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| **Course Title** | **Integral Calculus** | | | | | | |
| **Course Code** | BDM40544 | **Lecture hours** | 45 (3 hours per week) | | | | |
| **No. of Credits** | 04 | **Practical hours** |  | | | | |
| **Pre-requisites**  **Course Codes** | Differential Calculus | **Tutorial hours** | 15 (1 hour per week) | | | | |
| **Course Type** | Core | | | | | | |
| **Learning Outcomes** | | | | | | | |
| At the end of the module student will be able to:  LO1: Evaluate definite and indefinite integrals using techniques of integration, analytically and numerically. .  LO2: Solve wide variety of application problems using concepts and techniques of integration.  LO3: Determine convergence and divergence of sequence and series.  LO4: Apply methods in calculus in other coordinate systems when solving problems. | | | | | | | |
| **COURSE CONTENTS** | | | | | **Lecture Hours (45)** | | **Aligned Learning Outcomes** |
| **Techniques of Integration:** Substitution, Integration by Parts, Trigonometric Integrals, Trigonometric Substitution, Integration of Rational Functions by Partial Fractions, Integration Using Computer Algebra Systems, Approximate Integration, Improper Integrals  **Applications of Integration:** Areas Between Curves, Volumes, Volumes by Cylindrical Shells, Work, Average Value of a Function, Arc Length, Area of a Surface of Revolution, Applications to Physics and Engineering, Applications to Economics and Biology, Probability  **Sequences and Series:** Sequences, Series, The Integral Test and Estimates of Sums, The Comparison Tests, Alternating Series, Absolute Convergence and the Ratio and Root Tests, Strategy for Testing Series, Power Series, Representations of Functions as Power Series, Taylor and Maclaurin Series, Applications of Taylor Polynomials  **Parametric Equations and Polar Coordinates:** Curves Defined by Parametric Equations, Calculus with Parametric Curves, Polar Coordinates, Areas and Lengths in Polar Coordinates, Conic Sections, Conic Sections in Polar Coordinates | | | | | **15**  **15**  **9**  **6** | | **LO1**  **LO2**  **LO3**  **LO4** |
| **Methods of teaching and learning**  Lectures and Tutorials | | | | | | | |
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| **Assessment Method** | | | |  | | **Weight** | |
| Continuous Assessment   * Midterm Examination * Assignments/Quizzes   End Semester Examination | | | |  | | 20%  20%  60% | |
| **Recommended Reading**   * *J. Stewart, Calculus, 7th edition, (2012), Cengage Learning, ISBN-13: 978-0538497817, ISBN-10: 0538497815* * [*M. Kline*](https://www.amazon.com/Morris-Kline/e/B001H6MNLK/ref=dp_byline_cont_book_1)*, Calculus: An Intuitive and Physical Approach, 2nd edition (1998), Dover Publications, ISBN-10: 0486404536, ISBN-13: 978-0486404530* | | | | | | | |

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| **Course Title** | **Linear Algebra** | | | | | | |
| **Course Code** | BDM4063 | **Lecture hours** | 30 (2 hours per week) | | | | |
| **No. of Credits** | 03 | **Practical hours** |  | | | | |
| **Pre-requisites**  **Course Codes** | Precalculus | **Tutorial hours** | 15 (1 hour per week) | | | | |
| **Course Type** | Core | | | | | | |
| **Learning Outcomes** | | | | | | | |
| At the end of the module student will be able to:  LO1: Determine nature of solutions of systems of linear equations and solve them.  LO2: Use matrices and apply properties of matrices in application problems.  LO3: Apply properties of vector spaces solving problems.  LO4: Calculate eigenvalues, eigenvectors and apply orthogonality properties in solving problems. | | | | | | | |
| **COURSE CONTENTS** | | | | | **Lecture Hours (30)** | | **Aligned Learning Outcomes** |
| **Linear Equations:** Systems of Linear Equations, Row Reduction and Echelon Forms, Vector Equations, The Matrix Equation, Solution Sets of Linear Systems, Applications of Linear Systems, Linear Independence, Introduction to Linear Transformations, The Matrix of a Linear Transformation, Linear Models in Business, Science, and Engineering  **Matrix Algebra:** Matrix Operations, The Inverse of a Matrix, Characterizations of Invertible Matrices, Partitioned Matrices, Matrix Factorizations, The Leontief Input–Output Model, Subspaces of Rn, Dimension and Rank  **Determinants:** Introduction to Determinants, Properties of Determinants, Cramer’s Rule, Volume, and Linear Transformations  **Vector Spaces:** Vector Spaces and Subspaces, Null Spaces, Column Spaces, and Linear Transformations, Linearly Independent Sets; Bases, Coordinate Systems, The Dimension of a Vector Space, Rank, Change of Basis  **Eigenvectors and Eigenvalues:** The Characteristic Equation, Diagonalization, Eigenvectors and Linear Transformations, Complex Eigenvalues, Discrete Dynamical Systems, Iterative Estimates for Eigenvalues  **Orthogonality and Least Squares:** Inner Product, Length, and Orthogonality, Orthogonal Sets, Orthogonal Projections, The Gram–Schmidt Process, Least-Squares Problems, Applications to Linear Models, Inner Product Spaces  **Symmetric Matrices and Quadratic Forms**: Diagonalization of Symmetric Matrices, Quadratic Forms, The Singular Value Decomposition | | | | | **6**  **4**  **4**  **4**  **6**  **3**  **3** | | **LO1**  **LO2**  **LO2**  **LO3**  **LO4**  **LO4**  **LO2** |
| **Methods of teaching and learning**  Lectures and Tutorials | | | | | | | |
|  | | | | | | | |
| **Assessment Method** | | | |  | | **Weight** | |
| Continuous Assessment   * Midterm Examination * Assignments/Quizzes   End Semester Examination | | | |  | | 20%  20%  60% | |
| **Recommended Reading**   * *D.C. Lay, S.R. Lay, and J. J. McDonald, Linear Algebra and Its Applications 5th edition, (2015), Pearson, ISBN-10: 032198238X, ISBN-13: 978-0321982384* * *G.E. Shilov , Linear Algebra, Dover Publications (1977), ISBN-10: 048663518X, ISBN-13: 978-0486635187* | | | | | | | |