

Math 374: Undergraduate Representation Theory

MWF 10:00am - 10:50am, HBH 453. See Syllabus for details
Instructor: Dr. Chelsea Walton. notlaw@rice.edu

[Final version]

Lecture #	Date	Topic (Notes in Dropbox folder)	Section of James & Liebeck	Instructor lectures	Student Speaker 1 Mode (10:00a-10:20a)	Student Speaker 2 Mode (10:25a-10:45a)	Other references	Homework Due Date
1	M 8/25/2025	Introduction to Course Review of Groups	Chapter 1	✓	—	—	Walton's 2021 NAM-JMM talk + accomp. article	
2	W 8/27/2025	Review of Groups	Chapter 1	✓	—	—		
3	F 8/29/2025	Linear Algebra Review	Chapter 2	✓	—	—		HW #0 Due
4	W 9/3/2025 (after Labor Day)	Linear Algebra Review	Chapter 2	✓	—	—		
5	F 9/5/2025	Group Representations	Chapter 3	—	Thomas M. Chalk Talk p. 30-31 on representations	Teddy A. Chalk Talk p. 32-34 on equivalent reprns	Instructor Notes #5 p.1-2 #5 p.3-4	
6	M 9/8/2025	Group Representations FG-modules	Chapter 3 Chapter 4	—	Oscar P. Chalk Talk p. 34-35 on kernels of reprns	(Instructor) Chalk Talk p. 38-40, ending with Defn 4.3	Instructor Notes #5 p.5-7 #6 p.1-2, 3(top)	
7	W 9/10/2025	FG-modules	Chapter 4	—	Dasha D. Chalk Talk p. 40-41 on Theorem 4.4 with one example	Sungwon C. Chalk Talk p. 42-44 on Skip Prop 4.6, do a recap + Defn 4.8	Instructor Notes #6 p.3-4 #6 p.5, #7 p.1-2	
8	F 9/12/2025	FG-modules	Chapter 4	—	Luke S. Chalk Talk p. 44-45 on perm'n mods	Riley K. Chalk Talk p. 45-47 on FG-mods + equiv reprs	Instructor Notes #7 p.2-4 #7 p.5-7	
9	M 9/15/2025	FG-submodules Irreducible FG-modules	Chapter 5	—	Benjamin S. Chalk Talk p. 49-50 on FG-submods	Peter B. Chalk Talk p.50-51 on irred FG-mods	Instructor Notes #8 p.1-2 #8 p.3-4 (+5 as time allows)	
10	W 9/17/2025	Group Algebras	Chapter 6	—	Matthew B. Chalk Talk p. 53-55 on group alg of G, Prop 6.4 briefly	Eric S. Chalk Talk p. 56-58 on regular FG-mod, Prop 6.10 briefly	Instructor Notes #9 p.2-4 (just to examples) #9 p.4(bottom)-p.6	HW #1 Due
11	F 9/19/2025	FG-homomorphisms	Chapter 7	—	Viktor M. Chalk Talk p. 61-62 on FG-homoms	Dasha S. Chalk Talk p. 63-66 on Isom FG-mods (sketch Thm7.6)	Instructor Notes #10 p.1(bottom)-p.3 #10 p.4-6 (but could opt for Example 7.8)	
12	M 9/22/2025 (ONLINE)	Direct sum of FG-modules Maschke's Theorem	Chapter 7 Chapter 8	✓	—	—		
13	W 9/24/2025 (ONLINE)	Maschke's Theorem	Chapter 8	✓	—	—		
14	F 9/26/2025 (ONLINE)	Schur's Lemma	Chapter 9	—	Dasha D. Slides Online p. 78-80 on Schur's Lemma	Thomas M. Slides Online p. 81-83 on fin abl grp reprs +diag'n	(Please try your best in developing the slides on your own by using the material in the textbook)	
15	M 9/29/2025 (ONLINE)	Schur's Lemma	Chapter 9	—	Sungwon C. Slides Online p. 83-85, just Defns 9.12, 9.15 w/ examples (see ** -->)	Eric S. Slides Online p. 84-86 be sure to cover Propositions 9.14, 9.16, 9.18	(See above) ** Start with recapping the major theorems covered: Maschke's Thm (w/ Thm 8.7), and Schur's Lem (w/ Prop 9.5)	
16	W 10/1/2025 (ONLINE)	Irreducible modules and the group algebra More on the group alg	Chapter 10 Chapter 11	—	Riley K. Slides Online p. 89-91 on irred submods of CG	Matthew B. Slides Online p. 92-93 exams, + p. 95-96 thru Prop 11.2	(See above)	HW #2 Due
17	F 10/3/2025 (ONLINE)	More on the group algebra	Chapter 11	—	Teddy A. Slides Online p. 96-99 on Prop 11.3 thru Example 11.7	Viktor M. Slides Online p. 99-102 Prop 11.8 thru Thm 11.12 + examples	(See above)	
18	M 10/6/2025	Interlude: ADE classification/ McKay Correspondence		✓	—	—		
19	W 10/8/2025	Conjugacy Classes	Chapter 12	—	Luke S. Slides In-Person p. 104-107 on conj classes and sizes (skip pf of Theorem 12.8)	Oscar P. Slides In-Person p. 107-111 on conjugacy classes of D_{2n} and S_n	(See above)	
20	F 10/10/2025	Conjugacy Classes	Chapter 12	—	Dasha S. Slides In-Person p. 111-113 on a recap of conj classes, and those of A_n	Peter B. Slides In-Person p. 113-115 on normal subgroups	(See above)	
