



Syllabus

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Mathematics

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Program Master's Program

Title **Mathematical Science IIIA**

(in Japanese) 数理科学IIIA

Students recommended to study this course Students in 1st to 2nd year **Number of credits** 1.5 [Optional] [Specialized subject]

Teacher

| Lecture number | Available term | Available day and period | Classroom | Name of teacher (in Japanese) | Teacher's room | Telephone number or E-mail | Office hour |
|----------------|----------------|--------------------------|-----------|-------------------------------|----------------------------|----------------------------|-------------|
| 01BB605 | Spring ABC | Tuesday, 3 | 1E502 | Hirokazu Nishimura (西村泰一) | Natural Science Bldg. B625 | logic@math.tsukuba.ac.jp | |

Objective of coursework

We will discuss Homotopy Type Theory.

Overview of coursework

Homotopy Type Theory lies at the crossroads of computer science. It was found out in this century that dependent type theory is no other than the internal language for (abstract) homotopy theory, just as the Mitchell-Benabou language is the internal language for topos theory.

It is pleasing to note that the Freudenthal suspension theorem, Blakers-Massey theorem, Whitehead's principle for n -types, van Kampen theorem, and some other famous theorems are given new proofs within homotopy type theory.

Keywords of coursework

homotopy theory theory, homotopy theory, model category, dependent type theory, category theory, fibered category theory, comprehensive category, n -types, n -connectedness

Plan of coursework

After providing preliminary courses on category theory and homotopy theory, we will give elements of homotopy theory theory.

Method for evaluating learning results

By occasional reports

Educational materials, reference documents, and documents distributed, etc.

MacLane, Categories for the Working Mathematician
 Voevodsky et al., Homotopy Type Theory
 Jacobs, Categorical Logic and Type Theory
 Hirschhorn, Model Categories and Their Localizations
 Whitehead, Elements of Homotopy Theory
 Goerss and Jardine, Simplicial Homotopy Theory
 Lurie, Higher Topos Theory

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