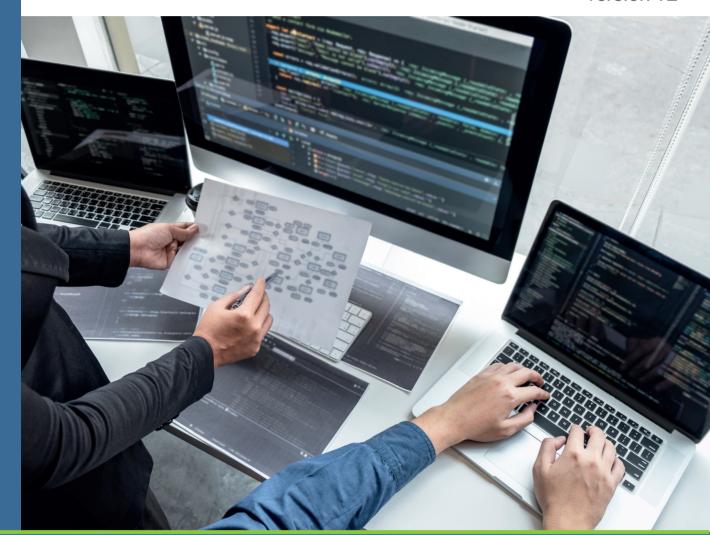


Android Application Development

version 12







- Covers a wide range of Android development topics.
- Demonstrates visual, behavioral and motion rich Android widgets.
- Displays step-by-step lab exercises to build Android apps.
- Includes guides to build Google Maps and Firebase database apps.
- Presents Android app publishing guidelines.

By Android ATC Team

www.androidatc.com

Android ATC

Android™ Application Development

Exam Code:AND-X01
Hands-on Guide to Android Application Development

Course Outline

Android Application Development

Exam Code: AND-X01

© 2021 Android ATC Published by: Android ATC

Sixth Printing: October 2021. First Printing: October 2013. ISBN: 978-0-9900143-0-0

Information in this book, including URL and other Internet Web site references, is subject to change without notice. Complying with all applicable copyright laws, no part of this document may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying, recording, or otherwise) for any purpose, without an express written permission from Android ATC.

Android ATC is not responsible for webcasting or any other form of transmission received from any linked site.

Android ATC is providing these links to you only as a convenience, and the inclusion of any link does not imply endorsement of Android ATC of the site or the products contained therein.

Android ATC may have patents, patent applications, trademarks, copyrights, or other intellectual property rights covering subject matter in this document. As expressly provided in any written license agreement from Android ATC, the furnishing of this document does not give you any license to these patents, trademarks, copyrights, or other intellectual property.

Android application development is a detailed guide that provides the basics to build Android applications. It is a combination of theoretical lessons and practical labs that covers skills and knowledge every Android developer should learn before starting the development of real-world applications.

All lessons and their lab exercises in this book were built to comply with the latest versions of Android SDK and Android Studio IDE. Since the update of both Android SDK and Android Studio is a continuous process, it is highly possible that any of these components has already been updated by the time you start your training using thisbook. If this is the case, you might notice some minor difference in the lab steps and the screenshots provided, depending on how major an update has been. Updates neither make the lessons outdated nor the labs incorrect. It is only impractical to release a new version of the book for every update.

This book is intended for trainees with background in object-oriented programming. It is expected to have such differences between the Android Studio version you are using and the one followed in the book; however, this should not constitute an obstacle for learning and following the labs.

Android ATC training team continuously works on providing the most up to date labs and code samples. Nonetheless, we would like to apologize in advance in case any lab step or screenshot was inaccurate.

Warning and Disclaimer:

This book is designed to provide information about Android application development course and exam AND-X01. Every effort has been made to make this book as complete and as accurate as possible.

Exam

You can examine your knowledge on the content of this book by taking the online exam AND-X01 through Pearson-VUE testing centers worldwide. Passing this exam grants the examinee the title: "Android Certified Application Developer". For more information, visit: https://home.pearsonvue.com/androidatc

Besides, you may schedule your exam at any Android ATC authorized training center worldwide or you may select the online proctored exam choice which allows you to conveniently and easily take an exam at the comfort of your home or office while being monitored by a remote proctor. Check Android ATC web site for more information.

Trademark Acknowledge:

All terms mentioned in this book that are known to be trademarks or service marks have been appropriately capitalized. The use of a term in this book should not be regarded as affecting the validity of any trademark or service mark.

Android is a trademark of Google Inc. The Android robot is reproduced or modified from work created and shared by Google and used according to terms described in the Creative Commons 3.0Attribution License.

Feedback Information:

As Android ATC, our goal is to create in-depth technical books of the highest quality and value. Each book is crafted with care and precision, undergoing rigorous development that involves the unique expertise of members from professional technical community.

