radicals & symmetric function |
| | | **CO6:** Apply of Galois Theory to classical problem |
| MTUT 133 | Introduction to Data Science | **CO1:** Basic Definitions of Data Science in a big Data World |
| | | **CO2**: Describes the steps of Data Science Process |
| | | **CO3:** Demonstrate Machine Learning & Types of Machine Learning |
| | | **CO4:** Discuss about the General Techniques and programming Tips for handling & dealing the large volume of data. |
| | | **CO5:** Describing Text mining Techniques and data visualization option |
| | | **CO6**: Real life apply of Data Science. |
| MTUTO 135 | Mechanics | CO1: Can define equaton of Motion |
| | | CO2: Can differentiate between momentums and solve the problems |
| | | **CO3:** Can solve Homogeneous quadratic functions of velocity |
| | | **CO4:** Can solve the problems on variational and Hamiltonian principles |
| | | **CO5:** Can explain Two body problem for central force motion |
| | | **CO6:** Can give some real life applications |

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| MTUTO 137 | Integral Equations | **C01:**Describing the nature of Fourier series |
| | | **C02:** Explain Fourier method |
| | | **C03:**Solve Sturm Liouville problems and find its applications |
| | | **C04:** Apply the method of fourier series to find eigen value and eigen function. |
| | | **C05 :** Discuss Legendre polynomials and applications |
| | | **C06:** To simplyfy complex data by decomposite it into the series of trignometric or exponential function. |
| **Semester-IV** | | |
| MTUT 141 | Fourier Series and Boundary Value Problem | **C01:**Describing the nature of Fourier series |
| | | **C02:** Explain Fourier method |
| | | **C03:**Solve Sturm Liouville problems and find its applications |
| | | **C04:** Apply the method of fourier series to find eigen value and eigen function. |
| | | **C05 :** Discuss Legendre polynomials and applications |
| | | **C06:** To simplyfy complex data by decomposite it into the series of trignometric or exponential function. |
| MTUT 142 | Differential Geometry | **C01:** Define the concepts of Graphs and level sets **.** |
| | | **C02:** Discuss Surfaces and its orientation**.** |
| | | **C03:**Explain the Curvature and arc length of curve**.** |
| | | **C04:** Describe Curvature of surfaces**.** |
| | | **C05:** Analyze local equivalence and its applications**.** |
| | | **C06 :** Used to analyze and describe geologic structure. |
| MTUT 143 | Python Programming | **C01:** Define the concepts Python and install Python on various OS **.** |
| | | **C02:** Discuss Conditional statement and its applications |
| | | **C03:**Explain the necessity of loops in Python |
| | | **C04:** Describe Strings and class in Python |
| | | **C05:** Analyze Object oriented programme |
| | | **C06 :** Apply Python programming to solve basic problems |

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| MTUT O 144 | Number Theory | **C01:** Discuss Divisibility in integers **.** |
| | | **C02:** Explain Congruences and its applications**.** |
| | | **C03:** Solve Diophantine Equations and its example. |
| | | **C04:** Describe Algebraic Number Fields**.** |
| | | **C05:** Investigate the historical background of Fermat's Theorem |
| | | **C06:** Examine Unique Factorization Property**.** |
| MTUTO 147 | Coding Theory | **CO1**: Basic Definitions like corrections & decoding, maximum likelihood decoding, hamming distance, vector space over finite field, etc. |
| | | **CO2**: Describes the distance of code linear codes, hamming weight & its theorem BCH code etc. |
| | | **CO3**: Explain Bases of linear codes, communication channels, cossets nearest neighbor decoding for linear code etc. |
| | | **CO4**: Solve the main coding theory problem, hamming, problems on hamming distance, etc. |
| | | **CO5**: Discuss about the equivalence linear code, encoding & decoding with linear codes, generator & parity check matrix etc. |
| | | **CO6**: Analyzes the different types of bounds in coding like as Sphere covering bound,Gilbert Varshamov bound, Singleton bound & MDS code etc. and also they can apply coding theory in a linear algebra, ring theory & field theory etc. |