Cal State Los Angeles
Syllabus for the Algebra Comprehensive Exam
(Last updated Fall 2020)

Below are topical outlines for the Algebra comprehensive exam.   Note that this exam is for students who are on the 2020-2021 course catalog or after.

The references that the tables use are at the end of the syllabus.   For example, if the reference says "See [3] sections…" then you would look at reference [3] below which is: Abstract Algebra, Theory and Applications, Thomas Judson.

Linear Algebra Topical Outline	
Topic	**Reference**
Vector spaces, subspaces, linear combinations, spanning, linear dependence and independence, bases, dimension.	See [1] sections 1.1, 1.2, 1.3, 1.4, 1.5, 1.6.
Linear transformations.	See [1] sections 2.1, 2.4.
Basic properties of determinants.	See [1] chapter 4.
Eigenvalues and eigenvectors.	See [1] sections 5.1, 5.2

Abstract Algebra Topical Outline	
Topic	**Reference**
Groups and subgroups; abelian groups; integers modulo n; matrix groups; other examples of groups.	See [3] sections 3.1, 3.2, 3.3.
Cyclic groups, roots of unity.	See [3] sections 4.1, 4.2.
Permutation/symmetric groups; dihedral groups.	See [3] sections 5.1, 5.2.
Cosets; Lagrange's theorem; Fermat's and Euler's Theorems.	See [3] sections 6.1, 6.2, 6.3.
Isomorphisms; direct product; Cayley's theorem.	See [3] sections 9.1, 9.2
Factor groups and normal subgroups.	See [3] section 10.1
Homomorphisms; isomorphism theorems.	See [3] sections 11.1, 11.2.
Matrix groups; General and special linear groups; Orthogonal group; isometries of R^2.	See [3] sections 12.1, 12.2.
Group actions; the class equation; center of a group.	See [3] sections 14.1, 14.2.

Linear Algebra references:

[1] Linear Algebra, by Friedberg, Insel, Spence, 5th edition.

https://www.pearson.com/us/higher-education/program/Friedberg-Linear-Algebra-5th-Edition/PGM1939358.html

[2] Linear Algebra, by Jim Hefferon, 4th edition,
http://joshua.smcvt.edu/linearalgebra/book.pdf.

Group Theory references:

[3] Abstract Algebra, Theory and Applications, Thomas Judson.
http://abstract.ups.edu/download/aata-20100827.pdf

[4] Dummit and Foote, Abstract Algebra.

[5] Fraleigh, A First Course in Abstract Algebra.