Faculty	Natural Sciences
Home Department	Mathematics and Applied Mathematics
Module Topic	Advanced Calculus and Linear Algebra
Generic Module Name	Mathematics 211
Alpha-numeric Code	**MAT211**
NQF Level	6
NQF Credit Value	20
Duration	Semester
Proposed semester to be offered	First Semester
Programmes in which the module will be offered	BSc (Mathematical and Statistical Sciences) (3227, 3031) BSc (Chemical Sciences) (3220, 3019) BSc (Physical Science) (3233, 3120) BSc (Computer Science) (3221,3023)
Year level	2
Main outcomes:	On completion of this module students should be able to: Advanced Calculus • Know how to use the Principle of Mathematical Induction to prove statements. • Understand infinite sequences and series; be familiar with different tests for convergence of sequences and series. • Perform power series expansion of functions and find its interval and radius of convergence. • Use functions of several variables, surfaces and coordinate transformations, contours, level surfaces and traces. • Determine tangent planes and linear approximations, partial differentiation, implicit differentiation, limits, continuity and differentiability of functions of several variables. • Use Lagrange multipliers, maxima and minima, Second derivative test for functions of several variables, chain rule for functions of several variables. • Perform double and triple integrals, iterated integrals, surface integrals, the Jacobian, change of variables for double and triple integrals. Linear Algebra • Comprehend basic concepts associated with vectors, linear equations, matrices, linear transformations and eigenvectors and eigenvalues. • Analyse arguments in the above contexts. • Construct counter-examples in the above contexts. • Structure logically valid arguments in the above contexts.
Main content:	**Paper 1 (Advanced Calculus)** • Induction, Sequences. • Infinite series (convergence tests, alternating series, conditional convergence, power series, Taylor & Maclaurin Series). • Limits, continuity and differentiability of functions of several variables. • Quadric surfaces, polar coordinates and parametric equations, spherical and cylindrical coordinates. • Partial derivative (chain rule, maxima and minima of functions of two variables, Lagrange Multipliers). • Multiple Integrals, surface integrals, multiple integrals in

	polar, spherical and cylindrical coordinates. **Paper 2 (Linear Algebra)** • Homogeneous and non-homogeneous systems of linear equations. • Matrices and their inverses. • Vector spaces and subspaces. • Determinants. • Linear transformations. • Eigenvectors and eigenvalues			
Pre-requisite modules	MAT105 or (MAT103 and MAT104) or (MAM151 and MAM152)			
Co-requisite modules	None			
Prohibited module Combination	None			
Breakdown of Learning Time	**Hours**	**Timetable Requirement per week**		**Other teaching modes that does not require time-table**
Contact with lecturer / tutor:	84	*Lectures p.w.*	3	
Assignments & tasks:	0	*Practicals p.w.*	3	
Assessment	10	*Tutorials p.w.*	1	
Practicals:	0			
Selfstudy	60			
Other: Please specify Tutorials	46			
Total Learning Time	**200**			
Methods of Student Assessment	Continuous Assessment (CA): 60% Final Assessment (FA): 40%			
Assessment Module type	Continuous and Final Assessment (CFA)			