BEN GURION UNIVERSITY

אוניברסיטת בן גוריון בנגב

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First Announcement:

Derived Categories I

Course in 1st Semester 2015-16

Audience & Prerequisites. This is an advanced course, aimed at M.Sc. and Ph.D. students, post-docs and researchers. *Participants from outside the BGU community are welcome.* The lectures will be in English.

The prerequisite for this course is a solid knowledge of classical homological algebra. For some of the examples and applications, a familiarity with commutative algebra, ring theory, algebraic geometry and algebraic topology will be helpful.

Organization. The course will meet once a week for a 2 hour lecture. The tentative time is Wednesday 12:00-14:00 (which fits nicely with the AG&NT Seminar later that day). If there is demand, we might change the time, or add an exercise session (one hour per week). The semester begins on 25 October 2015. Potential participants are urged to get in touch with me for information about registration.

The course is expected to *continue in the 2nd semester.* I intend to *publish the course notes as a textbook.*

Topics. Here is a tentative list of topics for the course (including the 2nd part).
  (1) Review of abelian categories and additive functors.
  (2) Differential graded (DG) rings, modules and categories.
  (3) Triangulated categories and derived functors.
  (4) The derived category of an additive DG category.
  (5) Resolutions of DG modules.
  (6) Commutative algebra via derived categories. Dualizing complexes, local duality, MGM equivalence, rigid dualizing complexes.
  (7) Geometric derived categories (of sheaves on spaces). Direct and inverse image functors, Grothendieck duality, Poicaré-Verdier duality, perverse sheaves.
  (8) Derived categories associated to nocommutative rings. Dualizing complexes, tilting complexes, the derived Picard group, derived Morita theory.
  (9) Survey of: derived categories in modern algebraic geometry and mathematical physics; derived algebraic geometry.