February, 2021

18.702 SUBJECT OUTLINE

This outline will be revised during the semester.

I. Group Representations

Wednesday, February 17: *group representations*, Ch 10, Sec 1,4
Exercises: Ch 10, 1.1, 1.2

Friday, February 19: *unitary representations*, Ch 10, Sec 2,3
Exercises: Ch 10, 2.1, 2.2, 3.4

Monday, February 22 *characters*, Ch 10, Sec 4,5
Exercises: Ch 10, 4.1, 4.3a,c, 4.8, 5.1, 5.3

Wednesday, February 24: *the regular representation*, Ch 10, Sec 6
Exercises: Ch 10, 5.4, 6.1, 6.3

Friday, February 26: *Schur's Lemma*, Ch 10, Sec 7
Exercises: Ch 10, 7.1, 7.2

Monday, March 1: *proof of the orthogonality relations*, Ch 10, Sec 8
Exercises: Ch 10, 7.4, 7.6

II. Rings

Wednesday, March 3: *rings, ring homomorphisms*, Ch 11, Sec 1,2,3
Exercises: Ch 11, 1.1, 1.5, 1.8, 1.9

Friday, March 5: *ideals, quotient rings, correspondence theorem*, Ch 11, Sec 4,5
Exercises: Ch 11, 3.12, 3.13, 4.1, 4.2

Monday, March 8: **Holiday**

March 9:
adjoining elements (monday class held)
Exercises:

Wednesday, March 10: *maximal ideals, prime ideals, fractions*, Ch 11, Sec 8,9
Exercises: Ch 11, 6.1, 7.1, 8.3

III. Factoring

Friday, March 12: *Gauss' Lemma*, Ch 12, Sec 3
Exercises: Ch 12, 2.3, 2.7, 3.2

Monday, March 15: *unique factorization*, Ch 12, Sec 1,2
Exercises: Ch 12, 1.1, 1.5, 2.1, 2.2

Wednesday, March 17: *factoring integer polynomials*, Ch 12, Sec 4
Exercises: Ch 12, 4.1a, 4.6, 4.7, 4.11

Friday, March 19: *Gauss primes*, Ch 12, Sec 5 *(add date)*
Exercises: Ch 12, 5.1, 5.2b, 5.3

Monday, March 22: **Holiday**

IV. Quadratic Imaginary Integers

Wednesday, March 24: *quadratic integers*, Ch 13, Sec 1
Exercises: Ch 13, 1.1, 1.2, 1.3a,c

Friday, March 26: *factoring ideals*, Ch 13 Sec 2,3
Exercises: Ch 13, 2.1, 3.1, 3.2, 3.3

Monday, March 29: *prime ideals*, Ch 13, Sec 5,6
Exercises: Ch 13, 5.3, 6.1, 6.2

Wednesday, March 31: *ideal classes*, Ch 11, Sec 9,10
Exercises: Ch 13, 7.1, 7.2, 8.2

Friday, April 2: *computing the class group*
Exercises:

V. Linear Algebra in a Ring

Monday, April 5: *integer matrices*, Ch 14, Sec 1, 2
  Exercises: Ch 14, 1.1, 2.1, 2.4

Wednesday, April 7: *free modules*, Ch 14, Sec 3, 4
  Exercises: Ch 14, 3.2, 4.1a, 4.3

Friday, April 9: *presenting a module*, Ch 12, Sec 5
  Exercises: Ch 14, 5.1, 5.2

Monday, April 12: *Hilbert Basis Theorem*, Ch 14, Sec 6
  Exercises: Ch 11, 6.1, 6.2, M.1

Wednesday, April 14: *structure of abelian groups*, Ch 14, Sec 7
  Exercises: Ch 14, 7.1, 7.2, 7.5

Friday, April 16: *algebraic elements, degree*, Ch 15, Sec 1,2
  Exercises: Ch 15, 1.1, 1.3, 2.1

VI. Field Extensions

Monday, April 19: **Patriot's Day, Holiday**

Wednesday, April 21 *ruler and compass*, Ch 13, Sec 5
  Exercises: Ch 15, 5.1, 5.2

Friday, April 23: *adjoining elements*
  Exercises:

Monday, April 26: *finite fields*, Ch 15, Sec 7
  Exercises: Ch 15, 7.1, 7.2, 7.13

Wednesday, April 28: *primitive elements*
  Exercises:

Thursday, April 29 (drop date)

Friday, April 30: *symmetric functions, discriminant*
  Exercises:

Monday, May 3: *splitting fields, the Galois group,* Ch 15, Sec 8
  Exercises: Ch 15, 8.1, 8.2

Wednesday, May 5: *fixed fields, Galois extensions*, Ch 16, Sec 5,6
  Exercises: Ch 16, 5.1b,c, 6.1

Friday, May 7: **Holiday**

VII. Galois Theory

Monday, May 10 : *main theorem of Galois theory*, Ch 16, Sec 3,4
  Exercises: Ch 16, 3.2, 4.1
  Exercises: Ch 16, 7.1, 7.3, 7.6, 7.7

Wednesday, May 12: *cubic equations*, Ch 16, Sec 8
  Exercises: Ch 16, 8.2a,b,c

Friday, May 14: *quartic equations*, Ch 16, Sec 9
  Exercises: Ch 16, 9.1, 9.6, 9.12a,b

Monday, May 17: *roots of unity*, Ch 16, Sec 10,11
  Exercises: Ch 16, 10.1, 10.3, 11.1

Wednesday, May 19: *quintic equations*, Ch 16, Sec 12
  Exercises: Ch 16, 12.1, 12.2, 12.7