COURSE SYLLABUS FORM

American University of Beirut
Faculty of Arts and Sciences
Department of Mathematics

Course Number and Title: Math 241 Introduction to Abstract Algebra

1. Course Learning Outcomes

1. Define and give examples of groups, normal subgroups, and homomorphisms.
2. Explain the advantages of normal subgroups over general subgroups.
3. Test whether a given finite group is cyclic by computing orders of elements.
4. State the first isomorphism theorem and use it to identify certain quotient groups
5. State the theorems of Lagrange, Cayley, Cauchy and Sylow
6. Apply the Sylow theory to test for existence of normal subgroups
7. State and apply the Orbit-Stabilizer Theorem for group actions.
8. Compute the group of symmetries of certain figures like a regular polygon.
9. Classify all abelian groups of a certain order.
10. Define & give examples of rings, integral domains, fields, ideals in a ring
11. Explain the advantages of ideals (in a ring) over general subrings.
12. Construct finite fields as quotient rings.
13. Define & give examples of Euclidean and principal ideal domains.
14. Write mathematical proofs on this subject.

2. Resources Available to Students

The following books will be used as references:
1. I.N. Herstein, Topics in Algebra, 2nd edition
2. J.B. Fraleigh, A first course in Abstract Algebra, 6th edition

3. Grading Criteria

Two quizzes, 25% each
Weekly Homeworks: 15%
Comprehensive final examination, 35%

4. Schedule

Week 1: Groups, subgroups, direct products of groups.
Weeks 2-3: Cyclic groups, cosets, Lagrange's Theorem, a counting principle.
Weeks 4-6: Homomorphisms, normal subgroups, factor Groups, isomorphism theorems.
Weeks 7-8: Permutation groups, Cayley's Theorem, orbits and stabilizers, Cauchy's Theorem,
Weeks 9-10: Class equation, p-groups, Sylow Theorems, abelian and non-abelian finite groups.
Week 11: Rings, subrings, integral domains, fields, division rings, direct products of rings
Weeks 12-13: Homomorphisms, ideals and quotient rings, prime and maximal ideals, finite fields.
Week 14: Euclidean and principal ideal domains.