

# Perspectives in Mathematical Sciences I (Spring 2018)

Teacher: Jacques Garrigue

## Course Subject

Part 2 of the course is “Typed Lambda-Calculi and the Curry-Howard isomorphism”.

## Purpose

Starting from mathematical logic, the lambda-calculus has become one of the main foundations of programming language theory. Through the introduction of types, it has demonstrated a close connection between proofs and programs, known as the Curry-Howard isomorphism. It has been applied both to functional programming languages and type theory based proof assistants. We will give a quick tour through some of the type systems developed for lambda-calculus, and show their implications both for programming and logic.

## Evaluation

Evaluation will be based on a report.

If you wish, you can send it by mail to [garrigue@math.nagoya-u.ac.jp](mailto:garrigue@math.nagoya-u.ac.jp).

## References

We will not use no textbook, but the following books may be of interest to those wishing to know more.

- Henk Barendregt, “The lambda-calculus : its syntax and semantics”, North-Holland, 1981.
- Jean-Yves Girard, Yves Lafont and Paul Taylor, “Proofs and types”, Cambridge University Press, 1990. <http://www.paultaylor.eu/stable/Proofs+Types.html>
- 大堀 淳, “プログラミング言語の基礎理論”. 共立出版, 1997.

## Course Plan

The course shall progress as indicated below

1st lecture (5/22) Lambda calculus : syntax

2nd lecture (5/29) Simply-typed lambda-calculus

3rd lecture (6/5) Intuitionistic logic and the Curry-Howard isomorphism

4th lecture (6/12) Second-order lambda calculus (System F)

5th lecture (6/19) Dependent type systems and applications

## Office Hour

Every Monday 14:00~15:00 Math. Bld., Room 405 or 455.

## Course URL

Course material and other information can be found at the course URL:

<http://www.math.nagoya-u.ac.jp/~garrigue/lecture/>