Course title: Algebra: a categorical perspective

Instructor: Pranav Pandit

Course description: This will be an advanced course in algebra, emphasizing the categorical viewpoint and the methods of homological algebra. Topics that we will aim to discuss include categories and functors, (co)limits and Kan extensions, adjunctions and monads, derived categories, derived functors, algebras and their representation theory, and Galois theory. Classroom discussions will often rely on previous homework assignments, which will include problem sets as well as reading assignments.

Prerequisites: The equivalent of a one-year graduate level course in algebra.

Textbooks: [EGH$^+$11], [Mac71], [GM03], [Lan65], [Alu09], [Sza09].

Evaluation: Homework will be assigned every week, and will usually be due the next week. There will be two midterm exams and one final exam. The final grade will be based on homework assignments (40% of the grade) and exams (60% of the grade), with each of the three exams accounting for 20% of the final grade.

Venue: ICTS

References

[Alu09]   Paolo Aluffi, *Algebra: chapter 0*, Graduate Studies in Mathematics, vol. 104, American Mathematical Society, Providence, RI, 2009.

[EGH$^+$11] Pavel Etingof, Oleg Golberg, Sebastian Hensel, Tiankai Liu, Alex Schwendner, Dmitry Vaintrob, and Elena Yudovina, *Introduction to representation theory*, Student Mathematical Library, vol. 59, American Mathematical Society, Providence, RI, 2011, With historical interludes by Slava Gerovitch.

[GM03]   Sergei I. Gelfand and Yuri I. Manin, *Methods of homological algebra*, second ed., Springer Monographs in Mathematics, Springer-Verlag, Berlin, 2003.

[Lan65]   Serge Lang, *Algebra*, Addison-Wesley Publishing Co., Inc., Reading, Mass., 1965.

[Mac71]   Saunders MacLane, *Categories for the working mathematician*, Springer-Verlag, New York-Berlin, 1971, Graduate Texts in Mathematics, Vol. 5.

[Sza09]   Tamás Szamuely, *Galois groups and fundamental groups*, Cambridge Studies in Advanced Mathematics, vol. 117, Cambridge University Press, Cambridge, 2009.