

FYUGP Mathematical Sciences (Batch 2024 and Onwards)

Course Outline for Semester II (Batch 2024)

S. No.	Category	Course Code	Course Title	Credits	L	T	P	S	Hours per week
1	Major	MTHS150MJ	Calculus	4	4	x	x	x	4
2	Minor 2		Students to choose	4					
4	Multidisciplinary		Student to choose	3	3	x	x	x	3
5	Ability Enhancement		Urdu/Hindi Language	3	3	x	x	x	3
6	Skill Enhancement		Student to choose	2	3	x	x	x	3
7	Value-added		Understanding India	2	2	x	x	x	2
			Environmental Sciences	2	2	x	x	x	2

Course Title: Calculus	L	T	P	S	Semester: 2nd
Course Code: MTHS150MJ	4	x	x	x	Max Marks: 100
Credits: 4					

Course Objective: To explore and comprehend the concepts of limits, continuity, differentiability, and integrability, and to develop the ability to apply these techniques in various fields of science and engineering, as well as to equip students with the foundational knowledge required for pursuing advanced studies in mathematics.

Course Outcomes: Upon successful completion of the course, students will be able to:

- (i) Apply differential operators to analyze and interpret the dynamics of various real-life situations.
- (ii) Apply differential calculus for optimization and integral calculus for area estimation and complex problem solving.

Unit-I: Limits: Definition and existence of a limit with examples, indeterminate forms, algebra of limits, continuity of function at a point, ϵ - δ definitions of a limit and continuity, discontinuity and types of discontinuities, Differentiability of a functions, rules of differentiation, Successive differentiation and Leibnitz theorem.

Unit-II: Rolle's theorem and mean value theorems with their geometrical interpretations, Taylor's theorem with Lagrange's and Cauchy's form of remainder, Taylor's series, Maclaurin's series, applications of derivatives(slopes, maxima and minima with applications like maximizing profit & minimizing cost, increasing and decreasing functions, how derivatives affect the shape of a graph).

Unit-III: Differential equation: Definition and formation, order, degree, linear and non-linear differential equations, solution of first order linear differential equations and integrating factors, exact differential equations, necessary and sufficient condition for exactness, applications of differential equations (exponential growth and decay problems, optimization problems).

Unit-IV: Antiderivative: Definition and examples, techniques of integration (substitution and partial fractions), definite integrals with properties and evaluation, definite integral as a limit of sum(concept of area under the curve), differentiation under integral sign, Rectification: rules for curve tracing, formula for rectification and examples, introduction to beta and gamma functions (properties, relation and application).

Text Books/ References

1. James Stewart , Calculus, Early Transcendentals, Seventh Edition Metric Version, Cengage Learning, Inc. 2010.
2. T.M. Apostol, Calculus Vol. I, John Wiley & Sons Inc, 1975.
3. G.B.Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
4. Shanti Narayan and P.K. Mittal, Differential Calculus, S. Chand, 2016.
5. Shanti Narayan and P.K. Mittal, Integral Calculus, S. Chand, 2005.