

Math 607: Topological Field Theories and Tensor Categories
Fall 2021, CRN 14037

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Office hours (tentative): MW 2-3 or by appointment

Class meets: TR 10am-11:20am at University 210

Course website: <https://pages.uoregon.edu/vostrik/math607fall21/index607.html>

All handouts (e.g. homeworks) for the course will be posted there.

Texts: (electronic versions available on class website)

- J. Kock “Frobenius Algebras and 2D Topological Quantum Field Theories”
- B. Bakalov, A. Kirillov, Jr “Lectures on Tensor Categories and Modular Functor”
- D. S. Freed “Lectures on Field Theory and Topology” (no electronic version)
- V. Turaev, A. Virelizier “Monoidal Categories and Topological Field Theory”

Homework: There will be few homework assignments which should be submitted in class. Collaboration on homework assignments is allowed and encouraged, provided that you write up your solutions independently. It is expected that the students will typeset their homework solutions using LaTeX.

Grading: Your grade will be determined by class participation. This includes (but not limited to) class attendance, homework assignments, class presentations, writing class notes.

Learning Outcomes: As with most advanced math classes, the most important skills that you will develop in this class will be related to communication (reading, writing, listening, and speaking) about quantitative subjects. These skills will be valuable in any of your future endeavors, academic or otherwise. More specifically to this class, you will learn the basic ingredients of topological quantum field theories: categories of cobordisms, general symmetric tensor categories and tensor functors, low dimensional examples. We will cover Deligne’s categories and universal topological field theories. As a specific example we will discuss Turaev-Viro models and Reshetikhin-Turaev models. Time permitting we will look at condensed matter physics incarnations of these models such as Kitaev’s toric code.