M. S. P. Mandal's

Vinayakrao Patil Mahavidyalaya, Vaijapur

Department of Mathematics

Course Outcomes

Sr. No.	Class	Course Code	Course Name	Course Outcomes
01	F. Y. B. Sc.	MAT-101	Differential Calculus	**This course will empower the students to:** **CO1:** Understand functions, relations, types of functions, limit & continuity, theorems on limit and types of discontinuity. **CO2:** Work out the problems on partial derivative of a function of more than one variable using Leibnitz's theorem. **CO3:** Apply Rolle's Theorem, Lagrange's mean value theorem and Cauchy's mean value theorem to solve problems of different level. **CO4:** Find expansion of exponential, trigonometric and logarithmic functions using Taylor's and Maclaurin's theorem. **CO5:** Study different differential operators such as gradient, divergence and curl.

02		MAT-102	Differential equations	**This course will empower the students to:** **CO1:** Form the differential equation by eliminating arbitrary constants and functions. **CO2:** Find the solution of the first-order linear differential equation and exact differential equation. **CO3:** Obtain the solution of linear differential equation with constant coefficient and variable coefficients using general and short methods. **CO4:** Solve the linear homogeneous differential equation and study the formation of partial differential equation by eliminating the arbitrary constants and functions.

| 03 | | MAT-201 | Integral Calculus | **This course will empower the students to:**

CO1: Use reduction formulae to find the integration of some standard trigonometric functions.

CO2: Determine integration of algebraic rational functions in the case of repeated linear factors, non-repeated linear factors and linear or quadratic non-repeated factors.

CO3: Employ the fundamental theorem of integral calculus to find definite integrals as a limit sum.

CO4: Obtain the area bounded by a curve, length of the arc of a curve and line integral and surface integrals.

CO5: Study the theorems of Gauss, Green's and Stoke's and their applications in vector calculus. |

04		MAT-202	Analytical Geometry	**This course will empower the students to:** **CO1:** Obtain different forms of the equation of a plane and use these equations to solve problems. Also, find the equation of the system of planes and the length of perpendicular to a plane. **CO2:** Derive the equation of the right line, the angle between the plane and line, equation of two intersecting planes. **CO3:** Obtain condition for coplanar lines and the shortest distance between two coplanar lines. **CO4:** Determine the equations of the sphere, cones, cylinder and conicoids and their intersection with the plane.

05	S. Y. B. Sc.	MAT-301	Number theory	**This course will empower the students to:** **CO1:** Apply the division algorithm (Euclidean algorithm) to find the greatest common divisor of two or more than two integers and express it in a linear combination of them. **CO2:** Study method of solving linear Diophantine equation and Chinese remainder theorem to solve linear congruences. **CO3:** Explain Fundamental theorem of arithmetic, Fermat's, Wilson's, Euler's theorem and Mobius inversion formula. **CO4:** Study some number-theoretic functions and their properties.

| 06 | | MAT-302 | Integral transforms | **This course will empower the students to:**

CO1: Study applications of beta and gamma functions in evaluating integrals.

CO2: Define Laplace transform, inverse Laplace transform for different functions and their properties such as the convolution theorem.

CO3: Define Fourier transform, Fourier sine and cosine transform and different properties of these transforms.

CO4: Study applications of Laplace transform to solve ordinary and partial differential equations. |

07		MAT-303	Mechanics: I	**This course will empower the students to:** **CO1:** Study of triangle law of forces, Parallelogram law of forces, resultant of forces, resultant of several coplanar forces, equation of the line of action of the resultant, equilibrium of a rigid body under more than two coplanar forces sine rule and cosine rule, etc. **CO2:** Abel to understand the equilibrium of forces acting on the particle, Lammi's theorem and polygon of forces. **CO3:** Understand centroid of weighted point, the centre of gravity, the centre of gravity of some uniform bodies and their applications.

| 08 | | MAT-401 | Numerical analysis | **This course will empower the students to:**

CO1: Abel to apply Bisection Method, Method of False Position, Newton-Raphson Method and Newton's generalized method to find the root of linear and non-linear equations.

