NILKANTHA MULTIPLE CAMPUS

Dhading

Annual Teaching Plan

Academic Session: 2080/081

Level: Bachelor Degree (B. Ed.) **Subject: Modern Algebra** **Subject Teacher: Prayas Regmi**	**Year: 3rd** **Subject code no: Math. Ed. 433**

Time/ Teaching hours	Unit	Objectives	Methodology	Materials	Evaluation (Questions)	Reference book / Resources
25 Hours	**Unit 1** **Groups** 1.1 Algebraic System. 1.2 Operation, Cayley's tables, properties of binary operations. 1.3 Semi-groups, monoids 1.4 Equivalence relation, quotient structures. 1.5 Definition and examples of group. 1.6 Integral power of elements of a group. 1.7 Cyclic groups 1.8 Composition table. 1.9 Elementary properties of group and subgroups. 1.10 Permutations and product of permutations 1.11 Group of permutations, symmetric group S_n, and dihedral group. 1.12 Group actions.	• To Define binary operation and algebraic structure. • To Construct Cayley`s table for operation on a set. • To prove the properties of binary operation. • To decompose a set into equivalence classes and to define quotient structure. • To define groups and to give example of groups. • To verify the laws of exponents in the product of integral power of elements of group. • To prove some prosperities of integral power of elements. • To define cyclic group and to give example of cyclic groups. • To prove the elementary properties of groups and cyclic groups. • To define permutations and find all permutation of small sets. • To compute the products of permutation • To define permutation group and symmetric group, alternating group and dihedral	● Expository ● Lecture with illustrations ● Inquiry and question answer ● Demonstration ● Individual and group work presentation for illustrations and exercise for all units ● Discussion ● Problem solving	1. Curriculum and syllabus 2. Reference books 3. Table and charts	1. Define binary operation and explain algebraic structure. 2. Construct Cayley`s table for operation on a set. 3. Prove the properties of binary operation. 4. Decompose a set into equivalence classes and explain quotient structure. 5. Define groups and give example of groups. 6. Verify the laws of exponents in the product of integral power of elements of group. 7. Prove some prosperities of integral power of elements. 8. Define cyclic group and give example of cyclic groups. 9. Test whether a given structure is a group or not. 10. Prove the elementary properties of groups and cyclic groups. 11. Define permutations and find all permutation	**Recommended Books** Bhattarai, B.N. (2011) *Introduction of Group Theory*, Kathmandu: Subhakamana Prakashan Bhattarai, B.N. (2011) *Introduction of Rings and Modules,* Kathmandu: Subhakamana Prakashan Dummit, D.S. & Foote R. (2002). *Abstract algebra*, New Delhi: Wiley India Reprint Fraleigh, J.B. (2003). *A first course in abstract algebra*, India: Pearson Education Inc. Herstine, I.N. (1986). *Abstract algebra*, New York: Macmillan Publishing Company Koirala, S.P. & Bhattarai B.N. (2010) *A textbook on higher algebra*, Kathmandu: Pragya

