



East China Normal University
GEC International Summer School

CPS56: Comparative Programming Languages

Term: October 7th to November 10th, 2024

Class Hours: Monday to Friday, 13:00 PM – 15:00 PM (in person, 2,750 minutes in total)

Class Location: Physics Building 210

Lab Hours: Friday, 16:00 PM – 18:00 PM

Lab Location: Physics Building 601

Instructor: Bai Jiangang

Home institution: Peking University

Office Hours: TBD

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Course Description

Explore the diverse landscape of programming paradigms in this course, with a focal point on the functional paradigm. Dive into topics such as data typing, program decomposition, scoping rules, control structures, and parameter passing. Delve into commercially significant functional languages like Haskell, and Erlang, gaining practical skills and insights into their usage and applications. Through hands-on projects and discussions, you'll develop a strong understanding of how functional programming principles can be applied to solve real-world problems, preparing you for success in today's dynamic tech industry.

Course Objectives

By the end of this course, students will be able to:



1. Gain a comprehensive understanding of various programming paradigms, with a specific focus on the functional paradigm, through exploration of its principles and methodologies.
2. Acquire in-depth knowledge of fundamental concepts including data typing, program decomposition, scoping rules, control structures, and parameter passing, essential for proficient programming in diverse environments.
3. Develop practical proficiency in commercially significant functional languages such as Haskell and Erlang, including hands-on experience with coding exercises and projects.
4. Explore the applications and implications of functional programming principles in real-world scenarios, fostering critical thinking and problem-solving skills necessary for success in the dynamic tech industry.
5. Engage in lively discussions and collaborative learning experiences to deepen understanding and exchange insights into the usage and effectiveness of functional programming in modern software development.
6. Cultivate the ability to apply functional programming principles creatively to address complex challenges, preparing for future career opportunities in software engineering and related fields.

Recommended Reading

Wild, J. J., & Wild, K. L. (2015). *International Business: The challenges of globalization (8th ed.)*. Harlow: Pearson Education Limited.

Course Hours

The course has 25 class sessions in total. Each class session is 110 minutes in length, for a total of 2750 minutes of in-class time. The course meets from Monday to Friday. ECNU awards 3 credits for this course. Different universities may count course credits differently. Consult officials at your own home institution.



Attendance

Summer school is very intense and to be successful, students need to attend every class. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. ECNU policy requires a medical certificate to be excused. Any absence may impact on the student's grade. Moreover, ECNU policy is that a student who has more than 3 absences will fail the course. Arriving late or leaving early will count as a partial absence.

Grading Policy

ECNU awards grades of A, A-, B+, B, B-, C+, C, D, and F. Most colleges and universities do not award transfer credit for grades of D or F.

In this course, grading will be based on the following:

Projects*2	15%*2=30%
Lab Assignments	30%
Final Exam	40%

General Expectations

Students are expected to:

- Attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade.
- Arrive to class on-time: Late arrivals are disruptive to your fellow students and to the conduct of the class.
- Complete the day's required reading and assignments before class.
- Review the previous day's notes before class; make notes about questions you have about the previous class or the day's reading.
- Refrain from texting, phoning or engaging in computer activities unrelated to class during class (不要用手机). It is highly disrespectful to the professor and to the class.
- Participate in class discussions and complete required written work on time.

Course Schedule

The planned schedule sketched out below may be modified to suit the interests or



abilities of the enrolled students or to take advantage of special opportunities or events that may arise during the term.

Week 1

- *Day 1*
 - o *Course introduction*
 - o *Programming paradigms*
- *Day 2*
 - o *Typing models and Programming models*
- *Day 3*
 - o *Language interaction*
 - o *Decision constructs*
- *Day 4*
 - o *Decisions, repetitions*
 - o *Typing model*
 - o *Collections*
- *Day 5*
 - o *Tutorial/Discussion*
 - o *Lab Assignment*

Week 2

- *Day 1*
 - o *Object-Oriented Languages: Motivations*
- *Day 2*
 - o *Object-Oriented Languages: Design Considerations*



- *Day 3*
 - o *Object-Oriented Languages: Implementation Considerations*
- *Day 4*
 - o *Object-Oriented Languages: Example Language: Ruby*
- *Day 5*
 - o *Tutorial/ Discussion*
 - o *Lab Assignment*

Week 3

- *Day 1*
 - o *Syntax: Context-Free Grammars and BNF*
- *Day 2*
 - o *Syntax Trees and Diagram*
- *Day 3*
 - o *Syntax and Semantics*
- *Day 4*
 - o *Midterm Review Session*
 - o *Lab Assignment*
- *Day 5*
 - o *Midterm*

Week 4

- *Day 1*
 - o *Functional Languages: Example Language: Haskell*



- *Day 2*
 - o *Semantics: Binding of Attributes*
- *Day 3*
 - o *Semantics: Scoping and Symbol Tables*
- *Day 4*
 - o *Semantics: Constants vs. Variables*
- *Day 5*
 - o *Tutorial/Discussion*
 - o *Lab Assignment*

Week 5

- *Day 1*
 - o *Logic Languages: Horn Clauses*
- *Day 2*
 - o *Logic Languages: Resolution and Unification*
 - o *Example Language: Prolog*
- *Day 3*
 - o *Date Typing*
- *Day 4*
 - o *Tutorial/Discussion*
 - o *Final Exam Review Session*
- *Day 5*
 - o *Final Exam*
 - o *Lab Assignment*



Academic Honesty

Students are expected to maintain high standards of academic honesty. Specifically, unless otherwise directed by the professor, students may not consult other students, books, notes, electronic devices or any other source, on examinations. Failure to abide by this may result in a zero on the examination, or even failure in the course.