Course Syllabus

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Graduate Programming Languages
University of Texas at Austin, Computer Science
Spring 2020

Instructor **William Cook (http://www.cs.utexas.edu/users/wcook)**

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Office: GDC 5.824

Office Hours:

- Monday 2-3pm
- Tuesday 2-3pm
- Thursday 10-11am
- Friday 1-2pm
- or by appointment

TA: **Mihir Mehta**
TA Email: mihir@cs.utexas.edu
TA Hours: Monday 8:00-9:00am, Thursday 8:00 - 9:00am

Summary

This course is an introduction to programming language principles and theory. I'll focus on the Lambda Calculus, the Agda dependently-typed programming language and proof assistant, and Type theory

Here is how to get Agda:

- I'm working on getting Agda installed on the department linux machines,
  but I expect you will want it on your own machine.
- Agda web site **wiki.portal.chalmers.se/agda/pmwiki.php**
  (https://wiki.portal.chalmers.se/agda/pmwiki.php)
  be sure to install Emacs and Agda-mode, or you will be very unhappy

We will use this book (its free on the internet)
Programming Language Foundations in Agda (https://plfa.github.io/)

Assignments: 60%. Midterm Exam 20%, Final Exam: 20%.

See the **assignments** page in Canvas for a calendar of topics and assignments.

Course Summary:

Date	Details	
Tue Jan 21, 2020	Class Introduction (https://utexas.instructure.com/calendar?event_id=1495169&include_contexts=course_1276467)	12:30pm to 2pm
Thu Jan 23, 2020	Introduction to Lambda Calculus (https://utexas.instructure.com/calendar?event_id=1495170&include_contexts=course_1276467)	12:30pm to 2pm
Tue Jan 28, 2020	Installation of Agda and Logistics (https://utexas.instructure.com/calendar?event_id=1495173&include_contexts=course_1276467)	12:30pm to 2pm
Thu Jan 30, 2020	PLFA: Naturals: Natural numbers (https://utexas.instructure.com/calendar?event_id=1495174&include_contexts=course_1276467)	12:30pm to 2pm
Mon Feb 3, 2020	Lambda Calculus Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4910575)	due by 11:59pm
Tue Feb 4, 2020	Induction: Proof by induction (1) (https://utexas.instructure.com/calendar?event_id=1495189&include_contexts=course_1276467)	12:30pm to 2pm
Thu Feb 6, 2020	Induction: Proof by induction (2) (https://utexas.instructure.com/calendar?event_id=1495190&include_contexts=course_1276467)	12:30pm to 2pm
Fri Feb 7, 2020	Natural Numbers Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4909176)	due by 11:59pm
Tue Feb 11, 2020	Relations: Inductive definition of relations (1) (https://utexas.instructure.com/calendar?event_id=1495365&include_contexts=course_1276467)	12:30pm to 2pm
Thu Feb 13, 2020	Relations: Inductive definition of relations (2) (https://utexas.instructure.com/calendar?event_id=1495366&include_contexts=course_1276467)	12:30pm to 2pm
Fri Feb 14, 2020	Induction Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4910494)	due by 11:59pm
Tue Feb 18, 2020	Equality: Equality and equational reasoning (https://utexas.instructure.com/calendar?event_id=1495368&include_contexts=course_1276467)	12:30pm to 2pm

Date	Details	
Thu Feb 20, 2020	**Isomorphism: Isomorphism and embedding** (https://utexas.instructure.com/calendar?event_id=1495374&include_contexts=course_1276467)	12:30pm to 2pm
Fri Feb 21, 2020	**Relations Exercises DUE** (https://utexas.instructure.com/courses/1276467/assignments/4910568)	due by 11:59pm
Tue Feb 25, 2020	**Connectives: Conjunction, disjunction, and implication (1)** (https://utexas.instructure.com/calendar?event_id=1495418&include_contexts=course_1276467)	12:30pm to 2pm
Thu Feb 27, 2020	**Discussion: Sorting** (https://utexas.instructure.com/calendar?event_id=1507066&include_contexts=course_1276467)	12:30pm to 2pm
Tue Mar 3, 2020	**Connectives: Conjunction, disjunction, and implication (2)** (https://utexas.instructure.com/calendar?event_id=1495419&include_contexts=course_1276467)	12:30pm to 2pm
Thu Mar 5, 2020	**Negation: Negation, with intuitionistic and classical logic** (https://utexas.instructure.com/calendar?event_id=1495450&include_contexts=course_1276467)	12:30pm to 2pm
Fri Mar 6, 2020	**Isomorphism Exercises DUE** (https://utexas.instructure.com/courses/1276467/assignments/4910595)	due by 11:59pm
Tue Mar 10, 2020	**Quantifiers: Universals and existentials** (https://utexas.instructure.com/calendar?event_id=1495453&include_contexts=course_1276467)	12:30pm to 2pm
Thu Mar 12, 2020	**Midterm EXAM updated (AGAIN)** (https://utexas.instructure.com/courses/1276467/assignments/4910658)	due by 11:59pm
Mon Mar 16, 2020	**SPRING BREAK** (https://utexas.instructure.com/calendar?event_id=1495462&include_contexts=course_1276467)	12am
Tue Mar 17, 2020	**SPRING BREAK** (https://utexas.instructure.com/calendar?event_id=1495463&include_contexts=course_1276467)	12am
Wed Mar 18, 2020	**SPRING BREAK** (https://utexas.instructure.com/calendar?event_id=1495464&include_contexts=course_1276467)	12am
Thu Mar 19, 2020	**SPRING BREAK** (https://utexas.instructure.com/calendar?event_id=1495465&include_contexts=course_1276467)	12am

