<table>
<tr><th>No.</th><th>Course Information</th></tr>
<tr><td>1.</td><td>Name and Code of Course: UDPS1013 LINEAR ALGEBRA</td></tr>
<tr><td>2.</td><td>Synopsis: This subject serves as an introduction to the most basic concepts in linear algebra. The vector spaces within which the general ideas are developed are all real vector spaces, R^n. The course will develop basic skills in computing with vectors and matrices. The topics to be discussed in this unit are vectors, matrices, determinants, eigenvalues and eigenvectors, vector spaces, matrix games and orthogonality.</td></tr>
<tr><td>3.</td><td>Name(s) of Academic Staff: Chin Fung Yuen, Lem Kong Hoong</td></tr>
<tr><td>4.</td><td>Trimester and Year Offered: 1/1</td></tr>
<tr><td>5.</td><td>Credit Value: 3</td></tr>
<tr><td>6.</td><td>Pre-requisite/Co-requisite (if any): None</td></tr>
<tr><td>7.</td><td>Couse Classification: Major</td></tr>
<tr><td>8.</td><td>Course Learning Outcomes (CLO):
CLO 1 – Solve problems related to structures of vector spaces using linear techniques and linear transformation
CLO 2 – Compute eigenvalues and eigenvectors of a matrix
CLO 3 – Solve least squares problem
CLO 4 – Solve the matrix game problem</td></tr>
<tr><td>9.</td><td>Mapping of the Course Learning Outcomes to the Programme Learning Outcomes, Teaching Methods and Assessment:
<table>
<tr><th rowspan="2">Course Learning Outcomes (CLO)</th><th colspan="8">Programme Learning Outcomes (PLO)</th><th rowspan="2">Teaching Methods</th><th rowspan="2">Assessment</th></tr>
<tr><th>PLO 1</th><th>PLO 2</th><th>PLO 3</th><th>PLO 4</th><th>PLO 5</th><th>PLO 6</th><th>PLO 7</th><th>PLO 8</th></tr>
<tr><td>CLO 1</td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Lecture/ Tutorial</td><td>Test/ Quiz/ Assignment/ Final exam</td></tr>
<tr><td>CLO 2</td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Lecture/ Tutorial</td><td>Test/ Quiz/ Assignment/ Final exam</td></tr>
<tr><td>CLO 3</td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Lecture/ Tutorial</td><td>Test/ Quiz/ Assignment/ Final exam</td></tr>
<tr><td>CLO 4</td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Lecture/ Tutorial</td><td>Test/ Quiz/ Assignment/ Final exam</td></tr>
<tr><td>TOTAL</td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Indicate the primary causal link between the CLO and PLO by ticking "√" the appropriate box.</td></tr>
<tr><td>10.</td><td>Transferable Skills (if applicable): Practical/Technical Skills</td></tr>
<tr><td>11.</td><td>Distribution of Student Learning Time (SLT):</td></tr>
</table>

Course Content Outline	CLO	Teaching and Learning Activities						Total SLT
		Guided Learning (F2F)				Guided Learning (NF2F) eg: e-Learning	Independant Learning (NF2F)	
		L	T	P	O			
1. **Linear Equations** • Systems of linear equations • Row reduction and echelon forms • Vector equations • The matrix equation • Solution sets of linear systems • Linear independence • Introduction to linear transformations	1	7	2	-	-	3	7	19
2. **Matrix Algebra** • Matrix Operation • The inverse of a matrix • Characterizations of invertible matrices	1	4	1	-	-	2	4	11
3. **Determinants, Eigenvalues and Eigenvectors** • Introduction to determinants • Properties of determinants • Eigenvectors and eigenvalues • The characteristic equation Diagonalization	2	5	1	-	-	2	6	14
4. **Vector Spaces** • Vector spaces and subspaces • Null spaces, column spaces, and linear transformations • Linear independent sets; bases • Coordinate systems • The dimension of a vector space • Rank	1	6	2	-	-	3	6	17
5. **Orthogonality** • Inner product, length, and orthogonality • Orthogonal sets • Orthogonal projections • Least- squares problems	3	5	2	-	-	2	5	14
6. **Optimization, Finite- State Markov Chains** • Matrix games • The steady- state vector and Google's PageRank • Communication Classes	4	5	2	-	-	2	5	17
Total Notional Hours		**32**	**10**	**-**	**-**	**-**	**47**	**89**

	Continuous Assessment	**CLO**	**Percentage (%)**	**F2F**	**NF2F**	**Total SLT**
	Tests/ Quiz/ Assignment	1-4	40	3	9	**12**
	Final Assessment	**CLO**	**Percentage (%)**	**F2F**	**NF2F**	**Total SLT**
	Final Exam	1-4	60	6	13	19
	GRAND TOTAL SLT					**120**

** Please tick (✓) if this course is Industrial Training / Clinical Placement / Practicum / WBL using 2-week, 1 credit formula ☐

L= Lecture; T= Tutorial; P=Practical; O=Others; F2F= Face to Face; NF2F= Non Face to Face ☐

12.	Special Requirement or Resources to Deliver the Course (e.g., software, nursery, computer lab, simulation room): None
13.	• Main References: 1. David C. Lay (2016). *Linear algebra and its applications.* (5th ed.). Addison- Wesley, Pearson Education. 2. Friedberg, S. H., Insel, A. J., Spence, L. E. (2008). *Elementary linear algebra: A matrix approach.* (2nd ed.). Upper Saddle River, N. J.: Prentice Hall/Pearson Education. 3. Poole, D. (2006). *Linear algebra: A modern introduction.* (2nd ed.). Belmont, CA: Thomson/Brooks/Cole Publishing. • Additional References: 4. Anton, H., & Busby, R. C. (2003). *Contemporary linear algebra.* Hoboken, N. J.: John Wiley & Sons. (References should be the most current)
14.	Other Additional Information: Nil
15.	Date of Senate Approval: 4 January 2018