

**15-816**

**Linear Logic**

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# My Responsibility

- Lectures Mon and Wed, 12:00-1:20
  - Live video conferencing at some sites
  - Recorded lectures posted online within 24hrs
- Google+ Hangout, Thu 12:00-1:00
  - For remote course participants
  - Welcome UBC, Indiana, Chicago, NASA Langley, Princeton, UPenn, U.Lisbon, UN.Lisbon, Porto, ITU, Bilkent!
- Office Hour, Thu 1:00-2:00 (GHC 9101)
- Website  
[www.cs.cmu.edu/~fp/courses/15816-s12/](http://www.cs.cmu.edu/~fp/courses/15816-s12/)

# Your Responsibility

- Class participation (if you are [tele]present)
- Mailing List [linlog-course@cs.cmu.edu](mailto:linlog-course@cs.cmu.edu)
  - Discussion and announcements; please subscribe!
- Homework assignments (60%)
  - 6 weekly assignments up to midterm (individual)
  - 3 biweekly assignments after midterm (small groups)
  - Let me know if you have your heart set on project
- Midterm exam (15%), March 7
  - Closed notes, in class (80 minutes)
- Final exam (25%), date TBA

# About Linear Logic

- Jean-Yves Girard (1987)
  - Inspired by a mathematical semantics
  - Changed the way we view logic and computation
  - Changed the way we approach proof theory
- My approach
  - Inspired by Dummett (1976) and Martin-Löf (1983)
  - Systematic internal justification of (linear) logical laws
  - Will relate these views
- Part of a family of **substructural** logics
  - Lambek calculus, affine logic, strict logic, relevance logic, ordered logic, bunched logic, separation logic, ...

# About Linear Logic

- A logic of **state** or **resources**
- Numerous applications in computer science
  - Logic programming (imperative, concurrent)
  - Functional programming (machines, complexity)
  - Concurrency (session types, geometry of interaction)
  - Object-oriented programming (typestate)
- Numerous applications in logic
  - Understanding structural rules
  - Focusing and polarization
  - Resource semantics
  - Knowledge and possession

# Course Outline

- Part I: Fundamentals
  - Systematic development of linear logic
  - Understanding its intrinsic properties
  - Intuition from guiding examples and applications
- Part II: Applications
  - Study selected applications
  - Team assignments for further investigation
- Part III: Frontier?
- Today: **Deductive Inference**