

# 1 Introduction

These notes grew out of a course given by Prof. Tobias Dyckerhoff at the University of Hamburg. However, much of the presentation and many of the proofs are mine. All mistakes are entirely my own.

Here is a rough sketch of the course.

1. Category theory
2. Simplicial homotopy theory
3.  $\infty$ -category theory

These notes are phrased in terms of ZFCU, i.e. the Zermelo-Frenkel axioms together with the following axioms.

- C: the axiom of choice.
- U: Grothendieck's universe axiom.

For a primer on Grothendieck universes, as well as basic category theory, see my notes.

## 1.1 Notation

- We will denote comma categories  $(\mathcal{A} \downarrow x)$  by  $\mathcal{A}/x$ .
- This course used the wrong<sup>1</sup> convention for units and counits: we will denote units by  $\epsilon$  and counits by  $\eta$ .
- We will denote hom-sets  $\mathcal{C}(a, b)$ .

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<sup>1</sup>I.e. opposite to the nLab, wikipedia, Categories Work, etc.