

<b>Faculty</b>	Natural Sciences		
<b>Home Department</b>	Mathematics and Applied Mathematics		
<b>Module Topic</b>	Real Analysis and Modern Algebra		
<b>Generic Module Name</b>	Real Analysis and Modern Algebra 311		
<b>Alpha-numeric Code</b>	<b>MAT311</b>		
<b>NQF Level</b>	7		
<b>NQF Credit Value</b>	30		
<b>Duration</b>	Semester		
<b>Proposed semester to be offered</b>	First Semester		
<b>Programmes in which the module will be offered</b>	Mathematical and Statistical Sciences, Physical Science, Computer Science		
<b>Year Level</b>	3rd		
<b>Main Outcomes</b>	<p>On completion of this module students should be able to:</p> <ul style="list-style-type: none"> <li>• Explain the notions of open subset, boundedness and finiteness, connectedness and compactness in Euclidean space.</li> <li>• Explain the notions of continuity and uniform continuity of functions between subspaces of Euclidean space, and in relation to sequences, compactness and connectedness.</li> <li>• Use their knowledge of the basic theory of groups to provide examples and counter-examples of various concepts.</li> <li>• Carry out proofs of mathematical statements.</li> <li>• Use new knowledge in unfamiliar but similar situations.</li> </ul>		
<b>Main Content</b>	<p>Paper 1</p> <ul style="list-style-type: none"> <li>• Bounded subsets of real numbers</li> <li>• Suprema, Supremum property, Existence of irrational roots</li> <li>• Inner product and normed spaces</li> <li>• Open sets, Nested cells theorem, Cluster point</li> <li>• Bolzano-Weierstrass theorem (for sets), Compactness</li> <li>• Heine-Borel theorem, Connectedness</li> <li>• Sequences, Convergence and subsequences, Monotone convergence theorem, Bolzano-Weierstrass theorem for sequences, Cauchy sequences, global continuity theorem</li> <li>• Preservation of compactness and connectedness <ul style="list-style-type: none"> <li>•Uniform continuity, Fixed point theorems</li> </ul> </li> </ul> <p>Paper 2</p> <ul style="list-style-type: none"> <li>• Operations, Groups &amp; subgroups, Normal subgroups and factor groups, Cyclic groups, Homomorphisms &amp; fundamental homomorphism theorem, Permutation groups, Cayley's theorem</li> </ul>		
<b>Pre-requisite modules</b>	MAT211 and MAT221		
<b>Co-requisite modules</b>	None		
<b>Prohibited module Combination</b>	None		
<b>Breakdown of Learning Time</b>	<b>Hours</b>	<b>Time-table Requirement per week</b>	<b>Other teaching modes that does not require time-table</b>
<i>Contact with lecturer / tutor:</i>	39	Lectures p.w.	3
<i>Assignments &amp; tasks:</i>	40	Practicals p.w.	2
<i>Practicals:</i>	78	Tutorials p.w.	
<i>Assessments:</i>	23		
<i>Self-study:</i>	120		
<i>Other:</i>	0		
<b>Total learning time:</b>	<b>300</b>		

<b>Method of Student Assessment</b>	Continuous Assessment (CA): 50% Final Assessment (FA): 50%
<b>Assessment Module Type</b>	Continuous and Final Assessment (CFA)