



Advanced Course

## ***Lectures on Differential Graded Categories***

***From homotopy theory to Hodge theory***

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Since the invention of derived categories by Grothendieck and Verdier as a natural setting for duality theorems in algebraic geometry, our interest in categories arising from geometry has been increasing. Indeed, all types of invariants associated with geometric objects (like de Rham cohomology or  $K$ -theories) are usually invariants of the category of sheaves on these objects. This interest is driven by the ubiquity of categories —everything meets there: symplectic manifolds, complex varieties, quiver representations, matrix factorizations, and others. Nowadays it is admitted that in this context categories need to be of a homotopical nature, and among several possible models we choose here dg-categories, i.e., differential graded categories. Thus, the goal of these lectures will be to give an introduction to the theory of dg-categories with perspectives in categorical Hodge theory.

### **Lectures**

1. Survival kit for homotopy theory; basic definitions and examples; derived Morita theory; smooth and compact dg-categories.
2. Derived stacks; the derived stack of objects in a dg-category and of perfect complexes on a dg-category; algebraic  $K$ -theory and Hochschild (co)homology.
3. Topological  $K$ -theory; the lattice conjecture; Calabi–Yau dg-categories; deformations.

**Place:** IMUB Lecture Room

**Time:** 15.00 – 16.00

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