Graduate-level introduction to functional programming and programming language theory. Topics to be covered include: strongly typed functional programming in Haskell, abstract syntax and grammars, interpreters, denotational semantics, domain theory, and lambda calculus.

Logistics:

Instructor: Eric Walkingshaw  
Email: walkiner@oregonstate.edu  
Office: KEC 3049  
Lectures: T Th 4:00–5:20pm, Withycombe 217  
Office hours: (see course web page)

Teaching assistant: Mike McGirr  
Email: mcgirrm@oregonstate.edu  
Office hours: (see course web page)

Course web page: [http://web.engr.oregonstate.edu/~walkiner/teaching/cs581-fa17/](http://web.engr.oregonstate.edu/~walkiner/teaching/cs581-fa17/)

Graduate Program Notes:

- This course may be taken instead of CS 381 or CS 480 to satisfy the “Translators or Programming Languages” minimum requirement for all graduate programs.
- This course is a prerequisite for:
  - CS 582 – Programming Languages II
  - CS 583 – Advanced Functional Programming
  - CS 585 – Domain-Specific Languages
  - CS 589 – Special Topics in Programming Languages

Learning Objectives:

At the end of the course, students should be able to . . .

1. **Describe** the role of metalanguages in defining programming languages
2. **Infer** the type of an expression given the types of its components
3. **Implement** a recursive function over an algebraic data type
4. **Implement** an interpreter for a language given a formal definition
5. **Design** an abstract syntax for a simple programming language
6. **Evaluate** the suitability of a semantic domain for a particular language
7. **Design** a denotational semantics for a simple programming language
8. **Apply** a given reduction strategy to evaluate a lambda calculus expression
9. **Translate** between encodings of a language in different metalanguages
Tentative Schedule (subject to change):

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<th>Week</th>
<th>Topic</th>
<th>Important Dates</th>
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<td></td>
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<td>Tuesday</td>
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<tr>
<td>0</td>
<td>Introduction</td>
<td>Sep 21</td>
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<tr>
<td>1</td>
<td>FP/Haskell</td>
<td>Sep 26</td>
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<td>2</td>
<td>FP/Haskell</td>
<td>Oct 3</td>
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<td>3</td>
<td>Syntax</td>
<td>Oct 10</td>
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<td>Quiz</td>
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<td>4</td>
<td>Semantics</td>
<td>Oct 17</td>
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<td>5</td>
<td>Naming, State, Effects</td>
<td>Oct 24</td>
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<td>Quiz</td>
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<td>Lambda Calculus</td>
<td>Oct 31</td>
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<td>Midterm</td>
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<td>Lambda Calculus</td>
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<td>Domain Theory</td>
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<td>9</td>
<td>Fixed Points</td>
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<td>no class</td>
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<td>10</td>
<td>Review</td>
<td>Nov 28</td>
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<td>Nov 30</td>
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Final exam: Thur Dec 7, 6:00pm–7:50pm

For the latest scheduling information, check the course web page regularly!

To every class meeting, you should bring: paper, pen/pencil, and your response cards.

Grading and Course Policies:

Grades will be computed using the following weights.

- 20% Homework
- 15% Participation
- 15% Quizzes (3 × 5% each)
- 20% Midterm Exam
- 30% Final Exam

All quizzes and exams are closed book and closed notes.

Direct collaboration on homework assignments is not allowed. However, homework in this class is not graded for correctness, but is instead graded for effort. If you cannot solve a problem, you must provide an explanation of what you know, what you tried, and where you got stuck. Detailed instructions and the rationale for this policy are provided on the course web page.

Grades are assigned using the standard ranges, after rounding. For example, ≥93% = A, 90–92% = A-, 87–89% = B+, 83–86% = B, 80–82% = B-, and so on. Overall grades will not be curved. However, scores on individual quizzes and exams may occasionally be adjusted upward for the entire class.

Students with Disabilities:

Accommodations are collaborative efforts between students, faculty and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098.