Readers' feedback constitutes the natural continuation of this process. If you have any comments regarding how we could improve the quality of this book, or otherwise modify it to better suits your needs, you may contact us by email at: info@androidatc.com. Please make sure to include the book title and ISBN in your message.

We greatly appreciate your assistance. Android ATC Team

Table of Contents

Lesson 1: Introduction to Kotlin

Kotlin History	1-1
Kotlin Advantages	1-1
How Kotlin Programs Work?	1-2
Kotlin Software Prerequisites	1-3
IntelliJ IDEA	1-4
Installing IntelliJ IDE	1-4
Creating a Kotlin Program	1-15
Running a Kotlin Program	1-17
The main() function	1-18
Writing Comments	1-20
Kotlin Variables	1-21
Kotlin Data Types	1-22
Input of Information to Kotlin Program	1-33
Lesson 2: Control Flow Statements	
Introduction	
Introduction	2-1
Introduction If Statement If - Else Statement	2-1 2-4
Introduction If Statement If – Else Statement If Else and Logical Operators	2-1 2-4 2-6
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression	2-1 2-4 2-6 2-8
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression For Loops	2-1 2-4 2-6 2-8 2-9
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression For Loops While Loops	2-1 2-4 2-6 2-8 2-9 2-12
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression For Loops While Loops Do-while Loops	2-1 2-4 2-6 2-8 2-9 2-12
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression For Loops While Loops Do-while Loops Jump Expressions	2-1 2-4 2-6 2-8 2-9 2-12 2-13
Lesson 2: Control Flow Statements Introduction If Statement If - Else Statement If Else and Logical Operators. When Statement and Expression For Loops. While Loops. Do-while Loops Jump Expressions Break Statement	2-1 2-4 2-6 2-8 2-9 2-12
Introduction If Statement If - Else Statement If Else and Logical Operators. When Statement and Expression For Loops. While Loops. Do-while Loops Jump Expressions Break Statement Continue Statement	2-1 2-4 2-6 2-8 2-9 2-13 2-15 2-16
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression For Loops While Loops Do-while Loops Jump Expressions Break Statement Continue Statement Return Statement	2-1 2-4 2-6 2-8 2-12 2-13 2-15 2-16 2-16
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression For Loops While Loops Do-while Loops Jump Expressions Break Statement Continue Statement Return Statement Functions	2-1 2-4 2-6 2-8 2-9 2-13 2-15 2-15 2-16 2-16
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression For Loops While Loops Jump Expressions Break Statement Continue Statement Return Statement Functions Function Structure	2-1 2-4 2-6 2-8 2-9 2-13 2-15 2-16 2-16 2-16 2-17
Introduction If Statement If - Else Statement If Else and Logical Operators When Statement and Expression For Loops While Loops Do-while Loops Jump Expressions Break Statement Continue Statement Return Statement Functions	2-1 2-4 2-6 2-8 2-12 2-13 2-15 2-16 2-16 2-17 2-18

Lesson 3: Functions & Object-Oriented Programming (OOP)

Object-Oriented Programming (OOP)	3-1
Object	3-1
Class	3-1
Creating a Class	3-2
Providing Constructors for Your Classes	3-6
Class Inheritance	3-7
Abstract Class	3-11
Interface Class	3-15
Generic Class	3-21
Class Variables	3-23
Member Variables	3-23
Kotlin Collections	3-26
Hashmaps	3-26
ArrayList	3-30
listof and mutableListOf	3-35
Introduction	
Android Platform Architecture	
Android Libraries	4-3
Components of Android Application	4-4
Types of Android processes and their priorities	4-7
Android Studio	4-8
What is Android Studio?	4-8
Android Studio Software Prerequisite	4-9
Install Android Studio	4-13
Creating Kotlin Project Using Android Studio	4-20
Run Android App	4-23
Instant Run	
Setup an Android Virtual Device	4-27
What is Android Studio Gradle?	
Run your Apps on a Hardware Device (Physical Phone)	4-27
	4-27 4-29
Run your Android App on Android Phone	4-27 4-29 4-30
Run your Android App on Android Phone Lab 4: Creating Your First Application	4-27 4-29 4-30 4-30
	4-27 4-29 4-30 4-30 4-35 4-36

