

Reading Assignment II: Functional Programming

Objective

There's not as big a volume of reading this week, but many of you might find the topics this week a bit more dense and foreign to what you know (depending on your experience, of course).

The primary goal is to understand the fundamental constructs in Swift that support functional programming: `protocols`, `extensions`, generics and closures. An additional important topic is `Optionals`. We've mentioned all of these things in lecture, but now it's time to study them.

Due

As with last week, try to get this done by a week from today (i.e. by the start of week 3), but if it takes you until the start of week 4, that's probably okay. Don't watch lecture 7 until you've finished this.

Materials

You'll continue reading from the same document(s) (e.g. [Swift Programming Language](#)) as last week.

Swift Programming Language

Don't gloss over reading any NOTE text (inside gray boxes) since many of those things are quite important. However, if a NOTE refers to Objective-C or bridging, you can ignore it.

If you read something and don't understand it, that's what Piazza is for! Don't be shy.

If there is a link to another section in the text, you don't have to follow that link unless what it links to is also part of this week's reading assignment.

Always read the overview at the top of each major section (e.g., in [The Basics](#), be sure to read the part that starts "Swift is a new programming language for iOS ...").

You've read everything in [A Swift Tour](#) except the last two sections. We'll postpone Error Handling to next week (just to reduce volume this week).

Protocols and Extensions

Error Handling

In the [Language Guide](#) area, read the following sections in the following chapters. It is important to understand the information in these sections for you to be able to continue to follow along in lecture, so don't blow off this reading.

The Basics

We're still not going to worry about the Error Handling API in Swift for now.

Error Handling

Basic Operators

This is related to Optionals and thus important.

Nil-Coalescing Operator

Strings and Characters

If you skipped this section last week, here's another chance to read this.

- String Literals
- Initializing an Empty String
- String Mutability
- Strings Are Value Types
- Working with Characters
- Concatenating Strings and Characters
- String Interpolation
- Unicode
- Counting Characters
- Accessing and Modifying a String
- Substrings
- Comparing Strings
- Unicode Representations of Strings

Collection Types

Set is not quite as commonly used as Array and Dictionary, but it has a lot of cool uses (it's sort of under-appreciated).

- Sets
- Performing Set Operations (and this)

Control Flow

Just finishing off a couple of interesting language features here.

- Conditional Statements
- Value Bindings
- Where
- Control Transfer Statements
- Continue
- Labeled Statements
- Checking API Availability

Closures

Another of the “most important topics of the week.” Here you’ll read the remaining parts leftover from last week. Definitely make sure you understand this entire topic (i.e. both last week’s and this week’s reading in this section).

- Capturing Values
- Closures are Reference Types
- Escaping Closures
- Autoclosures

Enumerations

Read this entire section. Enumerations are also under-appreciated relative to structs and classes, but judicious use of them can make certain code really clean. You almost certainly find this to be true in your Assignment 3, so don’t skip this section!

Structures and Classes

No new reading in this section, but be certain you understand the difference between a reference type and a value type.

Properties

You're finding out in the demos that computed properties are used a lot in SwiftUI.

Computed Properties

Property Observers

Property Wrappers

Methods

Only one section left here, but what it talks about is something we're more likely to do in an enumeration. Go ahead and read that section, but understand that you won't be doing it that often (I'll try to demo it later in the quarter).

Instance Methods

Assigning to self Within a Mutating Method

Subscripts

Inheritance

We're kind of going to gloss over object-oriented programming in Swift because (outside of your ViewModel), you're not going to use it much in SwiftUI. So I've left it gray again to reduce volume this week.

Initialization

The section in yellow is a really nifty feature of Swift and one that can get you around the Catch-22 of the inability to call functions on yourself while initializing a `var`. The gray sections are us skipping over object-oriented programming to reduce bulk in this reading assignment.

Initializer Delegation for Value Types

Class Inheritance and Initialization

Failable Initializers

Required Initializers

Setting a Default Property Value with a Closure or Function

Deinitialization

Optional Chaining

This is part of understanding Optionals (one of the “most important topics this week”). Read this entire section.

Error Handling

Type Casting

Nested Types

Nested Types in Action

Referring to Nested Types

Extensions

The first of three sections which cover the fundamentals of functional programming in Swift. Your goal this week is really to try to let this concept of functional programming sink in as you read these sections.

- Extension Syntax
- Computed Properties
- Initializers
- Methods
- Subscripts
- Nested Types

Protocols

Ditto Extensions explanation above.

- Protocol Syntax
- Property Requirements
- Method Requirements
- Mutating Method Requirements
- Initializer Requirements
- Protocols as Types
- Delegation
- Adding Protocol Conformance with an Extension
- Collections of Protocol Types
- Protocol Inheritance
- Class-Only Protocols
- Protocol Composition
- Checking for Protocol Conformance
- Optional Protocol Requirements
- Protocol Extensions

Generics

Ditto above again.

We did not talk about generics as they apply to **protocols** themselves (i.e. the sections about “associated types” below). I’m leaving that out this week (although doing so might make some of the other sections refer to things you won’t have read) just because there’s so much functional programming to absorb here, adding that is probably over the top.

The Problem that Generics Solve

Generic Functions

Type Parameters

Naming Type Parameters

Generic Types

Extending a Generic Type

Type Constraints

Associated Types

Generic Where Clauses

Extensions With a Generic Where Clause

Associated Types with a Generic Where Clause

Generic Subscripts

Automatic Reference Counting

Memory Safety

Access Control

Access Levels

Access Control Syntax

Custom Types

Subclassing

Constants, Variables, Properties, and Subscripts

Initializers

Protocols

Extensions

Generics

Type Aliases

Swift API Guidelines

Read this [Swift API Guidelines](#) document in its entirety.

Read this over **again** this week. It should be starting to sink in. As the quarter progresses, you should eventually become an *expert namer of properties, methods and other Swift constructs*. This will require you to refer back to this document often.

Be sure to click everywhere that it says “MORE DETAIL”.

Pay special attention to the “Write a documentation comment” section.

Pay special attention to the “Follow case conventions” section.

Pay special attention to the entire “Argument Labels” section.

You can ignore (for now), points that reference Protocols. When we learn about Protocols next week, be sure to check back with this document after that.

You can also ignore the final subsection of the final section “Special Instructions -> Take extra care with unconstrained polymorphism”. We won’t be doing anything with the Any and AnyObject types.