Date	Details	
Fri Mar 20, 2020	SPRING BREAK (https://utexas.instructure.com/calendar?event_id=1495466&include_contexts=course_1276467)	12am
Mon Mar 23, 2020	Spring Break (https://utexas.instructure.com/calendar?event_id=1544858&include_contexts=course_1276467)	12am
Tue Mar 24, 2020	Spring Break (https://utexas.instructure.com/calendar?event_id=1544859&include_contexts=course_1276467)	12am
Wed Mar 25, 2020	Spring Break (https://utexas.instructure.com/calendar?event_id=1544860&include_contexts=course_1276467)	12am
Thu Mar 26, 2020	Spring Break (https://utexas.instructure.com/calendar?event_id=1544862&include_contexts=course_1276467)	12am
Fri Mar 27, 2020	Spring Break (https://utexas.instructure.com/calendar?event_id=1544863&include_contexts=course_1276467)	12am
Sun Mar 29, 2020	Test Meeting (https://utexas.instructure.com/calendar?event_id=1599364&include_contexts=course_1276467)	4pm to 5pm
Mon Mar 30, 2020	Connectives Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4910623)	due by 11:59pm
Tue Mar 31, 2020	Decidable: Booleans and decision procedures (1) (https://utexas.instructure.com/calendar?event_id=1495455&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599341&include_contexts=course_1276467)	12:30pm to 1:45pm
Thu Apr 2, 2020	Lists: Lists and higher-order functions (1) (https://utexas.instructure.com/calendar?event_id=1495457&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599342&include_contexts=course_1276467)	12:30pm to 1:45pm
Fri Apr 3, 2020	Negation Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4910626)	due by 11:59pm
Mon Apr 6, 2020	Quantifiers Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4910627)	due by 11:59pm

Date	Details	
Tue Apr 7, 2020	Lists: Lists and higher-order functions (2) (https://utexas.instructure.com/calendar?event_id=1495458&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599343&include_contexts=course_1276467)	12:30pm to 1:45pm
Thu Apr 9, 2020	Lambda: Introduction to Lambda Calculus (1) (https://utexas.instructure.com/calendar?event_id=1495460&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599344&include_contexts=course_1276467)	12:30pm to 1:45pm
Fri Apr 10, 2020	Decidable Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4910628)	due by 11:59pm
Tue Apr 14, 2020	Lambda: Introduction to Lambda Calculus (2) (https://utexas.instructure.com/calendar?event_id=1495461&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599345&include_contexts=course_1276467)	12:30pm to 1:45pm
Thu Apr 16, 2020	Properties: Progress and Preservation (1) (https://utexas.instructure.com/calendar?event_id=1495467&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599346&include_contexts=course_1276467)	12:30pm to 1:45pm
Fri Apr 17, 2020	Lists Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4910635)	due by 11:59pm
Tue Apr 21, 2020	Properties: Progress and Preservation (2) (https://utexas.instructure.com/calendar?event_id=1495468&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599347&include_contexts=course_1276467)	12:30pm to 1:45pm
Thu Apr 23, 2020	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599348&include_contexts=course_1276467)	12:30pm to 1:45pm

Date	Details	
Fri Apr 24, 2020	Lambda Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4944779)	due by 11:59pm
Tue Apr 28, 2020	DeBruijn: Intrinsically-typed de Bruijn representation (1) (https://utexas.instructure.com/calendar?event_id=1495469&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599349&include_contexts=course_1276467)	12:30pm to 1:45pm
Thu Apr 30, 2020	More: Additional constructs of simply-typed lambda calculus (There is no assignment associated with this event) (https://utexas.instructure.com/calendar?event_id=1500740&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599350&include_contexts=course_1276467)	12:30pm to 1:45pm
Fri May 1, 2020	Properties Exercises DUE (https://utexas.instructure.com/courses/1276467/assignments/4910670)	due by 11:59pm
Tue May 5, 2020	Bisimulation: Relating reduction systems (https://utexas.instructure.com/calendar?event_id=1545164&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599351&include_contexts=course_1276467)	12:30pm to 1:45pm
Thu May 7, 2020	Class wrapup (https://utexas.instructure.com/calendar?event_id=1495475&include_contexts=course_1276467)	12:30pm to 2pm
	Sp20 - Grad PL (50740) (https://utexas.instructure.com/calendar?event_id=1599352&include_contexts=course_1276467)	12:30pm to 1:45pm
Fri May 8, 2020	DeBruijn: Intrinsically-typed de Bruijn representation DUE (https://utexas.instructure.com/courses/1276467/assignments/4974436)	due by 11:59pm
Wed May 13, 2020	Final Exam Take Home ASSIGNED (https://utexas.instructure.com/calendar?event_id=1545203&include_contexts=course_1276467)	12:30pm
Mon May 18, 2020	Final Exam Take-Home DUE (https://utexas.instructure.com/courses/1276467/assignments/4974439)	due by 11:59pm