

**Mrs. Kesharbai Sonajirao Kshirsagar Alias Kaku Arts, Science &  
Commerce College, Beed.  
Department of Mathematics  
Course Outcomes (Cos)**

| Sr. No. | Class                     | Paper Name                     | COs                                                                                                                                                                                                                                                                                                                                                                                           |
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| 1       | B.Sc. F.Y.<br>First Sem.  | Calculus                       | i) Find derivative of hyperbolic, inverse hyperbolic functions and nth derivatives of given functions.<br>ii) Find the Maclaurin's series expansion of functions.<br>iii) Find the partial derivatives of functions.<br>iv) Determine areas of plane regions, length of curves and volume of solid of revolution.                                                                             |
| 2       | B.Sc. F.Y.<br>First Sem.  | Theory of Equations            | After completion of the course, students will be able to -<br>1) Solve the cubic and bi-quadratic equations.<br>ii) Find the imaginary and surd roots.<br>iii) Solve the discussion of reciprocal equations.<br>iv) Apply the Horner's process.                                                                                                                                               |
| 3       | B.Sc. F.Y.<br>Second Sem. | Basic Statistics               | After completion of the course, students will be able to -<br>i) Determine the mean, mode, median and deviation for the given data.<br>ii) Apply the concepts of probability.                                                                                                                                                                                                                 |
| 4       | B.Sc. F.Y.<br>Second Sem. | Differential Equations         | After completion of the course, students will be able to -<br>i) Determine the solution of first order linear differential equations.<br>ii) Determine the solution of exact differential equations.<br>iii) Determine the solution of linear equations with constant coefficient using general and short method.<br>iv) Determine the solution of linear homogeneous differential equations. |
| 5       | B.Sc. S.Y.<br>Third Sem.  | Number Theory                  | After completion of the course, students will be able to -<br>i) Find the gcd & lem of integers.<br>ii) Find solution of linear Diophantine equations.<br>iii) Solve the linear congruences.<br>iv) Solve the system of linear congruences.<br>v) Evaluate $\tau, \sigma, \mu, \phi$ for a given number.                                                                                      |
| 6       | B.Sc. S.Y.<br>Third Sem.  | Partial Differential Equations | After completion of the course, students will be able to -<br>i) Solve Lagrange's equation<br>ii) Find the solutions such as complete integral, singular integral and general integral.<br>iii) Determine the solution of partial differential equations using Charpit's Method.<br>iv) Describe and apply Monge's Method.                                                                    |
| 7       | B.Sc. S.Y.<br>Third Sem.  | Logic and Sets                 | After completion of the course, students will be able to -<br>i) Construct the truth tables of given proposition.<br>ii) Prove equivalence of two given propositions.<br>iii) Prove the properties of set operations.<br>iv) Find Cartesian product of two sets.                                                                                                                              |
| 8       | B.Sc. S.Y.<br>Third Sem.  | Vector Algebra                 | After completion of the course, students will be able to -<br>i) Define scalar, vector and angle between two vectors<br>ii) Find the directional cosine of the line<br>iii) Find the scalar triple product and vector triple product                                                                                                                                                          |