		group and to prove the related theorems. • To define group action and to prove some related theorems			of small sets. 12. Compute the products of permutation 13. Define permutation group and symmetric group. Alternating group and dihedral group and prove the related theorems. 14. Define and give examples of group action and prove some related theorems	Prakashan **References Books** Durbin, J.R. (2005) *Modern algebra*, India: John Wiley and Sons Inc. Hersteine, I.N. (2008) *Topics in algebra*, New Delhi: Wiley, India. Maharjan, H.B. (2000) *First course in abstract algebra.* Kathmandu: Ratna Pustak Bhandar. Maharjan, H.B. (2007) Group *theory,* Kathmandu: Bhundi Puran Maharjan, H.B. (2008) Rings *and modules*, Kathmandu: Bhundi Puran Shrestha, R.M. (2006) Elementary *linear algebra,* Kathmandu: Sukunda Pustak Bhawan Stheth, I.H. (2002) *Abstract algebra,* New Delhi: Prentice Hall of India Thomas, W.H. (1974) *Algebra,* New York: Springer Verlag Inc. Pandit R.P and Bhujel M.B. Modern Algebra(2075) Kathmandu: Shubhakamana Prakashan Pvt. Ltd.
15 Hours	**Unit-2 :** **Subgroups** 2.1 Definitions and examples of subgroups. 2.2 Centralizer, normalizer 2.3 Properties of Subgroup5 2.4 Generators and defining relations. 2.5 Subgroups generated by subsets of a group 2.6 Lattice of subgroup.	• To define subgroups with examples. • To define relation. • To find the groups with defining relations. • To prove the properties of subgroup. • To construct small subgroups. • To draw lattice diagram of subgroups	● Lecture with illustrations ● Inquiry and question answer ● Demonstration ● Individual and group work presentation for illustrations and exercise for all units ● Expository ● Discussion ● Problem solving	1. Curriculum and syllabus 2. Reference books 3. Table and charts	1.Define subgroups and give examples of subgroups. 2.Define relation. 3.Find the groups with defining relations. 4.Prove the properties of subgroup. 5.Construct small subgroups. 6. Draw lattice diagram of subgroups.	
25 Hours	**Unit-3 :** **Normality, Co-sets, Quotient Groups and Homomorphism and Direct Products** 3.1. Co-sets, quotients of groups, normality and homomorphism. 3.2. Algebra of subsets of group co-sets. 3.3. Properties of homomorphism. 3.4. Normalizer, stabilizer, centralizer, orbits, Lagrange`s theorem. 3.5. Counting principle. 3.6. Isomorphism theorem: fundamental theorem, diamond and quotient isomorphism theorems and correspondence theorem auto-morphism. 3.7. Direct Products.	• To define and construct co-sets • To prove the simple properties of co-sets. • To define and construct quotient groups. • To define homomorphism • To prove the simple properties of homomorphism. • To define centralizer, normalizer, stabilizer, and orbits. • To prove Langrange`s theorem. • To calculate the order of products of subgroups. • To construct isomorphism of small groups. • To prove isomorphism theorems. • Define the direct products of groups and prove properties of internal and external direct products.	● Lecture with illustrations ● Inquiry and question answer ● Demonstration ● Expository ● Individual and group work presentation for illustrations and exercise for all units ● Expository ● Discussion ● Problem solving	1. Curriculum and syllabus 2. Reference books 3. Table and charts	1. Define and construct co-sets. 2. Prove the simple properties of co-sets. 3. Define and construct quotient groups. 4. Define homomorphism and prove the simple properties of homomorphism. 5. Explain centralizer, normalizer, stabilizer, and orbits. 6. Prove Langrange`s theorem and calculate the order of products of subgroups. 7. Construct isomorphism of small groups. 8. Prove isomorphism theorems. 9. Define the direct products of groups and prove properties of internal and external	

