

Course Outline

Program	BS Solid State Physics	Course Code	SSP-202	Credit Hours	2 (2-0)
Course Title	Linear Algebra				
Course Introduction					
<p>This course is about linear combinations. It involves vectors, matrices, vector spaces, matrix spaces, sets of linear equations and linear transformations involved in the spaces. It involves solving system of linear equations by using vector and matrix properties. It has many applications such as in artificial intelligence, error correcting algorithms, search engine algorithms, etc.</p>					
Learning Outcomes					
<p>Following objectives are expected at the end of this course:</p> <ol style="list-style-type: none"> 1. Learning the concepts of system of linear equations and matrices. 2. Learning the working principles in Euclidean vector spaces 3. Learning the methodology of general vector spaces 4. Having the grip of understanding eigen value problems 5. Understanding linear transformations in general way 6. Learning the concepts of similarity transformations 					
Course Content					
Week 1	Course Introduction involving its scope and applications, etc.				
	System of Linear equations and matrices: Introduction, Gaussian elimination method				
Week 2	Matrices and Matrix operations				
	Inverse of Matrix, Algebraic properties of matrices				
Week 3	Elementary matrices, and methods of finding inverse				
	Diagonal, triangular, and symmetric matrices				
Week 4	Applications of linear systems				
	Determinants by Cofactor expansion				
Week 5	Evaluating determinant by row reduction				
	Properties of determinants				
Week 6	Cramer's rule				
	Euclidean vector spaces: vector in 2D, 3D, nD space				
Week 7	Euclidean vector spaces: Norm, Dot product and distance in \mathbb{R}^n				
	Cross product				
Week 8	General Vector Spaces: Real vector spaces				

	Subspaces		
Week 9	Linear independence		
	Coordinates and basis, Dimension		
Week 10	Change of basis		
	Linear operators		
Week 11	matrix representation of linear operators		
	Matrix Transformations from \mathbb{R}^n to \mathbb{R}^m		
Week 12	Eigen values and eigen vectors: Definitions		
	Diagonalization		
Week 13	Complex vector spaces		
	Inner Product Spaces: Inner product		
Week 14	Inner Product Spaces: Gram-Schmidt process; QR Decomposition		
	Inner Product Spaces: Orthogonal Matrices		
Week 15	Inner Product Spaces: Diagonalization of orthogonal matrices		
	General linear transformations		
Week 16	Matrices for general linear transformation		
	Similarity transformation		
Textbooks and Reading Material			
Recommended Books:			
<ol style="list-style-type: none"> 1. Elementary Linear Algebra (11th edition), Howard Anton, <i>John Wiley & Sons</i> (2013). 2. Foundations of Mathematical Physics, Sadri Hassani, <i>Prentice-Hall International</i> (1991). 3. Linear Algebra, G. Hadley, <i>Addison-Wesley</i> (1987). 4. Elements of Modern Algebra (8th edition), L. Gilbert and G. Gilbert, <i>Cengage Learning</i> (2014). 			
Teaching Learning Strategies			
<ol style="list-style-type: none"> 1. Instructor will provide mathematical details of linear algebra concepts so that students can better grip the concepts involved. 2. Instructor can use the software and multimedia technology to better highlight the linear algebra concepts. 3. Students will learn the concepts by practicing the mathematical details and then will solve the exercise problems assigned by the instructor. 4. Students can use software technology to better understand the linear algebra concepts. 			
Assignments: Types and Number with Calendar			
At least two assignments and two quizzes. A course project may also be assigned.			
Assessment			
Sr. No.	Elements	Weightage	Details

1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.