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| 9  | B.Sc. S.Y.<br>Third Sem. | Numerical<br>Methods-I  | After completion of the course, students will be able to -<br>i) Analyze the error in numerical methods<br>ii) Construct interpolating polynomial when the points are equally spaced<br>iii) Obtain interpolating polynomial when the points are unequally spaced                                                                                                                                                                                                                              |
| 10 | B.Sc. S.Y.<br>Forth Sem. | Algebra                 | After completion of the course, students will be able to -<br>i) Identify and apply group structure properties<br>ii) Identify and apply subgroup, normal subgroup and quotient group properties.<br>iii) Define and construct homomorphism of groups.<br>iv) Define and construct homomorphism and isomorphism of rings and characterize integral domains.                                                                                                                                    |
| 11 | B.Sc. S.Y.<br>Forth Sem. | Integral<br>Transforms  | After completion of the course, students will be able to -<br>i) Apply the Laplace transform for various functions.<br>ii) Obtain the inverse Laplace transform.<br>Find the solution of differential equations by using Laplace transform.<br>iv) Find the Fourier transform for various functions, Fourier sine and cosine transforms of functions.                                                                                                                                          |
| 12 | B.Sc. S.Y.<br>Forth Sem. | Discrete<br>Mathematics | After completion of the course, students will be able to -<br>ii) Prove laws of Boolean algebra.<br>i) Identify the types of relation and function.<br>iii) Apply the laws of Boolean algebra.<br>iv) Apply logic gates to adder, encoder and decoder.                                                                                                                                                                                                                                         |
| 13 | B.Sc. S.Y.<br>Forth Sem. | Vector Calculus         | After completion of the course, students will be able to -<br>i) Find the derivatives and partial derivatives of vector-valued functions of three variables.<br>ii) Define and apply the gradient, divergence and curl operators<br>Evaluate line and surface integrals.                                                                                                                                                                                                                       |
| 14 | B.Sc. S.Y.<br>Forth Sem. | Numerical<br>Methods-II | After completion of the course, students will be able to -<br>i) Apply numerical methods and find the integration by numerical methods<br>ii) Derive and apply numerical methods to find the roots of algebraic and transcendental equations<br>iii) Apply numerical methods to obtain numerical solution of ordinary differential equations                                                                                                                                                   |
| 15 | B.Sc. T.Y.<br>Fifth Sem. | Real Analysis-I         | After successful completion of the course, students will be able to:<br>i) Analyze sequences and subsequences of real numbers and determine their limits and convergence behavior.<br>ii) Identify and prove properties of bounded, monotone, and Cauchy sequences.<br>iii) Examine and determine the convergence, divergence, absolute convergence and conditional convergence of infinite series using appropriate tests.<br>iv) Understand and analyze the basic concepts of metric spaces. |
| 16 | B.Sc. T.Y.<br>Fifth Sem. | Abstract<br>Algebra     | After completion of the course, students will be able to -<br>i) Recognize the mathematical objects that are groups, and classify them as abelian and permutation groups.<br>ii) Understand the fundamental concept of Rings, Fields, subrings, integral domains and the corresponding ring homomorphism.<br>iii) Determine and classify rings into ED, PID and UFD.                                                                                                                           |

