

<b>Module code</b>	SM-2202		
<b>Module Title</b>	Multivariate Calculus		
<b>Degree/Diploma</b>	Bachelor of Science (Mathematics)		
<b>Type of Module</b>	Major Core		
<b>Modular Credits</b>	4	<b>Total student Workload</b>	10 hours/week
		<b>Contact hours</b>	4 hours/week
<b>Prerequisite</b>	SM-1202 Advanced Mathematical Methods for the Sciences		
<b>Anti-requisite</b>	None		
<b>Aims</b>			
The module is designed to introduce students who are majoring in mathematics to various topics in the calculus of functions of two or more variables.			
<b>Learning Outcomes</b>			
<i>On successful completion of this module, a student will be expected to be able to:</i>			
Lower order :	30%	- calculate the partial derivatives of functions of two or three variables; evaluate double and triple integrals in Cartesian, cylindrical and spherical coordinates; perform standard transformations of variables in multiple integrals; calculate the gradient of a scalar function and curl and divergence of a vector function	
Middle order :	60%	- reverse the order of integration in a double integral; use integration to calculate areas, volumes and related quantities; use vector functions to formulate and evaluate line and surface integrals; apply potential theory to evaluate line integrals involving conservative vector fields; use Green's theorem in the plane to transform between line and area integrals	
Higher order:	10%	- use partial differentiation to solve selected problems in error estimation and optimisation theory - work independently	
<b>Module Contents</b>			
- Partial Differentiation: Functions of two or more variables; partial derivatives and their geometric interpretation with applications to surfaces and equations of the tangent and normal planes; errors and their approximation; maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers.			
- Multiple Integrals: Double and triple integrals; change of the order of integration in double integrals; cylindrical and spherical coordinate systems; use of the Jacobian to transform the independent variables in a multiple integral; application of multiple integrals to evaluate surface areas and volumes, mass, centre of gravity and moment of inertia.			
- Vector Calculus: Vector functions; gradient, divergence and curl; integration of vector point functions; line and surface integrals; conservative vector fields, independence of path and elementary potential theory; Green's theorem in the plane			
<b>Assessment</b>	Formative assessment	Tutorial and feedback.	
	Summative assessment	Examination: 60% Coursework: 40% - 2 class tests (40%)	