

## Math 690 (Special Topics in Mathematics)

### Abstract and Concrete Categories

by Jawad Abuhlail

**Title:** Abstract and Concrete Categories

**Pre-requisite:** Math 345 (or equivalent).

**Semester:** 132

**Rationale/Objectives:** The main objective of the course is to provide the student with basic knowledge about categories, functors, special families of morphisms, factorization systems and adjoint functors along with applications to concrete categories and varieties (in the sense of universal algebra).

**Learning Outcomes:** By the end of this course, the student is supposed to:

- a) control the definitions, basic properties and main theorems on categories and functors.
- b) be aware of the main differences between the equivalent definitions of special families of morphisms in the different categories.
- c) apply the main notions of category theory to the different varieties (in the sense of universal algebra).

**Textbook:** J. Adámek, H. Herrlich and G. Strecker, *Abstract and concrete categories*, Dover Books on Mathematics (2009).

**Why this book?** In contrast with other books in Category Theory, this book:

- has a significant number of examples.
- has a whole chapter on *Factorization Systems* which is significant for this course.

**Note:** This is a reprint of the celebrated book with the same title published by John Wiley & Sons, Inc., New York, 1990 and which was out of print.

#### Further Reading:

- S. Mac Lane, *Categories for the Working Mathematician*, 2<sup>nd</sup> edition, Graduate Texts in Mathematics, 5. Springer-Verlag, New York, 1998.
- M. Barr and Ch. Michael, *Category Theory for Computing Science*, Prentice Hall International Series in Computer Science, Prentice Hall International, New York, 1990.

