Department of Mathematics
College of Liberal Arts and Sciences
Iowa State University

Math 617 – Category Theory – Fall 2018

Course Summary

Categories, duality, functors, natural transformations, adjunctions, representability and
Yoneda Lemma, limits, monads, Kan extensions. If time permits, we may cover a selection of modern topics.

Texts:

- E. Riehl, *Category Theory in Context* (free e-book),

- T. Leinster, *Basic Category Theory* (free e-book),

- S. Mac Lane *Category Theory for the Working Mathematician* (Springer).

Credits: 3
Prerequisites: Two semesters of graduate algebra.
Lectures: MWF 2:10pm – 3:00pm in Carver 074

Instructor

Name: Dr. Jonas Hartwig
Phone: (515) 294-8159
Email: jth@iastate.edu
Office: Carver 470

Office Hours:
MWF 3:10pm – 4:00pm
F 11:00am – 11:50am

Examination

Homework

Homework will be assigned on a weekly basis. Between 4-8 homework sets will be
collected and graded. The solutions should be written in LaTeX(or equivalent typesetting
system).

Project

Each participant should do a **project**. This involves reading a survey/paper/book section or other text that you decide in conversation with Dr. Hartwig during office hours,
and solving/discussing a related problem/theory in a written 4-5 page essay where a
summary of the topic is presented in a 20 minute presentation (+5 minutes for questions). The essay must be written in LaTeX(or equivalent typesetting system). Projects
will be presented before deadweek. Possible projects include:

- generalizations of categories (eg. operads, 2-categories, . . .)

- category theory and the foundations of mathematics (eg. topos theory)

- category theory in computer science (eg. type theory)

- abelian categories and module categories

- algebraic topology; homological algebra

- derived categories; algebraic geometry

The project will be graded according to the following categories (in no particular order):

- Overall creativity

- Mathematical correctness

- Clarity of presentation

- Quality of written essay

Timeline for projects is as follows. Recommended time to begin the project is mid October, but starting time is flexible. On or before Oct 29 you can email a preliminary version of your written essay to receive **feedback** from Dr. Hartwig. You will receive this feedback by Nov 2. The deadline for the essay is Nov 9. Presentations of the projects will take place in the following two weeks (Nov 12–16 and Nov 26–Dec 30) during lecture or if necessary other scheduled time.

General Class Policies

        https://math.iastate.edu/syllabus-and-class-policies/

Deadweek

Nothing is due during deadweek. Time will be spent covering exciting modern directions of category theory. Attendance is not optional.

Disability Accommodation

If you have a disability and require accommodations, please contact the instructor early in the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability to the Disability Resources (DR) office, located on the main floor of the Student Services Building, Room 1076, 515-294-6624.