Teaching methods:
28 hours lecture
28 hours tutorial

Prerequisites: Some mathematical maturity is the main prerequisite. Some basic knowledge of logic, abstract algebra, or of topology is useful even though no specific material will be required.

Learning outcomes: After this course the student is familiar with the notions of ordered algebraic structure, topo-relational structure, categorical duality and syntax and semantics of a propositional logic. She or he is familiar with several examples of propositional logics used in computer science such as intuitionistic logic and various forms of modal logic. He or she is familiar with Stone/Priestley Duality for bounded distributive lattice-ordered algebras, and has seen several applications including one to knowledge representation.

Description: Algebra and geometry are, and have been since ancient times, the two main and separate strands of mathematics. Duality theory treats the part of algebra and topology (as a form of generalised geometry) where these strands are interchangeable and become one and the same. This setting turns out to be, essentially, the setting of propositional logic. In applications of logic we need to understand two aspects of a logic: the behavior of the system (its model theory) and the expressive/specification power of the system. These two fundamental aspects of logic are modelled by the two sides of topological duality.

The course will consist roughly of the following three segments:
1. Partial orders, lattices, and their relation to logic.
   (8 lectures; 8 tutorials)
2. Partial orders, topology, and their relationship to domain theory.
   (8 lectures; 8 tutorials)
3. Duality theory for bounded distributive lattices with operators and relational semantics for propositional logics.
   (12 lectures; 12 tutorials)

Examination: Oral

Literature: Parts of the book manuscript 'Lattices in Logic: canonicity, duality, and correspondence' with H. A. Priestley.
(Optional)
P. Blackburn, M. de Rijke & Y. Venema, Modal Logic (CUP 2001).