

Faculty	Natural Sciences
Home Department	Mathematics and Applied Mathematics
Module Topic	Advanced Calculus and Linear Algebra
Generic Module Name	Mathematics 221
Alpha-numeric Code	MAT221
NQF Level	6
NQF Credit Value	20
Duration	Semester
Proposed semester to be offered	Second 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:	<p>On completion of this module students should be able to:</p> <p>Vector Calculus</p> <ul style="list-style-type: none"> • Perform basic operations in Vector Algebra. • Determine vector function, tangent vector, acceleration, TNB-frame and osculating plane. • Evaluate and interpret line integrals. • Understand Independence of Path. • Be familiar with the properties of vector fields, as well as grad, div and curl differential operators. • Use Green's Theorem to evaluate line integrals and double integrals. • Apply Stokes' Theorem to vector fields. • Understand Surface Independence. • Use the Divergence Theorem to evaluate surface integrals, volume integrals and the flux of a vector field across a surface. • Solve integral problems in mechanics. <p>Algebraic Structures</p> <ul style="list-style-type: none"> • Comprehend basic concepts associated with sets, relations, functions, groups, rings, and fields. • Analyse arguments in the above contexts. • Construct counter-examples in the above contexts. <p>Structure logically valid arguments in the above contexts</p>
Main content:	<p>Paper 1 (Vector Calculus)</p> <ul style="list-style-type: none"> • Vector Algebra and vector function of curves and surfaces • TNB – frame and osculating plane • Vector fields • Line integrals and independence of path • Green's Theorem • Grad div and curl • Surface integrals and flux • Stokes' Theorem • Divergence theorem • Applications to gravity, electromagnetism, fluid flow and heat <p>Paper 2 (Algebraic Structures)</p> <ul style="list-style-type: none"> • Sets, relations and functions • Integers, rational numbers, and real numbers • Introduction to groups, rings and fields
Pre-requisite modules	None

Co-requisite modules	MAT211		
Prohibited module Combination	None		
Breakdown of Learning Time	Hours	Timetable Requirement per week	Other teaching modes that does not require time-table
<i>Contact with lecturer / tutor:</i>	78	<i>Lectures p.w.</i>	6
<i>Assignments & tasks:</i>	18	<i>Practicals p.w.</i>	0
<i>Assessment</i>	18	<i>Tutorials p.w.</i>	2
<i>Practicals:</i>	0		
<i>Selfstudy</i>	60		
<i>Other: Tutorials</i>	26		
Total Learning Time	200		
Methods of Student Assessment	Continuous Assessment (CA): 60% Final Assessment (FA): 40%		
Assessment Module type	Continuous and Final Assessment (CFA)		