CO2: Study definitions of different Finite Differences and interpolation with equally spaced points and unequally spaced points.

CO3: Understand the Least Square method for fitting a straight line, second-degree polynomial and other non-linear equations.

CO4: Study of Chebyshev polynomial and economization of Power series.

CO5: Solve the ordinary differential equation by using Taylor's series Method, Picard's Method, Euler's Method and Runge-Kutta second-order and fourth-order method. |

09		MAT-402	Partial differential equations	**This course will empower the students to:** **CO1:** Form partial differential equation by eliminating arbitrary constants and functions and solve Lagrange's equation. **CO2:** Define complete integral, Singular integral and general integral. **CO3:** Solve partial differential equations using Charpit's Method and Jacobi's method. **CO4:** Study Monge's Method to solve an equation Rr+Ss+Tt=V, Method of transformation(Canonical Forms)

10		MAT-403	Mechanics: II	**This course will empower the students to:** **CO1:** Study velocity, acceleration, angular speed, angular velocity, radial component transverse component, areal speed and areal velocity. **CO2**: Understand angular momentum, work, energy, vector point function, motion under gravity, projectile, Motion of projectile. **CO3:** State Newton's Law of motion and its applications.

11	T. Y. B. Sc.	MAT-501	Real analysis: I	**This course will empower the students to:** **CO1:** Explain basic concepts such as sets, functions, real-valued functions, countable sets, Least upper Bound and greatest lower bound. **CO2:** Understand the definition of sequence and subsequence, Limit of a sequence, Convergent sequence, Divergent Sequence, Bounded sequences, Monotone Sequences, Operations on Convergent Sequences, Operations on divergent sequences, limit superior and limit inferior and Cauchy Sequence. **CO3:** Study Convergence and divergence, Series with non-negative terms, Alternating series, Conditional convergence and absolute convergence, Case of the function of functions, Jacobian of Implicit functions, Jacobian of Implicit functions and Theorems on Jacobians.

12		MAT-502	Abstract algebra: I	**This course will empower the students to:** **CO1:** Explain basic concepts such as sets, functions, partial order relations and binary operation. **CO2:** Understand the definition of a group, some examples of groups, some preliminary Lemmas on the group, automorphism, another counting principle, subgroups, cyclic groups, a counting principle. normal and quotient groups group homomorphisms, group isomorphisms and group automorphisms. **CO3:** Study definition of Ring, special classes of the ring, ring homomorphisms, Ideals & quotient rings, more Ideals & quotient rings and polynomial rings.

13			MAT-503	Mathematical statistics: I	**This course will empower the students to:** **CO1:** Study frequency distribution, histogram, measures of central tendency. **CO2:** Understand dispersion and Kurtosis, random variables and their characteristics. **CO3:** Apply probability techniques in general problems.

14		MAT-601	Real analysis: II	**This course will empower the students to:** **CO1:** Study metric spaces, limits in metric spaces and functions continuous on metric spaces. **CO2:** Define Connectedness, completeness, compactness and bounded & totally bounded sets. **CO3:** Prove theorems on connectedness, completeness, compactness and bounded & totally bounded sets. **CO4:** Study continuous functions on compact metric spaces and uniform continuity. **CO5:** Explain sets of measure zero, the definition of Riemann integral, the existence of Riemann integral, properties of Riemann integral, fundamental theorem of calculus and Fourier series.

| 15 | | MAT-602 | Abstract algebra: II | **This course will empower the students to:**

CO1: Study some elementary basic concepts of vector spaces.

CO2: Study Linear independence, bases and Dual spaces.

CO3: Understand Inner product spaces, Graham Schmidt orthogonalization and modules. |

16		MAT-603	Mathematical statistics: II	**This course will empower the students to:** **CO1:** Understand mathematical expectation, generating functions and discrete probability distribution. **CO2:** Study different types of distribution such as uniform distribution, binomial distribution, Normal Distribution and Gamma distribution. **CO3:** Employ correlation coefficient and regression analysis to solve different types of statistical problems.