

UNIVERSITY OF MADRAS
M.Sc. DEGREE PROGRAMME IN MATHEMATICS
SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Course		ALGEBRA I					
Paper Number		CORE I					
Category	Core	Year	I	Credits	5	Course Code	428C1A
		Semester	I				
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		5	1	--	6		
Pre-requisite		UG level Modern Algebra					
Objectives of the Course		To introduce the concepts and to develop working knowledge on class equation, solvability of groups, finite abelian groups, linear transformations, real quadratic forms					
Course Outline		UNIT I– Another Counting Principle , Sylow’s theorems <i>Chapter 2: Sections 2.11 and 2.12</i>					
		UNIT II - Direct products - Finite abelian groups- Modules <i>Chapter 2: Sections 2.13 and 2.14</i> <i>Chapter 4: Section 4.5</i>					
		UNIT III - Linear Transformations - Canonical forms -Triangular form –Nilpotent transformations. <i>Chapter 6: Sections 6.4 , 6.5</i>					
		UNIT IV - Jordan form - rational canonical form. <i>Chapter 6 : Sections 6.6 and 6.7</i>					
		UNIT V - Trace and transpose - Hermitian, unitary, normal transformations, real quadratic form. <i>Chapter 6 : Sections 6.8, 6.10 and 6.11 (Omit 6.9)</i>					
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					
Recommended Text		I.N. Herstein. Topics in Algebra (II Edition) Wiley, 2002.					

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Reference Books	<ol style="list-style-type: none"> 1. M.Artin, <i>Algebra</i>, Prentice Hall of India, 1991. 2. P.B.Bhattacharya, S.K.Jain, and S.R.Nagpaul, <i>Basic Abstract Algebra</i> (II Edition) Cambridge University Press, 1997. (Indian Edition) 3. I.S.Luther and I.B.S.Passi, <i>Algebra</i>, Vol. I –Groups(1996); Vol. II Rings, Narosa Publishing House , New Delhi, 1999 4. D.S.Malik, J.N. Mordeson and M.K.Sen, <i>Fundamental of Abstract Algebra</i>, McGraw Hill (International Edition), New York. 1997. 5. N.Jacobson, <i>Basic Algebra</i>, Vol. I & II W.H.Freeman (1980); also published by Hindustan Publishing Company, New Delhi.
Website and e-Learning Source	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics , http://www.opensource.org , www.algebra.com

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Recall basic counting principle, define class equations to solve problems, explain Sylow’s theorems and apply the theorem to find number of Sylow subgroups

CLO 2: Define Solvable groups, define direct products, examine the properties of finite abelian groups, define modules

CLO 3: Define similar Transformations, define invariant subspace, explore the properties of triangular matrix, to find the index of nilpotence to decompose a space into invariant subspaces, to find invariants of linear transformation, to explore the properties of nilpotent transformation relating nilpotence with invariants.

CLO 4: Define Jordan, canonical form, Jordan blocks, define rational canonical form, define companion matrix of polynomial, find the elementary devices of transformation, apply the concepts to find characteristic polynomial of linear transformation.

CLO 5: Define trace, define transpose of a matrix, explain the properties of trace and transpose, to find trace, to find transpose of matrix, to prove Jacobson lemma using the triangular form, define symmetric matrix, skew symmetric matrix, adjoint, to define Hermitian, unitary, normal transformations and to verify whether the transformation is Hermitian, unitary and normal

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	POs						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	3	3	3	2	1
CLO2	2	1	3	1	3	3	3	2	1
CLO3	3	2	3	1	3	3	3	2	1
CLO4	1	2	3	2	3	3	3	2	1
CLO5	3	1	2	3	3	3	3	2	1