21	W 10/15/2025 (after Midterm Recess)	Characters	Chapter 13	✓	—	—		HW #3 Due
22	F 10/17/2025	Characters	Chapter 13	✓	—	—		
23	M 10/20/2025	Inner Product of Characters	Chapter 14	—	Eric S. Chalk Talk p. 133-135 on inner products	Teddy A. Chalk Talk p. 135-137 on inner prod of chars thru Hyp 14.7	(Please try your best in developing your notes on your own by using the material in the textbook)	
24	W 10/22/2025	Inner Product of Characters	Chapter 14	—	Thomas M. Chalk Talk p. 137-139 on recall Hyp 14.7 thru Prop 14.10	Ben S. Chalk Talk p. 139-141 on Cor 14.11 and Thm 14.12	(See above)	
25	F 10/24/2025	Inner Product of Characters	Chapter 14	—	Matthew B. Chalk Talk p. 141-143 on Thm 14.17 thru Defn 14.19	Peter B. Chalk Talk on p. 143-145 on Thm 14.20 thru Example 14.22	(See above)	
26	M 10/27/2025	Inner Product of Characters	Chapter 14	—	Dasha D. Chalk Talk p. 145-146 on Theorems 14.23 and 14.24	Oscar P. Chalk Talk p. 146-149 decomp CG-mods with one example	(See above)	
27	W 10/29/2025	The Number of Irreducible Characters Character Tables	Chapter 15 Chapter 16	—	Riley K. Chalk Talk p. 152-154 thru Corollary 15.4	Viktor M. Chalk Talk p. 154, 159-160 on Prp 15.5, Cor 15.6, Def 16.1, Prop 1.2, Ex 16.3(1,2)	(See above)	HW #4 Due
28	F 10/31/2025	Character Table and Orthogonality Relations	Chapter 16	—	Sungwon C. Chalk Talk p. 159-161 on Recall Def 16.1 and Prop 16.2, Ex 16.3(3) plus choice of examples from Chapter 18	Luke S. Chalk Talk p. 161-163 on Theorem 16.4 and Example 16.5(1)	(See above)	
29	M 11/3/2025	Character Table and Orthogonality Relations	Chapter 16	✓	—	—		
30	W 11/5/2025	Tensor Products	Chapter 19	✓	—	—		
31	F 11/7/2025	Tensor Products	Chapter 19	—	Dasha D. Speaker's choice: Chalk or Slides p. 194-196, skip pf of (19.9), cover Thm 19.10, and examples	Teddy A. Speaker's choice: Chalk or Slides p. 196-198 on decomp χ^2 thru Prop 19.13	(Please try your best in developing the notes/ slides on your own by using the material in the textbook)	
32	M 11/10/2025	Tensor Products	Chapter 19	—	Viktor M. Speaker's choice: Chalk or Slides p. 198-201, start w/ χ_S, χ_A , Prop 19.14 (skim proof), Example 19.15, skim Exam 19.16 as time permits	Ben S. Speaker's choice: Chalk or Slides p. 205-208 on direct products (skim pfs, focus on Example 19.19)	(See above)	
33	W 11/12/2025	Restriction to a Subgroup	Chapter 20	—	Luke S. Speaker's choice: Chalk or Slides p. 210-212 on restriction	Eric S. Speaker's choice: Chalk or Slides p. 212-214 on consts, Def 20.3 thru Prop 20.5	(See above)	HW #5 Due
34	F 11/14/2025	Restriction to a Subgroup Clifford's Theorem	Chapter 20	—	Sungwon C. Speaker's choice: Chalk or Slides p. 215-216 on Prop 20.7 and Clifford's Thm	Matthew B. Speaker's choice: Chalk or Slides p. 215-216 on Props 20.9-20.11	(See above)	
35	M 11/17/2025	Restriction Induced Modules	Chapter 20 Chapter 21	—	Thomas M. Speaker's choice: Chalk or Slides p. 219 on Prop 20.12, and do Exercise 20.5	Oscar P. Speaker's choice: Chalk or Slides p. 224-226, thru Def 21.4, compare defn of induction with restriction	(See above)	
36	W 11/19/2025	Induced Modules	Chapter 21	—	Peter B. Speaker's choice: Chalk or Slides p. 226-227 on Def 21.4 thru Prop 21.6	Riley K. Speaker's choice: Chalk or Slides p. 227-230 on Prop 21.7 thru Thm 21.11 (skim pfs as you choose)	(See above)	
37	F 11/21/2025	Induction and The Frobenius Reciprocity Theorem	Chapter 21	✓	—	—		
38	M 11/24/2025	The Frobenius Reciprocity Theorem Applications	(Instructor's notes)	✓	—	—		
39	M 12/1/2025 (after Thanksgiving)	Representations of Symmetric Groups	(Instructor's notes)	✓	—	—		McKay corresp (from Lecture 18) Extra Credit Due
40	W 12/3/2025	Representations of Symmetric Groups	(Instructor's notes)	✓	—	—		HW #6 Due
41	F 12/5/2025	Representations of Symmetric Groups	(Instructor's notes)	✓	—	—		
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Study Days	Sa 12/6/2025 - T 12/9/2025							
	No Final Exam for this course							