

Software Foundations (Fall 2026)

Course Information

- **Instructor:** Talia Ringer (they/them), Siebel 4218
- **TA:** Hannah Leung Liang (she/her)
- **Office Hours:** TBD
- **Forum:** TBD
- **Course URL:** <https://dependenttyp.es/classes/498fa2026.html>
- **Course Book:** <https://softwarefoundations.cis.upenn.edu/lf-current/index.html> (free)

Course Goals

Proof assistants are becoming more and more relevant in the era of large collaborations in software and mathematics—especially when AI is involved! They serve as a **trustworthy interface** between people and tools who may not have any reason to otherwise trust one another. My goal is to prepare you for a reality in which this kind of collaboration using proof assistants as an interface is the norm. Specifically, I aim to:

- teach you how to **verify** programs and mathematical results written with or without AI help, to instill some **trust** back into a world in which it has eroded;
- give you the **domain expertise** [needed](#) to use AI tools for and to critically evaluate AI results in programming and proving; and
- **prepare** you for a world in which proof assistants are more relevant than ever, so that you do not just need to ride the wave; you can **lead and build**.

AI Policy

The course operates on a policy of teaching, not policing. While AI tools are capable of solving most exercises in the course, the focus is on gaining the domain expertise required to use them responsibly. Specifically:

- AI usage is technically **allowed**, but is **strongly discouraged early on**.
- Later in the course, AI usage is encouraged only in **strategic** ways that ensure students are actually learning the material.
- What this looks like will be **communicated** clearly on a per-exercise basis.

- To mitigate the temptation to rely solely on AI, all exercises will be completed in **pairs**, and there will be a **discussion forum** on which students can post tips and experiences synchronously without posting full answers.
- There will also be **in-class discussions** around important topics (both relevant to AI and independent of it).

Course Structure and Grading

The course is centered around the book *Software Foundations (Volume 1)* and involves programming, specifying, and proving in Rocq.

Grading Breakdown

Component	Weight	Details
Exercises	60%	12 chapters (5% each). Completed in pairs.
Discussions	40%	(Co-)lead 2 sessions (10% each) and (Co-)assist 4 sessions (5% each).

Leaders must be ready to drive the discussion; **assistants** must be committed to participating in the discussion. Both leaders and assistants need to show up on the day of their chosen discussion. **Everyone else** is encouraged to come and to participate in the discussion, but will not be graded for it on that particular day. With that in mind, once the sign-up for discussion slots opens, please choose to lead and assist on days you know you can attend!

Policies

- **Late Exercises:** Students receive two "free" late submissions (up to one week late). To use these, you must notify the instructor and your partner at least 24 hours before the deadline.
- **Missed Discussions:** Participation in discussions is a graded component, but students do not need to attend every single class. Rather, students need to be there for just the 6 slots students that sign up to co-lead/co-assist in advance. Discussion slots can be rescheduled up to 24 hours in advance with no questions asked.
- **Exceptions:** Please contact me if you need exceptions to any of these things; I err on the side of accommodations (e.g., for health reasons, grief, disability including that beyond the scope of DRES alone, etc.).

Schedule

The material will follow the 10 recommended chapters from the first book of Software Foundations from [this chart](#), plus 2 additional chapters (Chapters 9 and 10) I find particularly relevant. Most days will consist of going through the material corresponding to the current chapter interactively in class. Special classes that depart from this format are highlighted in orange. Days with no class are highlighted in grey.

This schedule is a work in progress; [please check back soon for more details](#). Sign-ups for discussions will occur in a separate doc that only students in the class will have access to for FERPA reasons. [I will link to it here once it exists](#).

Date	Topic	Homework	Discussion
Aug. 25th	Overview (slides) [Talia Ringer]	Recommended: 1. Read the book's Preface 2. Install Rocq 3. Fill out background survey	N/A
Aug. 27th	Pair Proving, Basics [Talia Ringer]	Assigned: Ch. 1 (Basics)	N/A
Sep. 1st	More Basics [Talia Ringer]	Continued: Ch. 1 (Basics)	TBD
Sep. 3rd	Induction [Talia Ringer]	Due: Ch. 1 (Basics) Assigned: Ch. 2 (Induction)	TBD
Sep. 8th	More Induction [Talia Ringer]	Continued: Ch. 2 (Induction)	TBD
Sep. 10th	Structured Data [Hannah Leung Liang]	Due: Ch. 2 (Induction) Assigned: Ch. 3 (Lists)	TBD
Sep. 15th	More Structured Data [Talia Ringer]	Continued: Ch. 3 (Lists)	TBD
Sep. 17th	Polymorphism, HOFs [Talia Ringer]	Due: Ch. 3 (Lists) Assigned: Ch. 4 (Poly)	TBD
Sep. 22nd	More Polymorphism [Talia Ringer]	Continued: Ch. 4 (Poly)	TBD
Sep. 24th	Automation, Tactics	Due: Ch. 4 (Poly) Assigned: Ch. 5 (Tactics)	TBD

	[Talia Ringer]		
Sep. 29th	More Tactics [Talia Ringer]	Continued: Ch. 5 (Tactics)	TBD
Oct. 1st	Logic [Talia Ringer]	Due: Ch. 5 (Tactics) Assigned: Ch. 6 (Logic)	TBD
Oct. 6th	More Logic [Talia Ringer]	Continued: Ch. 6 (Logic)	TBD
Oct. 8th	Inductive Propositions [Talia Ringer]	Due: Ch. 6 (Logic) Assigned: Ch. 7 (IndProp)	TBD
Oct. 13th	More Propositions [Talia Ringer]	Continued: Ch. 7 (IndProp)	TBD
Oct. 15th	Proof Objects [Talia Ringer]	Due: Ch. 7 (IndProp) Assigned: Ch. 9 (ProofObjects)	TBD
Oct. 20th	More Proof Objects [Talia Ringer]	Continued: Ch. 9 (ProofObjects)	TBD
Oct. 22nd	Research Presentation (AI for Proofs) [Kevin Fisher]	Due: Ch. 9 (ProofObjects)	TBD
Oct. 27th	Research Presentation (Applied Verification) [Hannah Leung Liang]	N/A	TBD
Oct. 29th	Induction Principles [Talia Ringer]	Assigned: Ch. 10 (IndPrinciples)	TBD
Nov. 3rd	More Principles [Talia Ringer]	Continued: Ch. 10 (IndPrinciples)	TBD
Nov. 5th	Maps [Talia Ringer]	Due: Ch. 10 (IndPrinciples) Assigned: Ch. 8 (Maps)	TBD
Nov. 10th	More Maps [Talia Ringer]	Continued: Ch. 8 (Maps)	TBD
Nov. 12th	Imperative Programs [Hannah Leung Liang]	Due: Ch. 8 (Maps) Assigned: Ch. 14 (Imp)	TBD
Nov. 17th	More Imperative [Talia Ringer]	Continued: Ch. 14 (Imp)	TBD

Nov. 19th	Interlude: Checking In [Talia Ringer]	Due: Ch. 14 (Imp)	TBD
Nov. 24th	Fall Break	N/A	N/A
Nov. 26th	Fall Break	N/A	N/A
Dec. 1st	More Automation [Talia Ringer]	Assigned: Ch. 18 (Auto)	TBD
Dec. 3rd	More Automation [Talia Ringer]	Continued: Ch. 18 (Auto)	TBD
Dec. 8th	Conclusion	Due: Ch. 18 (Auto)	TBD

More TBD

More coming soon:

- Homework submission logistics
- Pair proving background and logistics
- Installation notes