



## MAT 2235 Algebraic Structures

### COURSE PLAN (03 Jan 2026)

L No	Topics	Course Outcome Addressed (draft)
0	Introduction to algebraic structures	CO1
1	Operations on a set – preliminaries	CO1
2	Symmetries of the two-dimensional plane	CO1
3	Group obtained from symmetries and examples	CO1
4	Subgroups, generators and defining relations, Cayley Diagrams	CO1
5	Groups of permutations, Dihedral groups (small order) Examples	CO1
6	Construction of Groups of small order (given equations) – problems	CO1
7	Order of group elements, cyclic groups (finite / infinite)	CO1
8	Properties of cyclic groups	CO1
9	Partitions and Equivalence relations	CO2
	<b>SDL: Computing groups of small order</b>	CO2
10	Counting Cosets, Lagrange's Theorem and consequences	CO2
11	Normal Subgroups, Construction of Quotient Groups	CO2
12	Dihedral Groups $D_{2n}$ (general case) and applications	CO2
13	Group acting on a set (conjugation / translation)	CO3
14	Applications of group actions on a set	CO3
15	Centralizer, Normalizer, Stabilizer and problems	CO3
16	Homomorphisms, Isomorphisms, Computing Kernal	CO3
	<b>SDL: More computational examples</b>	CO3
18	Direct product of groups, order of elements in direct product	CO2
19	Lattice of all subgroups of a group	CO2
20	Burnside Theorem and Applications	CO2
21	Fundamental theorem of homomorphisms	CO3
22	Applications of homomorphism theorem	CO3
23	Illustrations on direct product of quotient groups	CO3
	<b>SDL: Applications to Coding theory, linear codes</b>	CO3
24	Definition of ring, properties, simple examples	CO3
25	Integral domains and examples	CO4
26	Division rings, Fields and simple examples	CO5
27	Quotient rings and computations	CO4
28	Ring homomorphisms and ideals	CO4
29	Properties of ideals and subrings, more illustrations	CO4
30	Polynomial rings, matrix rings, examples	CO4
31	Computing and factoring of polynomials over $Z_n$	CO4
32	Criterion for irreducibility over rational numbers (field)	CO5
33	Structure of finite fields	CO5
34	Computing polynomials over a finite field	CO5
35	Geometric constructions – Extension fields	CO5
36	Algebraic elements – computations	CO5
	<b>SDL: More problems on finite fields</b>	CO5

**References:**

1. Michael Artin: Algebra, 2<sup>nd</sup> Edition, Prentice Hall, 2011
2. David S. Dummit and Richard M. Foote: Abstract Algebra, 3<sup>rd</sup> Edition, Wiley, 2005
3. Joseph A. Gallian: Contemporary Abstract Algebra, Eighth Edition, Cengage Learning 2013.
4. Thomas W. Judson, Abstract Algebra, Theory and Applications, 1994.
5. Charles C. Pinter, A Book of Abstract Algebra, Mc. Graw Hill International Editions 2010

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