

COURSE TEMPLATE

1.	Department/Centre proposing the course	Mathematics
2.	Course Title (<i>< 45 characters</i>)	LINEAR ALGEBRA
3.	L-T-P structure	3-1-0
4.	Credits	4
5.	Course number	MAL 255
6.	Status (<i>category for program</i>)	Core for students of B.Tech in Maths and Computing - Program-Linked BS course for other depts.

7.	Pre-requisites (<i>course no./title</i>)	MAL120 (Linear Alg and Diff Eqns)
----	--	-----------------------------------

8.	Status vis-à-vis other courses (<i>give course number/title</i>)	
8.1	Overlap with any UG/PG course of the Dept./Centre	Yes. 5% with MAL120
8.2	Overlap with any UG/PG course of other Dept./Centre	No
8.3	Supercedes any existing course	NO

9.	Not allowed for (<i>indicate program names</i>)	Nil
----	---	-----

10.	Frequency of offering	☐ Every sem ☒ 1 st sem ☐ 2 nd sem ☐ Either sem
-----	------------------------------	---

11.	Faculty who will teach the course to be filled later	
-----	--	--

12.	Will the course require any visiting faculty?	No
-----	--	----

13.	Course objective (<i>about 50 words</i>): This is undergraduate linear algebra course for those who require linear algebra beyond introduction.	
-----	---	--

14.	Course contents (<i>about 100 words</i>) (<i>Include laboratory/design activities</i>): Fields, Vector spaces over an arbitrary field, basis and dimension. Examples of infinite dimensional vector spaces. Linear transformation, its matrix representation, change of basis, rank-nullity theorem. Dual and double dual of a vector space and transpose of a linear transformation. The characteristic and minimal polynomials, eigenvalues, eigenvectors. Diagonalizability of linear operators of finite dimensional vector spaces. Subspaces invariant under a linear transformation, simultaneous triangulation and simultaneous diagonalization. The primary decomposition theorem - the diagonal and nilpotent parts. Inner product spaces, Gram-Schmidt orthogonalization, orthogonal complement of a subspace, adjoint of an operator. Hermitian, unitary and normal operators. Spectral decomposition. Introduction to	
-----	---	--

	bilinear and quadratic forms.
--	-------------------------------

15. Lecture Outline (with topics and number of lectures)

Module no.	Topic	No. of hours
1	Fields, characteristic of a field. Examples of fields of characteristic zero and p .	3
2	Vector spaces over an arbitrary field, basis and dimension. Examples of infinite dimensional vector spaces.	3
3	Linear transformation, its matrix representation, change of basis, rank-nullity theorem.	3
4	Dual and double dual of a vector space and transpose of a linear transformation.	2
5	The characteristic and minimal polynomials, eigenvalues, eigenvectors.	2
6	Diagonalizability of linear operators of finite dimensional vector spaces.	3
7	Subspaces invariant under a linear transformation, simultaneous triangulation and simultaneous diagonalization.	4
8	The primary decomposition theorem - the diagonal and nilpotent parts.	3
9	Inner product spaces, Gram-Schmidt orthogonalization, orthogonal complement of a subspace, adjoint of an operator.	6
10	Hermitian, unitary and normal operators.	5
11	Spectral decomposition.	4
12	Introduction to bilinear and quadratic forms.	4
COURSE TOTAL (14 times 'L')		42

16. Brief description of tutorial activities

Problem sheets will be distributed in advance and students are expected to attempt the problems using the concepts learned in the lectures. During the tutorial hours teachers will help the students to clear doubts and to solve the difficult problems if any.

17. Brief description of laboratory activities

Module no.	Experiment description	No. of hours
1	No Labs.	
2		
3		
4		
5		
6		
7		
8		
9		
10		
COURSE TOTAL (14 times 'P')		

18. Suggested texts and reference materials

STYLE: Author name and initials, Title, Edition, Publisher, Year.

1. Kenneth M. Hoffman and Ray Kunze, Linear Algebra, 2nd Edition, Prentice Hall, 1971.
2. Serge Lang, Linear Algebra (undergraduate text in mathematics), 3rd Edition, Springer, 1987.

--

19. Resources required for the course (*itemized & student access requirements, if any*)

19.1	Software	Nil
19.2	Hardware	Nil
19.3	Teaching aides (videos, etc.)	Nil
19.4	Laboratory	Nil
19.5	Equipment	Nil
19.6	Classroom infrastructure	Mike, Tablet PC and Projector.
19.7	Site visits	Nil

20. Design content of the course (*Percent of student time with examples, if possible*)

20.1	Design-type problems	Nil
20.2	Open-ended problems	Nil
20.3	Project-type activity	Nil
20.4	Open-ended laboratory work	Nil
20.5	Others (please specify)	Nil

Date: 28th February, 2013


 (Signature of the Head of the Department)