Course Code	MTH203
Course Name	Mathematics III (Multivariate Calculus)
Credits	4
Course Offered to	UG
Course Description	This course covers topics in multivariable calculus, vector calculus and complex analysis. The course starts with an extension of concepts like limits, continuity and differentiation to functions of several variables. Partial differentiation is defined and applied. The idea of Taylor series is extended to functions of two variables. This is followed by a definition and application of integration in more than one dimensions: double and triple integrals. We then work with vector functions and develop the ideas of vector fields and differentiation and integration as applicable to vector calculus (gradient, divergence, curl, line and surface integrals, etc. The ideas of circulation and flux are developed and Green's, Stoke's and divergence theorems are covered. The final module of the course deals with complex numbers and functions and an extension of concepts of calculus to complex variables.

Pre-requisites			
Pre-requisite (Mandatory)	**Pre-requisite (Desirable)**	**Pre-requisite(other)**	
*Please insert more rows if required			

Post Conditions*(For suggestions on verbs please refer the second sheet)			
CO1	**CO2**	**CO3**	**CO4**
Students are able to apply concepts of continuity, differentiability, extrema and integrability of multivariable functions and evaluate various integrals (line, double, triple and surface integrals).	Students are able to work with vector fields, evaluate line and surface integrals, calculate quantities such as work, circulation and flux across plane curves and surfaces, be able to carry out vector derivative operations such as gradient, divergence and curl and understand and apply Green's, Stoke's and divergence theorems.	Students are able to evaluate derivatives and integrals of complex functions, including the applications of Cauchy's theorem.	Students are able to determine convergence of complex series and power series and understand and apply Taylor series to represent complex functions.

Weekly Lecture Plan			
Week Number	**Lecture Topic**	**COs Met**	**Assignment/Labs/Tutorial**
Week 1	Functions of several variables, limits and continuity in higher dimensions, partial derivatives, chain rule.	CO1	
Week 2	Directional derivatives and gradient vectors, tangent planes and differentials, extreme values and saddle points.	CO1	HW1
Week 3	Lagrange multipliers, partial derivatives with constrained variables, Taylor's formula for two variables.	CO1	HW2

Week 4	Double integrals, Areas, moments and center of mass, Double integrals in polar form, triple integrals in rectangular coordinates.	CO1	HW3
Week 5	Masses and moments in three dimensions, triple integrals in cylindrical and spherical coordinates, substitutions in multiple integrals.	CO1	HW4
Week 6	Vectors in space, dot product, cross product, lines and planes in space; vector functions.	CO2	HW5
Week 7	Arc length and the unit tangent vector, curvature and the unit normal vector, torsion and the unit binormal vector.	CO2	HW6
Week 8	Line integrals, vector fields, gradient of a scalar field, work, circulation, flux, path independence, potential functions, conservative fields, divergence and curl of a vector field, Green's theorem.	CO2	HW7
Week 9	Surface area and surface integrals, parametrized surfaces, Stoke's theorem, Divergence theorem.	CO2	HW8
Week 10	Complex numbers, polar form, derivatives, analytic functions, Cauchy-Riemann equations.	CO3	HW9
Week 11	Exponential functions, trigonometric and hyperbolic functions, logarithms, general power.	CO3	HW10
Week 12	Complex integration, line integrals, Cauchy's theorem, Cauchy's integral formula, derivatives of analytic fucntions.	CO3	HW11
Week 13	Sequences, series, convergence tests, power series, functions given by power series, Taylor series.	CO4	HW12

*Please insert more rows if required

Weekly Lab Plan			
Week Number	**Laboratory Exercise**	**COs Met**	**Platform (Hardware/Software)**

*Please insert more rows if required

Assessment Plan	
Type of Evaluation	**% Contribution in Grade**
Quiz 1	10
Midsem	30
Quiz 2	10

Endsem	40
Homeworks (best 10 out of 12)	10
*Please insert more row for other type of Evaluation	

Resource Material	
Type	**Title**
Textbook 1	Thomas' Calculus (11th Edition) by Murice D. Weir, Joel Hass, Frank R. Giordano.
Textbook 2	Advanced Engineering Mathematics (9th Edition) by Erwin Kreyszig.