

Faculty	Natural Sciences		
Home Department	Mathematics & Applied Mathematics		
Module Topic	Computational Linear Algebra		
Generic Module Name	Computational Linear Algebra 728		
Alpha-numeric Code	MAM728		
NQF Level	8		
NQF Credit Value	15		
Duration	Semester		
Proposed semester to be offered.	First or Second Semester		
Programmes in which the module will be offered	BSc Hons (Mathematical Science) (3736); BSc Hons (Computational Finance) (3739) BSc Hons (Computer Science) (3735)		
Year level	7		
Main Outcomes	<p>On completion of this module students should be able to:</p> <ul style="list-style-type: none"> • A strong foundation in computational methods in Numerical Linear Algebra. • Proficiency in the use of MATLAB for solving problems in Numerical Methods. 		
Main Content	<ul style="list-style-type: none"> • INTRODUCTION TO MATLAB • MATRIX FACTORIZATIONS: LU-factorization, QR-factorization, Cholesky factorization . • MATRIX AND VECTOR NORMS: Properties of the $\ \cdot\ _1$, $\ \cdot\ _2$ and $\ \cdot\ _\infty$ norms of vectors in \mathbb{R}^n Properties of the $\ \cdot\ _1$, $\ \cdot\ _2$, $\ \cdot\ _\infty$ and $\ \cdot\ _F$ norms of an $m \times n$ matrix. • ERROR ANALYSIS OF LINEAR SYSTEMS: The Condition Number of a Matrix. Ill-Conditioned systems. Perturbation Analysis of Linear Systems. • CURVE FITTING AND APPROXIMATION OF FUNCTIONS: Least-squares approximations of over-determined and under-determined systems. Least-squares approximation of continuous functions; The Hilbert Matrix. Piece-wise polynomial interpolation • ITERATIVE METHODS FOR LINEAR SYSTEMS: The Jacobi and Gauss-Seidel Methods. The SOR method. Applications to the solution of linear systems with banded coefficient matrices. • THE SINGULAR VALUE DECOMPOSITION (SVD) The singular value decomposition of an $m \times n$ matrix. The Moore-Penrose Inverse. Rank k approximation of a matrix. 		
Pre-requisite modules	None		
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
<i>Contact with lecturer / tutor:</i>	30	<i>Lectures p.w.</i>	2
<i>Assignments & tasks:</i>	25	<i>Practicals p.w.</i>	1
<i>Practicals:</i>	15	<i>Tutorials p.w.</i>	0
<i>Tutorials:</i>	0		
<i>Assessments:</i>	8		
<i>Selfstudy:</i>	72		

<i>Other:</i>	0		
Total Learning Time	150		
Methods of Student Assessment	Continuous Assessment (CA): 60% Final Assessment (FA): 40%		
Assessment Module type	Continuous and Final Assessment (CFA)		