30 Hours	**Unit-4: Rings, Subrings, Ideals and Homomorphisms** 4.1. Definition and examples of rings and subrings. 4.2. Ideals and homomorphism 4.3. Algebra of ideals 4.4. Homomorphism of rings 4.5. Embedding and extension of rings. 4.6. Prime, maximal, nil-point and nil ideals. 4.7. Factorization domain. 4.8. Euclidean domain. 4.9. Direct products and direct sum of rings and ideals. 4.10. Principle ideal domain. 4.11. Unique factorization domain. 4.12. Properties of factorization domain 4.13. Ring of factorization	• To define and explain rings and give examples of rings. • To list types of rings with suitable examples • To prove the properties of rings • To define subrings, and ideals of rings • To define homomorphism of rings and extensions of rings • To explain the types of ideals, prime, maximal, nil-point and nil-ideas. • To prove the properties of subrings ideals and homomorphism of ring. • To prove the properties of algebra of ideals and quotient rings • To prove the properties of quotient ring by prime or maximal ideals. • To prove the properties of direct product and direct sum of rings. • To prove the properties of ideals. • To explain the concept of factorization in integral domains. • To prove the properties of factorization domain.	● Lecture with illustrations ● Inquiry and question answer ● Demonstration ● Individual and group work presentation for illustrations and exercise for all units ● Expository ● Discussion ● Problem solving	1. Curriculum and syllabus 2. Reference books 3. Table and charts	1. Define and explain rings and give examples of rings. 2. Discuss the suitable types of rings with suitable examples. 3. Prove the properties of rings. 4. Define subrings, ideals and homomorphism of rings, extensions of rings. 5. Discuss different types of ideals, prime, maximal, nil-point and nil-ideas. 6. Prove the properties of subrings ideals, homomorphism and algebra of ideals and quotient rings. 7. Prove the properties of quotient ring by prime or maximal ideals 8. Prove the properties of direct product and direct sum of rings and ideals. 9. Explain the concept of factorization in integral domains. 10. Prove the properties of factorization domain	
15 Hours	**Unit-5: Polynomial Rings** 5.1. Definition and examples of polynomials division algorithm 5.2. Factorization of polynomials	• To define polynomial rings. • To give examples of polynomials. • To state the properties of polynomial rings • To illustrate properties of polynomials with suitable example .	● Lecture with illustrations ● Inquiry and question answer ● Demonstration ● Expository ● Individual and group work presentation for illustrations and exercise for all units ● Discussion ● Problem solving	1. Curriculum and syllabus 2. Reference books 3. Table and charts	1. Define polynomial rings and give examples of polynomials. 2. State the properties of polynomial rings and illustrate properties of polynomials with suitable example	

15 Hours	**Unit-6 : Sylow's Theorems and Classification of Finite Groups** 6.1. Group actions on a set. 6.2. Conjugate relations. 6.3. Cauchy's theorems 6.4. Sylow's theorems 6.5. Classification of the groups	• To define group actions. • To prove the theorems on group actions. • To find the conjugate relations on a set. • To prove Cauchy`s theorem. • To prove Sylow`s theorems. • To find the classification of the finite groups.	● Lecture with illustrations ● Inquiry and question answer ● Demonstration ● Individual and group work presentation for illustrations and exercise for all units ● Discussion ● Expository ● Problem solving	1. Curriculum and syllabus 2. Reference books 3. Table and charts	1. Define group actions and to prove the theorems on group actions. 2. Find the conjugate relations on a set. 3. Prove Cauchy`s theorems and Sylow`s theorems 4. Find the classification of finite groups.	
25 Hours	**Unit-7: Fields** 7.1. Algebraic extent of fields 7.2. Irreducible polynomials and Eisenstein criteria 7.3. Adjunction of roots 7.4. Algebraic extension 7.5. Algebraic closed fields. 7.6. Normal and separable extensions 7.7. Splitting fields 7.8. Normal extensions 7.9. Multiple roots 7.10. Finite fields 7.11. Separable extensions	• To define the extension of fields • To prove the theorems on extension of fields. • To define irreducible polynomials. • To prove the theorems on irreducible polynomials. • To find the adjunction of roots. • To define the algebraic extensions • To prove the theorem on algebraic extension. • To define algebraically closed fields. • To prove theorems on closed fields • To define normal and separable extensions • To prove the theorems on normal and separable extensions. • To define splitting fields. • To prove the theorems on splitting fields with examples. • To find multiple roots. • To define finite fields. • To prove the theorem on finite field. • To state separable extension. • To prove theorems on separable extensions with examples	● Lecture with illustrations ● Inquiry and question answer ● Demonstration ● Individual and group work presentation for illustrations and exercise for all units ● Expository ● Discussion ● Problem solving	1. Curriculum and syllabus 2. Reference books 3. Table and charts	1. Define the extension of fields and prove the related theorem 2. Define irreducible polynomials and prove the related theorems 3. Find the adjunction of roots 4. Discuss algebraic extensions and prove the related theorems with examples 5. Define algebraically closed fields and prove related theorems 6. Define normal and separable extensions and prove their theorems 7. Define splitting fields and prove the related theorems with examples 8. Discuss and find multiple roots 9. Define finite fields and prove their theorems 10. State separable extensions and prove their theorems with examples .	