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|    |                          |                                           | iv) Understand the concepts of ring of polynomials and irreducibility tests for polynomials over the field.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 17 | B.Sc. T.Y.<br>Six Sem.   | Mathematics for<br>Machine<br>Learning-II | i) Solve eigenvalue problem and decompose the given matrix.<br>ii) Familiar with discrete and continuous probabilities<br>iii) Apply Bayes' theorem<br>iv) Understand and apply Gaussian distribution.                                                                                                                                                                                                                                                                                                                                           |
| 18 | B.Sc. T.Y.<br>Six Sem.   | Optimization<br>Techniques                | After completion of the course, students will be able to -<br>i) Model the real world problem to LPP.<br>ii) Apply the methods of solving LPP.<br>iii) Solve the transportation problem.<br>iv) Solve an assignment problem.                                                                                                                                                                                                                                                                                                                     |
| 19 | B.Sc. T.Y.<br>Six Sem.   | Ordinary<br>Differential<br>Equations     | After completion of course students will be able to -<br>i) Solve first order linear homogeneous and non-homogeneous differential equations.<br>Determine linear independence of solutions using the Wronskian and apply the formula for the Wronskian in second order equations. ii)<br>Solve second order homogeneous and non-homogeneous differential equations.<br>iv) Solve the initial value problems.                                                                                                                                     |
| 20 | B.Sc. T.Y.<br>Six Sem.   | Indian<br>Mathematics                     | After completion of the course, students will be able to -<br>i) To know the development of mathematics in India.<br>ii) To understand and apply contribution of Aryabhata-I, Bhaskaracharya, Mahavira and Brahmagupta.<br>iii) To apply the ancient Indian methods to real world problems.                                                                                                                                                                                                                                                      |
| 21 | B.Sc. T.Y.<br>Six Sem.   | Linear Algebra                            | After completion of the course, students will be able to -<br>i) Explain the concepts of vector spaces, subspaces, basis, dimension and quotient spaces with appropriate examples.<br>ii) Apply the theory of linear transformations to compute matrix representations, kernel, image and determine isomorphisms.<br>iii) Analyze structures in inner product spaces and orthogonality, and related geometric interpretations.<br>iv) Evaluate and solve problems involving eigenvalues and eigenvectors, and verify the Cayley-Hamilton theorem |
| 22 | B.Sc. T.Y.<br>Six Sem.   | Real Analysis-II                          | After completion of course students will be able to -<br>i) Identify and verify open and closed sets and apply their properties in various metric space problems.<br>ii) Analyze connected and totally bounded sets in the context of metric spaces.<br>iii) Study continuous and uniformly continuous functions on metric spaces and understand their behavior on compact spaces.<br>iv) Apply Riemann integral and its properties                                                                                                              |
| 23 | B.Sc. T.Y.<br>Fifth Sem. | Introduction to<br>LATEX                  | After completion of course students will be able to -<br>i) Make Alignments in a document and an Application for a job.<br>ii) Prepare a Bio-Data, and Table Structures.<br>iii) Edit Mathematical Statements using LaTeX.<br>iv) Prepare Articles and Inserting Pictures.<br>v) Prepare question paper and power point presentation in LaTeX format.                                                                                                                                                                                            |
| 24 | B.Sc. T.Y.<br>Fifth Sem. | Mathematics for<br>Machine<br>Learning-I  | After completion of course students will be able to -<br>i) Solve the system of linear equations.<br>ii) Identify linear independent vectors and find basis for                                                                                                                                                                                                                                                                                                                                                                                  |

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|    |                                  |                                    | <p>vector space.</p> <p>iii) Identify inner product spaces and apply the properties of inner products.</p> <p>iv) Understand and apply the concepts orthonormal basis and rotations..</p>                                                                                                                                                                                                                                                                                                                          |
| 25 | <b>B.Sc. T.Y.<br/>Fifth Sem.</b> | <b>Graph Theory</b>                | <p>After completion of the course, students will be able to -</p> <p>i) Identify and draw different types of graphs.</p> <p>ii) Find Eulerian paths and cycle in the given graph.</p> <p>iii) Prove the properties of trees.</p> <p>iv) Draw planar graph and prove Euler's formula.</p>                                                                                                                                                                                                                           |
| 26 | <b>B.Sc. T.Y.<br/>Fifth Sem.</b> | <b>Mathematical<br/>Statistics</b> | <p>After completion of course students will be able to -</p> <p>i) Construct histogram, frequency polygon and frequency curve.</p> <p>Determine average measures of central tendency.</p> <p>ii) Find the Mean, Median, Mode, Mean deviation, standard deviation, coefficient of variation.</p> <p>Determine mathematical expectation, variance and covariance. iv)</p> <p>v) Determine correlation coefficient.</p> <p>vi) Apply theoretical and continuous distribution, curve fitting and linear regression</p> |
| 27 | <b>B.Sc. T.Y.<br/>Fifth Sem.</b> | <b>Complex<br/>Analysis</b>        | <p>After completion of course students will be able to</p> <p>i) Apply basic properties of complex numbers.</p> <p>ii) Classify the sequences and series.</p> <p>iii) Determine the limit, continuity and derivative of complex valued function.</p> <p>iv) Analyze the properties of analytic function.</p> <p>v) Express complex exponential and trigonometric functions.</p>                                                                                                                                    |