

Honors Algebra II Syllabus, Spring 2021

Jan 28	Sections 12.1, 12.2	Unique factorization, Euclidian domains, rational integers, Gaussian integers, polynomial rings over fields
Jan. 29	recitation	There is no recitation meeting. Spend these 75 minutes reading the material in Assignment 1 about \mathbb{F}_p and the structure theorem (little Fermat) for \mathbb{F}_p^* .
Feb. 2	Section 12.3	Gauss lemma, unique factorization of polynomials in many variables
Feb. 4	Section 12.4	Irreducible polynomials in $\mathbb{Z}[x]$ and $\mathbb{F}_p[x]$, cyclotomic polynomials
Feb. 5	recitation	Chinese remainder theorem in \mathbb{Z} , $\mathbb{C}[x]$. Lagrange interpolation formula
Feb. 9, HW 1	Section 12.5	Gauss primes, factoring rational primes in $\mathbb{Z}[i]$
Feb. 11	Sections 15.1, 15.2	Fields, algebraic and transcendental extensions, construction of extensions and isomorphisms
Feb. 12	recitation	Embeddings of $\mathbb{Q}[\alpha]$ into \mathbb{C} , trace and norm
Feb. 16, HW 2	Section 15.3	Degree of extensions, composition of extensions
Feb. 19	recitation	Cyclotomic extensions, factorization of $x^n - 1$ over \mathbb{Q} , Euler $\phi(n)$ function
Feb. 23, HW 3	Section 15.5	Ruler and compass constructions, towers of quadratic extensions of \mathbb{Q} , can't trisect an angle
Feb. 25	quiz	5% of the grade, quick reality check
Feb. 26	recitation	quiz review
March 2, HW 4	Sections 15.6, 15.7	Extensions that split a polynomial, extensions of \mathbb{F}_p , structure of finite fields
March 4	special lecture	Quadratic reciprocity, Gauss sums
March 5	recitation	Polynomials and factoring in \mathbb{F}_p , irreducible polynomials in $\mathbb{Z}[x]$
March 9, HW 5	Sections 15.8, 15.9	Primitive element theorem and applications, overview of function fields and Riemann surfaces
March 11	Section 16.1	Symmetric polynomials, representation by elementary symmetric polynomials
March 12	recitation	Chinese remainder theorem in \mathbb{Z} , $\mathbb{C}[x]$. Lagrange interpolation formula

March 16, HW 6	Sections 16.2, 16.3	Discriminant, splitting fields
March 18	Sections 16.4, 16.5	Isomorphism of splitting fields, isomorphism group of an algebraic extension, the fixed field theorem
March 23, HW 7	Section 16.6	Galois extensions, fixed field theorem
March 25	Midterm exam	15% of the total score
March 26	recitation	review the midterm
March 30, HW 8	Section 16.7	Galois correspondence, fundamental theorem of Galois theory
Apr. 1	Sections 16.8, 16.9	Splitting fields and Galois groups of irreducible cubic and quartic polynomials
Apr. 2	recitation	more on quartic extensions
Apr. 6, HW 9	Section 16.10	Cyclotomic extensions
Apr. 8	Section 16.11	Kummer theory
Apr. 9	recitation	Galois group of $x^p = a$ over \mathbb{Q} , D_p
Apr. 13, HW 10	Section 16.12	Unsolvability of the general quintic over \mathbb{Q} .
Apr. 15	Section 13.1	Ring of algebraic integers in $\mathbb{Q}(\sqrt{d})$
Apr. 16	recitation	Galois group of $x^p = a$ over \mathbb{Q} , D_p
Apr. 20, HW 11	Section 13.2	Factoring in $\mathbb{Z}[\sqrt{d}]$, $N(\alpha)$
Apr. 22	Section 13.3	Ideals in $\mathbb{Z}[\sqrt{-5}]$, $6 = 2 \cdot 3$, $6 = (1 + \sqrt{-5})(1 - \sqrt{-5})$
Apr. 23	recitation	Integer solutions of $x^2 - 2y^2 = 7$, units in $\mathbb{Q}[\sqrt{2}]$ (B. and S., p. 75)
Apr. 27, HW 12	Section 13.4	Multiplying ideals in general and in $\mathbb{Q}[\sqrt{-d}]$
Apr. 29	Section 13.5	Prime and maximal ideals, unique ideal factorization in $\mathbb{Q}[\sqrt{-d}]$
Apr. 30	recitation	More on ideal multiplication and factorization
May 4, HW 13	Section 13.7	Ideal class group of $\mathbb{Q}[\sqrt{-d}]$
May 6	Section 13.9	Geometry of real quadratic number rings $\mathbb{Q}[\sqrt{d}]$
May 7	recitation	review
Finals week	take home final	25% of the grade total