

## **Math 8300      Topics in Algebra: Representations of Finite Groups    Fall 2021**

01:25 PM–02:15 PM MWF Vincent Hall 209

**Instructor:** Peter Webb

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Office Hours: MWF 11:15 - 12:05 or by appointment. I will be in my office at these times, and you can also contact me at the same moment using a [gather.town](https://gather.town) link that is shown on my home page.

### **The manner of teaching**

We will meet in person, and at the same time I will start a Zoom meeting with the link <https://umn.zoom.us/j/97445066415>, Meeting ID: 974 4506 6415 There is no password. I will record the session. I will teach by writing on my iPad in class, visible to the people on Zoom and in person. I will post the videos and my iPad notes on the Canvas site for the course. I plan to do a number of in-class activities involving collaborative work, and the collaborative aspect may be impossible for anyone who is online, so it is definitely an advantage to be present in person.

### **Text**

P. Webb, A course in finite group representation theory, Cambridge University Press 2016.

A prepublication version is available for free download at

<https://www-users.cse.umn.edu/~webb/RepBook/index.html>

A pdf version is available online from the library.

### **Intended Syllabus**

1. Semisimplicity, theorems of Wedderburn and Maschke.
2. Character tables.
3. Representations of groups in positive characteristic: the radical, structure of projective modules
4. Examples, presented throughout: cyclic groups, dihedral groups, small symmetric and alternating groups, some semi-direct products, special linear groups in some circumstances.

After that we will make choices from the following:

5. The decomposition map
6. Representations of symmetric groups in arbitrary characteristic
7. Block theory.

and possibly do all of the above.

### **Course Assessment**

There will be about 6 homework assignments during the course of the semester. If you make a genuine attempt at 50% or more of the questions you will get an A for the course. You do not have to obtain correct solutions to these questions, only make genuine attempts (in my opinion). I believe that it is extremely difficult to obtain a sound and permanently lasting command of the material presented without doing some work which actively involves the student. It should be possible for everyone who wishes to obtain an A on this course. Homework should be uploaded to Gradescope.

### **Expectations of written work**

Most of the time in the homework problems, to satisfy my criterion of making a genuine attempt you will need to write down explanations for the calculations and arguments you make. Where explanations need to be given, these should be written out in sentences i.e. with verbs, capital letters at the beginning, periods at the end, etc. and not in an abbreviated form.

I encourage you to form study groups. However everything to be handed in must be written up in your own words. If two students hand in identical assignments, they will both receive no credit.

**Prerequisites**

Math 8201/2 or possibly Math 5285/6.

In the Spring, Gennady Lyubeznik will teach about the derived category.