Lesson 5: Creating User Interface

Introduction	5-1
Android Project Structure	5-1
View	5-5
Adding a View to your application	5-5
Adding a View in an XML layout file	5-5
Adding a View using Kotlin code	5-8
Configuring Layout Views	5-8
Creating a User Interface	5-10
Adding a Text Box	5-10
Adding an Image	5-13
Adding a Check Box	5-18
Adding a Radio Button	5-27
Lab 5: Creating a Pizza Order Application	5-34
Create Your Application User Interface	5-3
Configure the Android Application Code	5-42
	E 44
Lesson 6: Android Layouts, Styles, Theme a	
Lesson 6: Android Layouts, Styles, Theme a	and Menus
Lesson 6: Android Layouts, Styles, Theme a	and Menus 6-1
Lesson 6: Android Layouts, Styles, Theme a	nnd Menus 6-1
Lesson 6: Android Layouts, Styles, Theme a	and Menus 6-1 6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout	end Menus 6-1 6-1 6-1 6-3
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout	end Menus
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout	6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout TableRow Layout	6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout TableRow Layout Frame Layout	6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout TableRow Layout Frame Layout Android Styles and Themes	6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout TableRow Layout Frame Layout Android Styles and Themes App Manifest	6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout TableRow Layout Frame Layout	6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout TableRow Layout Frame Layout Android Styles and Themes App Manifest	6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout TableRow Layout Frame Layout Android Styles and Themes App Manifest App Icons	6-1
Run Your Application Lesson 6: Android Layouts, Styles, Theme a Introduction Views Layouts Constraint Layout Linear Layout Relative Layout TableRow Layout Trame Layout Android Styles and Themes App Manifest App Icons Lab 6: Android Application Layouts, Styles, and Themes	6-1

Lesson 7: Snackbar, Activities, Android Intent, Alert Dialog and Android Notifications

What is an Activity?	
	7-7
Activity Lifecycle	7-8
Managing the activity lifecycle	7-9
Android Intent	7-16
Navigating Between Activities	7-18
Passing Data between Activities	7-25
Android Alert Dialog	7-29
Android Notifications	7-37
Creating an Android Notification	7-39
Notification Channel	7-40
Lab 7: Creating a Mail Schedule Pickup App	7-53
Lesson 8: Android Widgets	
Progress Bar	
Progress Bar Seek Bar	8-8
Progress Bar	8-8 8-15
Progress Bar	8-8 8-15 8-15
Progress Bar Seek Bar Date and Time Picker Dialogs Creating a Date Picker Creating a Ttime Picker	8-8 8-15 8-15 8-19
Progress Bar	8-8 8-15 8-15 8-19 8-21
Progress Bar Seek Bar Date and Time Picker Dialogs Creating a Date Picker Creating a Ttime Picker Calendar View Web View	8-8 8-15 8-15 8-19 8-21 8-23
Progress Bar Seek Bar Date and Time Picker Dialogs Creating a Date Picker Creating a Ttime Picker Calendar View Web View Rating Bar	8-8 8-15 8-15 8-19 8-21 8-23 8-28
Progress Bar Seek Bar Date and Time Picker Dialogs Creating a Date Picker Creating a Ttime Picker Calendar View Web View	8-8 8-15 8-15 8-19 8-21 8-23 8-28 8-31

Lesson 9: Android Navigation Components

Menus	9-1
Bottom AppBar	9-7
Recycler View	9-16
SearchView	9-35
TabLayout and ViewPager	9-46
Spinner	9-56
Drawer	9-63
Lab 09: Creating Navigation Drawer in Android App	9-64
Lesson 10: Firebase Authentication and Database	
Introduction	10-1
What is the JSON?	10-2
How does Firebase Database work?	10-2
Firebase Authentication (Signup and Login Android App)	10-3
Configure your App to use Firebase Services	10-8
Configuring Firebase Authentication	10-15
Login to App Using a Firebase User Accounts	10-23
Logout Configuration	10-24
Using Firebase Assistant with Android Studio	10-26
Firebase Database	10-27
Real Time Database	10-28
Cloud Firestore Database	10-37
Lab 10: Firebase Authentication and Database	10-44
Configure your App to use Firebase Services	10-52
Adding Firebase to your Android App	10-54
Configuring User Authentication Using Firebase Authentication	
Creating a Firebase Cloud Database	10-64
Retrieving Data Firebase Cloud Database	10-70

Lesson 11: Location-Aware Apps: Using GPS and Google Maps

Introduction	11-1
What is GPS and how does it work?	11-1
Latitude and Longitude	11-1
Camera Position	11-2
Adding Google Maps to an Android app	11-4
Map Fragment	11-6
Getting a Google API key	11-7
Adding a Google Map Marker	11-14
Capture a User's Location on Google Maps	11-20
Reverse Geolocation on Google Map	11-30
Retrieving a Readable Address on Google Map	11-31
Lab11: Location-Aware Apps Using a GPS and Google Maps	11-41
Creating an App Interface and Configuring Google Services Prerequisites	11-42
Creating a Google Map Fragment	11-43
Getting a Google API key	11-43
Configuring Your App to Use Your Google API Key and User App's Permission	11-47
Adding Google Map and Capturing Users' Location	11-48
Lesson 12: App Testing and Publishing	
Testing and Feedback Your App	12-1
Setting up a Test Environment	12-5
Usability Testing by Participants	12-5
Starting Your Test Session	12-6
Analyzing Your Test	12-7
Firebase Test Lab	12-7
Publishing Android App on Google Play Store	12-7
Preparing your app for release	
Publish App on Google Play Store	