Faculty of Sciences

MATH2392 Theory of categories (Second part)

[22.5h] 2.5 credits

This course is taught in the 2nd semester

Teacher(s):   Francis Borceux, Enrico Vitale (coord.)
Language: French
Level: Second cycle

Aims

This is an option course in first and second masters' year. It can be taken in both of them as the content will change every year.

Main themes

One or more arguments in the following list:
- Category theory and commutative algebra: classification of module categories, faithfully projective modules, Eilenberg-Watts theorem, Morita theorem; exact categories, regular projective objects, equivalence between exact categories with enough regular projective objects.
- Category theory and universal algebra: monads, algebras for a monad; monads over Set, finitary monads, algebraic categories, characterization of varieties and quasi-varieties.
- Category theory and algebric geometry: sheaves on a topological space; Grothendieck topos, elementary topos.
- Category theory and homological algebra: exact and abelian categories, localisations; monoidal categories, categorical groups, group extensions.
- Category theory, knot theory and quantum groups: monoïdal categories, braid groups, braided categories, Hopf algebras, invariants.
- Category theory and algebraic topology: groups, groupoids and fundamental groups of a topological space, exact sequence of groups and groupoids associated with a fibretion, Van Kampen theorem.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

References:
- H. Bass: Algebraic K-theory, Benjamin Inc. 1968;
- F. Borceux: Handbook of categorical algebra, Cambridge University Press 1994;
- Ch. Kassel: Quantum groups, Springer-Verlag 1995;
- S. Mac Lane: Categories for the working mathematician, Springer-Verlag 1972;
- S. Mac Lane, I. Moerdijk: Sheaves in geometry and logic, Springer-Verlag 1992;
- R. Piccinini: Lectures on Homotopy Theory, North-Holland 1992.
Prerequisites: course MATH 2391 and the Categories Theory, first part.
Organization mode: to be discussed with students.

Other credits in programs

INFO23	Troisième année du programme conduisant au grade d'ingénieur civil informaticien	(2.5 credits)
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(2.5 credits)
MATH22/G	Deuxième licence en sciences mathématiques	(2.5 credits)