Learning checklist

Part I

Lecture 1: Introduction

☐ Understand the basic ideas of the denotational approach to the semantics of programming languages.

☐ Understand the notion of compositional semantics.

☐ Understand the need for supporting fixed point operators.

Lecture 2: Least fixed points

☐ Be able to give the definition and examples/non-examples of partial order, cpo, and domain.

☐ Be able to give the definition of lubs of chains, and use the definition as a proof principle.

☐ Be able to give the definition and examples/non-examples of monotone, continuous, and strict functions.

☐ Be able to give the definition of least pre-fixed point, and use the definition as a proof principle.

☐ Be able to state and prove Tarski’s fixed point theorem.

Lecture 3: Constructions on domains

☐ Be able to give the definition of the product of domains, function domains, and flat domains.

☐ Be able to give the definition and establish the continuity of the various functions (projections, pairings, evaluation, currying, composition, fixed point operator) associated to the above constructions.

Lecture 4: Scott induction

☐ Be able to give the definition of the concept of admissible subset of a domain.

☐ Be able to state, prove the soundness of, and apply Scott’s induction principle.

☐ Be able to build admissible subsets, justifying the constructions.

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¹You can safely skip pages 32–34 of the lecture notes.
Learning checklist
PART II

Lecture 5: PCF

☐ Understand the syntax, typing, and operational semantics of PCF.

[§5.1–5.4]

☐ Be able to define partial recursive functions in PCF.

[§5.3]

☐ Be able to give the definition of the notion of contextual equivalence in PCF.

[§5.5]

Lecture 6: Denotational semantics of PCF

☐ Be able to give the definition of the denotational semantics of PCF.

[§6.1–6.2]

☐ Be able to use the denotational semantics of PCF to prove contextual equivalence in PCF.

[Slide 30]

☐ Be able to state the compositionality properties of the denotational semantics of PCF.

[§6.3]

☐ Be able to state and prove the soundness of the denotational semantics of PCF.

[§6.4]

[Slide 27]

Lecture 7: Relating denotational and operational semantics

☐ Be able to state the adequacy property of the denotational semantics of PCF.

[Slide 27]

☐ Be able to give the definition of the notion of contextual preorder in PCF, and to state and prove its extensionality properties.

[§7.3]

Lecture 8: Full abstraction

☐ Understand the concept of full abstraction in PCF, and the reason for which it fails.

[§8.1]

☐ Be able to give the definition of the operational and denotational semantics of PCF with parallel or.

[§8.2]